

# Organisational Knowledge Base and Knowledge Transfer in the Shipping Industry

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**Abstract:** Severe shortages of skilled and qualified personnel in the shipping industry have been addressed in different ways. This paper looks into the issue from a new perspective where high mobility in the shipping industry is seen as a vehicle of knowledge flows that can be used for knowledge transfer. This paper argues that while organisations cannot stop personnel leaving, it is possible, however, to retain part of the knowledge that these leaving personnel carry through effective knowledge management practices. This paper introduces organizational knowledge base (OKB) and identifies knowledge flows both at organizational and industrial levels showing that much can be done to effectively utilise knowledge spillovers brought about by high personnel mobility in the shipping industry. The paper then examines the barriers and facilitators of knowledge transfer in the context of the shipping industry. Due to the unique characteristics of the shipping industry such as the absence of genuine employment link between seafarers, and the remoteness of the onboard workplace from the onshore management, conventional knowledge management practices need to be modified to suit the context of the shipping industry. The paper suggests that advanced information and communication technologies, a dedicated knowledge sharing culture, and strong leadership are essential factors in facilitating knowledge transfer in the context of shipping. The implications of the application of knowledge management practices in the shipping industry are two fold: one is the change of perspectives towards the shortage of skilled personnel in the shipping industry which in turn impacts on maritime education and training; the other is the realignment of resources in tackling the problem of skill shortages, that is, a shift from employee retention to knowledge retention. It is expected that such an attempt will shed light on the understanding of skill shortages from a different perspective and provide insight on the tasks that the shipping industry is facing.

**Keywords:** OKB, human mobility, knowledge management, knowledge flow, knowledge transfer

## 1. Introduction

The shipping industry has been experiencing severe shortage of skilled and qualified personnel. A comprehensive study conducted by the Baltic and International Maritime Council, in conjunction with the International Shipping Federation shown an imbalance of supply and demand of seafarers (BIMCO 2000; 2005) as a result of on-going outflow of its highly experienced personnel to other shore-based industries and low intakes to refill its skill base. It is projected that by 2010, the shipping industry will be faced with a shortage of 46,000 skilled and qualified personnel worldwide (table 1). The shortage will impact the shipping industry's ability to sustain ever increasing demand on maritime transport therefore the wellbeing of international trade and world economy will be affected. The skill shortage will also threaten safe shipping practices thereby the marine environment. Due to shipping industry's unique characteristics, personnel movement across industries has been very high and in most cases, such movement is in one-way direction with the shipping industry constantly losing its expertise to other industries.

**Table 1:** Supply and demand balances source: BIMCO/ISF 2000; 2005

	1995		2000		2005		2010	
	Numbers	%	Numbers	%	Numbers	%	Numbers	%
Officers	-18000	-4.22	-16000	-3.81	-33000	-7.64	-46000	-10.38
Ratings	219000	36.14	224000	37.40	230000	38.21	255000	42.29

Conventional teaching from human resource management cannot effectively solve the problem of high turnover in the shipping industry due to, not only high costs involved in retaining leaving personnel, but also the initial motives of leaving being irrelevant to any retention incentives. The battle for retaining expertises and skills has gone for years with little success. It is under this background that this research was initiated as an attempt to address the shortages of seafarers from a new perspective. It is believed that personal knowledge can be retained without having to physically retain the individual who carries that knowledge. Given the fact that personnel mobility is rather high in the shipping industry, it is possible to establish an organisational knowledge base (OKB) (Fei & Grewal 2007) where personal knowledge can be transferred to organisational level and then be used for fast track training and

personal development therefore reducing the time span for getting experienced personnel and enriching their existing knowledge.

This paper starts with introducing OKB and discussing relationship between human mobility and knowledge flows in the shipping industry and its impacts on OKB. Barriers to knowledge transfer in the shipping industry are examined subsequently. This paper finally suggests a knowledge transfer model to be applied in the shipping industry for effective knowledge transfer.

## 2. Perceived effects of human mobility on the OKB in the shipping industry

### 2.1 Organisational knowledge base (OKB)

Organisational knowledge base (OKB) refers to the total knowledge resources that an organisation can use as leverage to gain competitive advantage. Drawn from the organisational knowledge matrix of Nonaka and Takeuchi (1995) and Spender (1996), and Cook and Brown's (1999) four forms of knowledge, the OKB can be illustrated in a matrix (figure 1) which includes both the organisational knowledge (tacit and explicit) that is independent to any individual, as well as personal knowledge (tacit and explicit) that can be possibly integrated into the organisational level. Components in each cell are identified through a review of measurement approaches on knowledge assets including Skandia Navigator (Edvinsson & Malone, 1997), IC-Index (Roos et al, 1997), intangible Asset Monitor (Sveiby, 1997), Knowledge Asset Map (Marr & Schiuma; 2001; Schiuma & Marr, 2001), and IC Audit Model (Brooking, 1996).

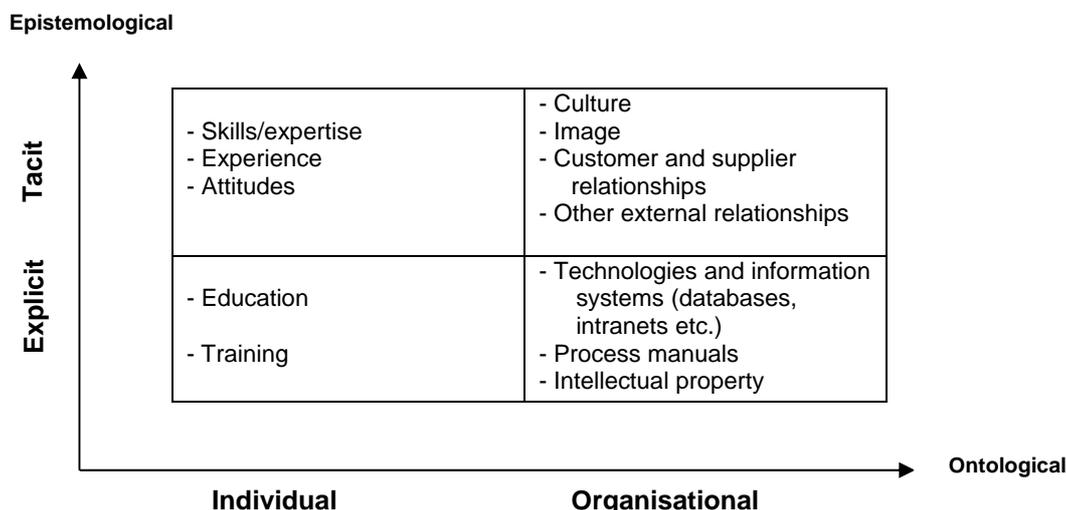


Figure 1: Knowledge components in an OKB matrix (source: authors)

Based on the above OKB matrix and its components, the OKB in the shipping industry can be considered as a construct comprising four groups of knowledge as follows:

#### Individual explicit knowledge

- Education: study in maritime or non-maritime education institutions that leads to attainment of formal certificates or degrees. Indicators of the level of personal education include years of school, certificates and/or degrees, including certificates of language fluency.
- Training: training undertaken to fulfil the requirements of STCW or other relevant international Conventions or Codes. Qualifications obtained as the result of training courses can be good indicators for training.

#### Individual tacit knowledge

- Skills/expertise: areas of expertise (nautical or managerial skills), acquired through the combination of education and work experience. Indicators of skills/expertise include certificates of competence and other relevant professional qualifications. In addition, skills or expertise are the result of individual experience and are reflected not only through the acquisition of professional qualifications, but also in the individual's problem solving capability and innovation ability in the real working world. Therefore, in terms of knowledge components in the OKB, skills/expertise should be

represented by three elements, that is, professional qualifications, personal problem solving capability, and personal innovation ability.

- Experience: generally, length of service in the industry and positions held are good indicators of personal working experience that to a great extent manifest the richness of a personal knowledge. In the shipping industry specifically, work experience in different types of ships, sailing on various ocean routes and exposure to multicultural workplaces, are important indicators of personal knowledge.
- Attitudes: work attitudes are considered closely related to individual performance and to the future success of an organisation (Hurst, 1995). In the shipping industry, especially for those who work onboard, work attitudes have great implications to their well-being and have direct effects on safe shipping. Attitudes can be measured through a) overall satisfaction with the current job, b) pride to work for the company, c) alignment of personal and company values, d) commitment to the company (organisational commitment) (Rode & Near, 2005), and e) commitment to the industry (career commitment).

#### Organisational explicit knowledge

- Technologies and Information Systems: these can be broadly categorised into three groups: a) knowledge storage and retrieval, which on the one hand assist management in decision-making and, on the other hand, enable employees in self-improvement, database for information sharing, for example, b) systems that provide access to existing knowledge base, such as intranets, EDI, track and tracing systems, and c) communication technologies that facilitate knowledge sharing, such as E-forums, alumni, and online communities of practice (where people having similar interests gather to share experience and discuss their viewpoints).
- Process Manuals: these are usually in the form of written instructions or operational procedures. In addition, best practices identified from workplaces are also included in this group in the form of codified knowledge.
- Intellectual property: while the inclusion of intellectual property in to organisational knowledge has been in debate, its elements (patents, copyrights, trademarks, registered designs, and brands) are certainly, to a great extent, to do with the knowledge capacity an organisation possesses. Trademarks and brands have a close relationship with organisational image.

#### Organisational tacit knowledge

- Culture: organisational culture is considered as a whole component of OKB. An understood and articulated vision and mission statement, a story of a respected captain, can be part of organisational culture.
- Image: an organisation's reputation for social and environmental responsibilities that is known to the public or community in general, and to the industry in particular, for example safety and quality approaches employed by a shipping company.
- External relationships, relationships such as shippers, terminals, manning companies, or agreement with alliances.

## **2.2 Mobility and knowledge flows**

The movement of personnel is widely recognised as a mechanism for distributing tacit knowledge and skills across space and time (Almeida & Kogut 1999; Cooper 2001; Gruenfeld, Martorana & Fan 2000). As personnel are knowledge carriers (Grant 1996; Polanyi 1962; Von Krogh & Roos 1995), when they move they bring their knowledge into the new workplace. While inflow mobility may bring in new knowledge that the organisation previously did not have (therefore reflecting an increase in its OKB), outflow mobility may be translated into a loss of certain knowledge if the knowledge of the leaving person is not known to the others in the organisation (therefore a decrease in its OKB). As OKB itself is dynamic (Fei & Grewal 2007), the measurement of its sheer size is of little relevance to organisational management. Rather the identification of knowledge flows related to an organisation may help management to initiate best practices to make best use of knowledge flows brought by personnel mobility.

### *2.2.1 Intra- and inter-firm knowledge flows*

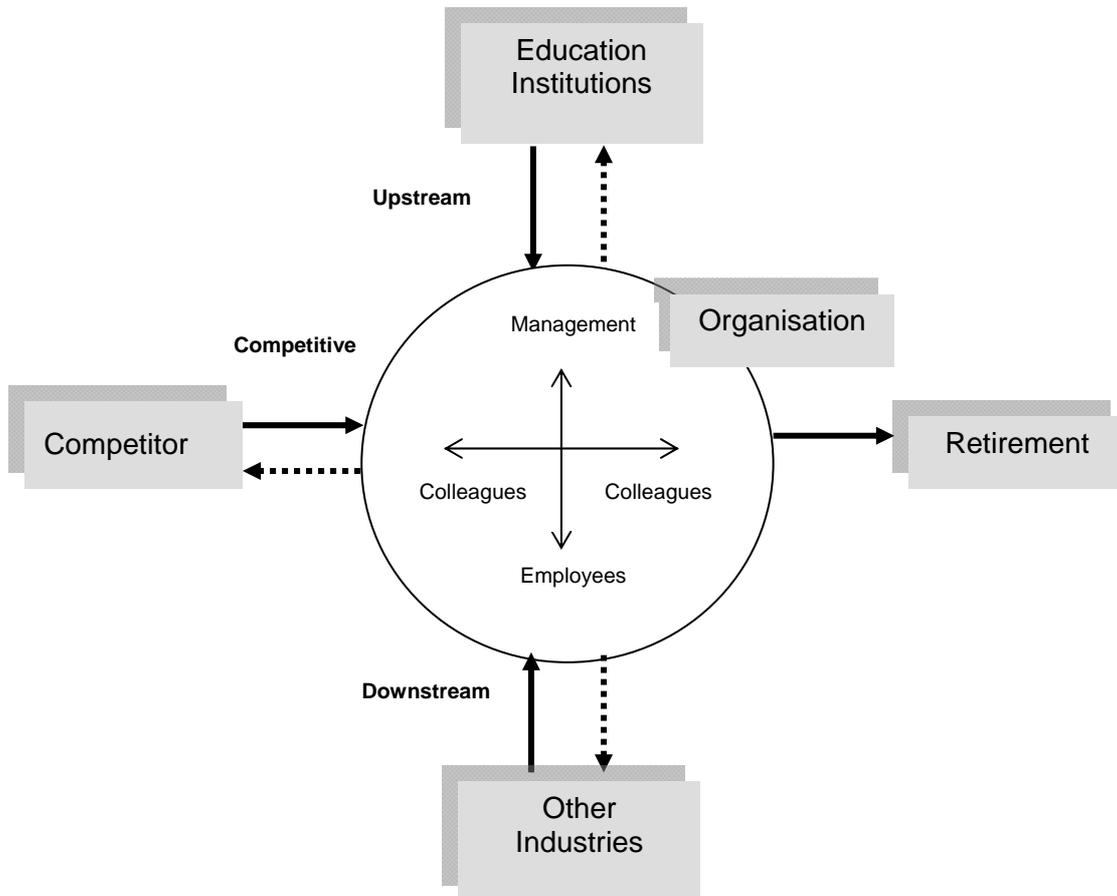
In the literature, knowledge flows are identified as both intra- and inter-firm (Eisenhardt & Santos 2002; Winter & Szulanski, 2001), with the organisation as unit of analysis. Intra-firm knowledge flows take

place within an organisation, between management and employees (vertical) or between colleagues (horizontal). Subgroups of knowledge flows may exist within the boundary of the organisation such as teams, groups and projects. Inter-firm knowledge flows include: 1) upstream flows from suppliers (e.g. universities) (Bolton 1994; Hauknes & Ekeland 2002); 2) downstream flows across industry boundaries (Tomlinson 1999) and 3) knowledge flows between other organisations, that is, between organisations in competitive interaction (Almeida, Song & Grant 2002). The only one-way movement direction is from organisation to the domain of retirement. The literature therefore provides a picture of how knowledge flows within and across the boundary of an organization shown in figure 2. The knowledge flows in a two-way direction with firm arrows representing knowledge inflow and dot arrow as outflow.

It is clear that the structure of knowledge flows corresponds to that of human mobility. The difference is, apart from inter-organisational knowledge flows, knowledge also flows horizontally as well as vertically within the organisation. The internal knowledge flows are a vital part of the whole knowledge flow structure in that knowledge retention occurs during this process through knowledge sharing and transfer. This reflects the individual-group-organisational (IGO) learning framework which highlights the importance of learning that resides in the organisation's systems, structures, procedures and routines (Fiol & Lyles 1985).

**2.2.2 Organisation – education institutions**

The entire formal education system is believed to be the first measurable step in human's acquisition of knowledge (Graversen 2003). Knowledge acquired through formal education in most cases, is explicit in nature, which is visible, reproducible and sharable. This knowledge is essential for the human's ability to absorb and develop new knowledge in the second step of their knowledge acquisition, that is, tacit knowledge. The inflow of graduates to the organisation brings fresh ideas into the workplace. The effects of the inflow on OKB depend on the level of formal education because a) formal education is an indicator of how much explicit knowledge the individuals have acquired and b) formal education is highly correlated with individuals' ability to acquire tacit knowledge in workplaces.



**Figure 2:** Intra- and inter- firm knowledge flows (source authors)

The outflow (personnel movement from industry to education institutions) can provide students with access to leading-edge thinking and technology in their field of interest. Industrial representation on university planning raises awareness of the needs of industry resulting in the development of educational programs that are more relevant to the demands of the industry (Bolton 1994). This outflow movement also includes those who will pursue further education or training in order to take higher positions when they come back to the industry or to find a different occupation in another industry. The former can be treated as graduates and the latter shall be considered as across sectoral movement. In terms of its effects on OKB, the organisation has a loss of knowledge when its employees leave for positions in education sector. However, because these employees will diffuse their knowledge to the students through lecturing, which in turn will benefit the industry as whole when these students come into the workplace, the net effect of this movement is hard to determine for a specific organisation. The overall result to the whole industry nevertheless is positive.

Among the inflow movement, included are also those who have been in the education sector for years but will spend time in the industry for research purposes or as an occupation. To simplify the discussion, this group of people will be treated in the industry- education collaboration. Research joint ventures, as one form of industry – education collaboration, have been increasing over time (Caloghirou, Tsakanikas, & Vonortas 2001), reflecting the advantages of knowledge creation and sharing in the process of joint research. The major benefit to the industry from university-industry collaboration is the enhancement of the knowledge base of the firm. This includes the improvement of the firm's technological and organisational capabilities, exploitation of complementary resources, new knowledge creation and/or acquisition, and acceleration of research.

### *2.2.3 Organisation – organisation*

Movement between organisations in the same industry is sometimes called 'temporary mobility' (Langberg & Graversen 2001). Personnel learn from their workplaces and bring their knowledge with them to the new workplace when they move. At the industry level, since personnel remain in the same industry and they learn from each organisation that they work for, mobility increases personal knowledge and has positive effects on the industry. At the organisational level, since mobility is a two-way movement to the organisation its effects on the OKB therefore depend on two facts and a moderator. The first one is if mobility is the result of dysfunctional or functional turnover (Dalton, Todor & Krackhardt 1982). The second is if there is a balance between inflow and outflow in knowledge movement in terms of individual qualifications, experience and skills, that is, personal knowledge. The moderator is related to the knowledge management practices that can be possibly employed to retain personal knowledge. The more effective the practices, the less impact of personnel leave on the OKB.

### *2.2.4 Organisation – other industry*

Research indicates that cross sectoral mobility happens more commonly between industries and R & D institutes or between higher education institutions (Graversen 2003). Other cross industry mobility might be caused by macro-economic or industrial restructure resulting in flows of skills acquired in one part of the economy into another for example, shifts of employment from manufacturing to services in 1980s (Tomlinson 1999). In the shipping industry, China experienced strong inflows of personnel from various other industries in 1980s when the industry was perceived as offering very high salary compared to other industries. Other nations such as the UK however, observed a net loss of experienced personnel to other maritime related industries (Gardner & Pettit 1999). While the effects of inflow cross industry mobility is to great extent, dependant on the relevance of the skills to the receiving industry, the outflow is considered as a loss of knowledge for the industry in general and for the delivering organisation in particular.

### *2.2.5 Organisation – retirement*

Personnel movement from active workforce to domain of retirement is a less explored area. Generally, retiring personnel have rich tacit knowledge that has been accumulated from many years of work experience. This knowledge is hard to articulate and is a valuable asset to the organisation. Research in the gas and oil industry indicates that the aging workforce is posing a severe threat to the whole industry, if significant steps are not taken (Leavitt 2002; Sapient Corporation 2001) to retain the rich knowledge that the aging workforce is carrying. If this knowledge is not known to the other members of the organisation, the retirement of these personnel will surely have a negative impact on the OKB.

### **2.2.6 Intra-firm**

Research indicates that knowledge diffuses more easily within a firm than between firms (Kogut & Zander 1992) and intra-firm knowledge flows tend to be stronger than inter-firm due to stronger interpersonal networks within firm boundaries (Singh 2005) and a high level of cooperation among members (Kogut & Zander, 1996). However, such intra knowledge may be relatively redundant because members of a firm share the interpretations of experience and firm's collective memory over time (Madsen, Mosakowski & Zaheer, 2003; March 1991). From the perspective of the OKB, intra-firm personnel movements may not contribute directly to the richness of the OKB, such movements nevertheless enhance the ability of the firm to retain knowledge in case of high intra-firm mobility.

### **2.3 Human mobility in the shipping industry and its effects on the OKB**

Overall, human mobility in the shipping industry is rather high. The survey of seafarers conducted during the Rochdale Committee of Inquiry into Shipping showed that 66% of all seafarers switch between companies while 32% remain with the first company they joined (Moreby 1975). Accompanied the high inter-company mobility is the high cross sectoral movement of personnel, which has been termed as 'wastage' so called as this personnel movement has been one-way direction therefore a loss to the shipping industry.

Previous research indicated an average time-span of shipping officers' active seafaring career was seven years (Moreby 1975). Recent reports in China recorded a 60% of attrition of graduates in a period of five years after they joined in the shipping industry (Kong & Ruan 2001). In addition, there has been difficulty in attracting personnel into the industry for various reasons (Dinwoodie 2000; Leggate 2004; Moreby 1975; Sambracos & Tsiaparikou 2001). The mobility in the shipping industry thus has three distinct characteristics:

- High mobility rate between companies within the industry;
- High and almost one-way direction movement of personnel from the shipping industry to other maritime related industries; and
- Low intake of graduates from maritime education institutions due to the difficulty in attracting candidates studying nautical courses.

Based on the discussion in the earlier section, investigation has been done to establish the structure and characteristics of personnel mobility in the shipping industry and its potential effects on the OKB (figure 3). The categorisation of groups and subgroups in the investigation process follows Graversen's (2003) definition of mobility while taking the shipping specific characteristics into consideration. This framework is conceptual in nature, however, can be used for empirical test in the late research.

For the shipping industry, the main source of intakes of personnel is graduates from various maritime education institutions (MEI). The long-existing problem associated with this source of inflow movement has been the difficulty faced by these MEIs to attract young people into the shipping industry and the high drop rate of nautical students. A close examination reveals a pyramid shape of numbers of people at different stages of study or career path with a large base and much smaller group of people on the top remaining actively in the industry (Chen, 1998). This obviously affects the overall costs of education and training and the efficiency of the whole system. While movement between organisations within the shipping industry is considered balanced and does not affect the overall skill base of the industry, the movement across industries has been identified as one of the major factors for the shipping industry losing its expertises to other industries due to the fact that such movement is greatly unbalanced and nearly one-way direction. Due to the characteristics of the shipping industry, it is unlikely that such phenomenal movement can be mitigated. In fact any attempt to obstruct such mobility may have a negative impact on the attractiveness of the industry as such mobility has been seen by many as major career path therefore the very reason to join the industry at the first place.

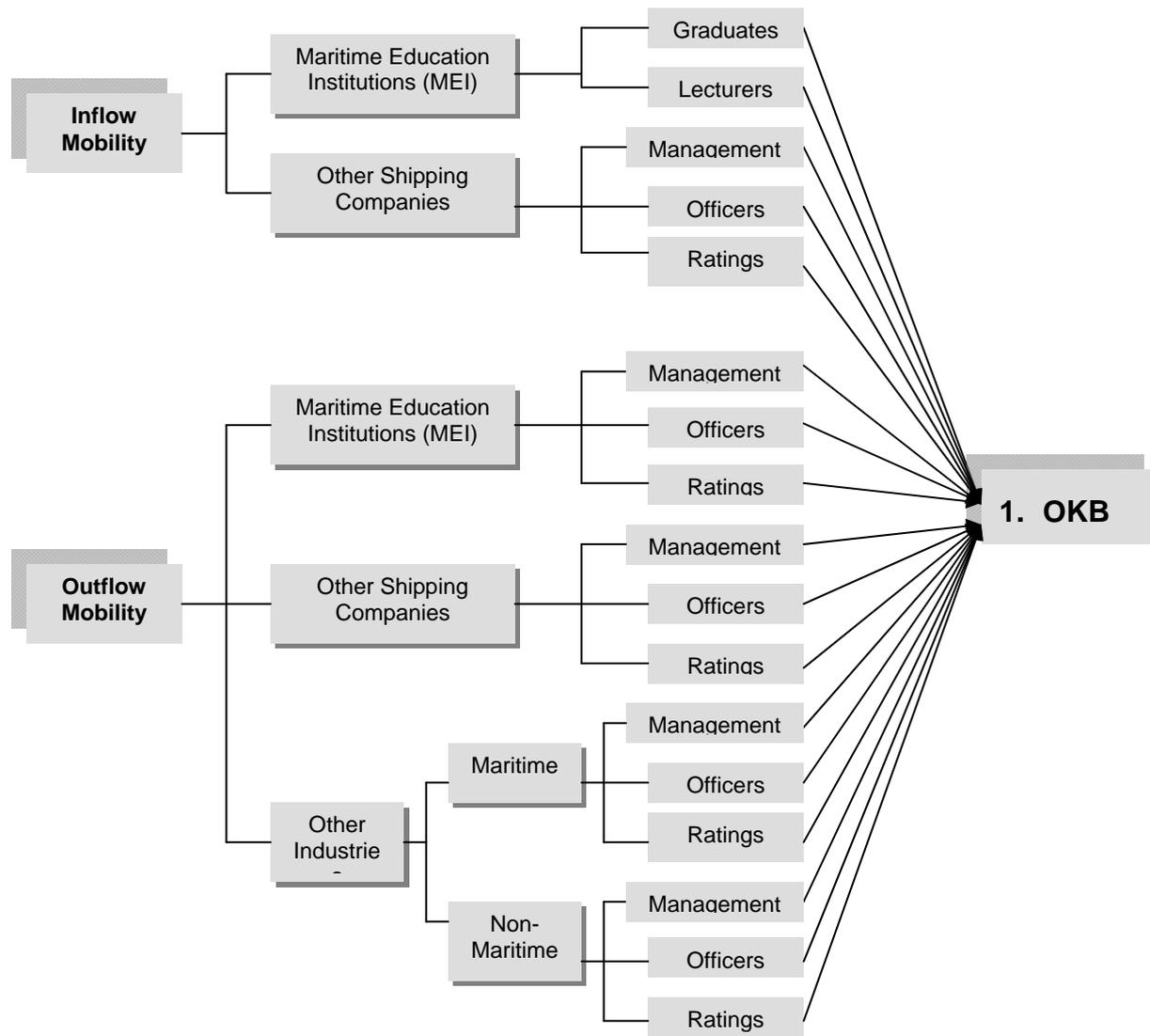


Figure 3: Personnel mobility and its effects on the OKB in the shipping industry (source authors)

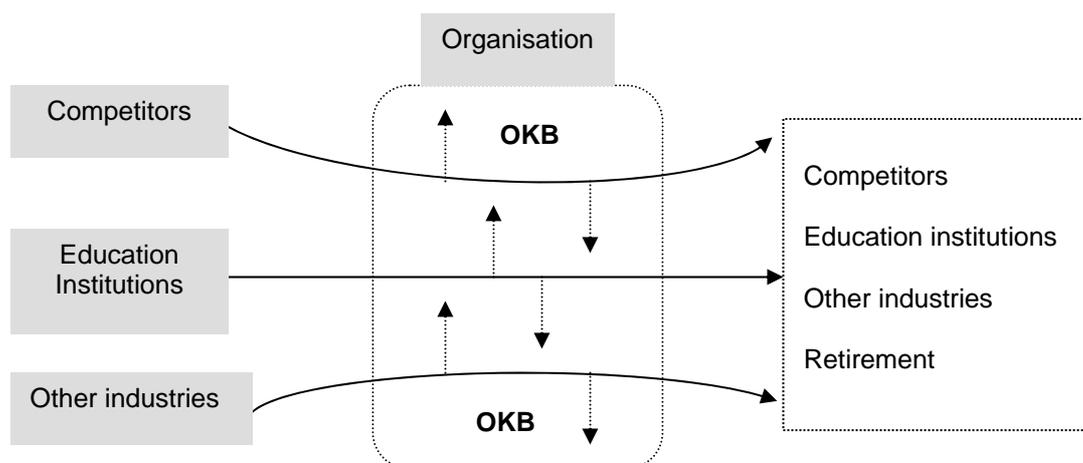
## 2.4 Human mobility and knowledge transfer

As human mobility is always accompanied by knowledge flows, there are different sources of knowledge flow through the organisation at any given time. The organisation is able to use the inflowing knowledge when the knowledge stays within the organisation. However, high mobility makes personal knowledge temporal to the organisation. If no retention mechanism is in place, these inflows of knowledge will be lost again when personnel leave the organisation. If knowledge flows are properly managed, then the OKB will be enhanced and continuously updated. Figure 4 illustrates the relationship between knowledge flows and the OKB. If proper methods are adopted, part of knowledge that flows into the organisation will be retained even if personnel leave.

Given the prevailing human mobility, the main task for knowledge management is to make the dot arrows in figure 4 solid, that is, to make knowledge transfer effective. Personnel coming from competitors provide the organisation opportunities to learn from others through sharing of their personal knowledge. People from education institutions and other industries often carry fresh ideas into the industry and represent opportunities for the organisation to advance its knowledge base. From the perspective of an industry, human mobility among organisations, between education institutions and the industry, and across industries, might maintain a dynamic balance, that is, the inflow and outflow of personnel to the industry is balanced therefore a balance of inflow and outflow knowledge.

However, personnel retirement certainly represents a sheer loss of knowledge to the industry as a whole if no knowledge retention mechanism is employed. In addition, for an industry where inflow and

outflow of personnel is unbalanced, especially when outflow outweighs inflow, mobility poses a severe issue for the industry to maintain a competent knowledge base.



**Figure 4:** Knowledge flows and the OKB (9source authors)

This is the case for the shipping industry where attrition of seafarers is high and intake of personnel is difficult. For a particular organisation within the industry, effective knowledge management practices can retain the knowledge carried by mobile personnel, which is interpreted as an increase on OKB. To make the process effective, obstacles of knowledge transfer need to be identified in order for management to employ relevant mechanisms to facilitate the transfer process.

### 3. Identifying barriers to knowledge transfer in the shipping industry

As previously discussed, there is prevailing human mobility and high attrition of expertise in the shipping industry. The agenda for the industry is therefore to retain the knowledge of leaving personnel so that a dynamic balance of the OKB is maintained. It is also established that knowledge transfer is an effective way of protect an organisation from knowledge attrition incurred by high mobility. The next two sections will examine the factors affecting knowledge transfer in the context of the shipping industry and to identify effective management practices to reduce the barriers and to facilitate the transfer of knowledge within a shipping organisation.

Literature on knowledge flows and knowledge transfer identifies a number of factors that might affect the process of knowledge transfer. These factors can be grouped into knowledge related (for example Kogut & Zander 1993; Simonin 1999; Winter 1987), context (for example Szulanski 1996; von Hippel 1994), individual (for example Gupta & Govindarajan 2000), relationship (for example Szulanski 1996), and organisation (for example Simonin 1999). Discussion of knowledge transfer barriers in the shipping industry follows the above identified groups of factors.

There are distinct characteristics in the shipping industry, which may affect the transfer of knowledge among individuals in organisations. These include the composition of the workforce in the shipping industry, unique working environment on ships, the management structure of shipping organisations, and highly mobile personnel. These elements have a direct impact on the factors discussed which in turn have implications on the adoption of effective management practices to facilitate knowledge transfer.

#### 3.1 Context

The shipping industry by its nature is international. Personnel in a shipping organisation often come from many different countries and with multicultural backgrounds. In fact, research indicates that two thirds of workforce is working in a multicultural environment (Kahveci & Sampson 2001). Cultural differences can make daily communication difficult and even more difficult for knowledge sharing. In addition, people coming from different cultural backgrounds often speak different languages. Although English has been the working language on ocean-going ships, the ability to communicate in English varies significantly among seafarers. 'Language filters and organises information from the physical and cultural realms and transform it into meanings that make up human knowledge and experience' (Polkinghorne 1988: 158). Research shows that there are tight links between verbal skills and the

acquisition of abstract concepts, conceptual depth, critical analysis, logical argumentation and the articulation of ideas (Orr 1987). Different national languages are reported as a key obstacle for knowledge transfer in MNC context (Almeida & Grant 1998). The complexity of workforce in the forms of different culture backgrounds and languages in the shipping industry is a source of barrier for knowledge transfer.

### **3.2 Relationship**

The working environment on ships has been well documented in literature (for example, Forsyth 1989; Gerstenberger 2002; Glen & McConville 2001; Moreby 1975; Roger 1983). Apart from linguistic and cultural issues, there is little time for personal communication due to clear duty definition and tight daily shifts. Most people carry out their duties alone and have different schedule from others. The staffing policy of reducing the number of personnel on modern ships makes the situation even worse. Furthermore, the physical design of space, machines, and workflow has been given little attention to the impact of the social and organisational requirements for creating an efficient, productive organisation (Whyte 1983). Moreover, every ship is an isolated world (Zhao 2001). A ship at sea is effectively isolated from the rest of the world spatially and socially. Even with the help of modern information technology (Goel 2003; Mazières et al. 2002), their ability to be socially connected is still limited. Therefore the workplace situation decreases the likelihood of these personnel being a part of networks for either social or learning purposes.

### **3.3 Organization**

The management structure of the shipping industry has two distinct features. One is the hierarchy on ships (Lane 1986; Zuboff 1983). The other is the time and spatial difference between onshore management and its vessels. While hierarchy is necessary to get things done in many circumstances, it is of no help in building informal relationships across hierarchical ranks. This makes onboard interaction limited to superficial working relations rather than personal, making detailed interpersonal communication impossible. On the other hand, the spatial distance and time difference from onshore management make interpersonal connection between crew members and staff ashore remote (Gerstenberger 2002). Members of both sides hardly reach to each other in a meaningful way. The reality of this management structure calls for realignment of personnel from all parts in order to facilitate both vertical and horizontal interactions between members and groups of the organisation.

### **3.4 Individual**

Finally, as previously discussed, mobility in the shipping industry is rather high, especially its “wastage”, compared to other industries. This is partly due to the eroding employee loyalty prevalent in modern workplaces (Abassi & Hollman 2000; Kransdorff 1996) and partly due to the uniqueness of occupations in the shipping industry (Moreby 1975). For many, working in the shipping industry is not a lifelong occupation, rather an interlude in their occupational life. The initial motives to choose the industry and later the broken “psychological contract” frequently leads many to drop out (Moreby 1975). In addition, flagging out and the development of financial markets have broken the genuine link between the owner of the ship and crewmembers who work and live on it (Gerstenberger 2002). As a result, commitment for both the organisation and personnel no longer exists.

### **3.5 Knowledge**

The types of knowledge in the shipping industry tend to be distinctively divided. On the one hand skills and expertises are very experiential and are obtained only through observation and real working experiences. On the other hand, however, there are abundant of written instructions, procedures, and manuals to follow under certain circumstances due to the fact that shipping is one of the most regulated industries because of its possible impacts on human lives and marine environment. It is a misperception that safe operations can be carried out solely based on the knowledge of various International Conventions, Codes, or other regulations. While the understanding of rules and procedures for a particular operation can be obtained through articulation of explicit knowledge in forms of Conventions, Codes, Manuals, the manoeuvring of an operation needs far more tacit knowledge which can only be mastered through observation and mentoring.

### 3.6 Mechanisms

Given the working environment in the shipping industry, knowledge transfer can be facilitated at different stages of a career path or through other related activities. Cadetship/apprenticeship is important part of the real world learning curve, where candidates start the process of applying what they have learnt from school to the real world situation, a process of knowledge validation and assimilation. Furthermore, job rotation provides participants the opportunity to access to different working environments where different skills are required. Such rotation stimulates learning motivation and promotes knowledge sharing environment. A distinctive feature of working in the shipping industry is the need to upgrade skills required by International Conventions in order to be competent for what they are doing. Therefore, regular training and development is important part of knowledge acquisition. Moreover, networking, especially informal, is important way of sharing knowledge given the multicultural workforce of the industry.

The above discussion can be summarised in table 2, where shipping industry specific characteristics are categorised into six knowledge transfer (KT) related factors, which have been examined previously. These factors are inter-related. Spatial or perceived distance between management and its workforce, and the lack of genuine link between crew members and the shipping company have adverse effects on trust building, which, in turn, affect the willingness of employees to share their knowledge (Empson 2001; Morris 2001; Scarbrough 1999). The weak employment tie also discourages companies from investing on training and providing other means for their employees to improve personal knowledge. Another barrier of sharing knowledge comes from the low trust between employees as a result of linguistic and cultural differences. In addition, the inactive attitudes of many employees to pursue new knowledge due to temporal nature of occupation in the shipping industry (Moreby 1975) further impede possible knowledge transfer. The characteristics of knowledge require appropriate transfer mechanisms to be employed. The organisation, by dedicating appropriate resources, can reduce these barriers and effectively facilitate the transfer of knowledge among its employees.

**Table 2:** Six KT-related factors in the shipping industry (source authors)

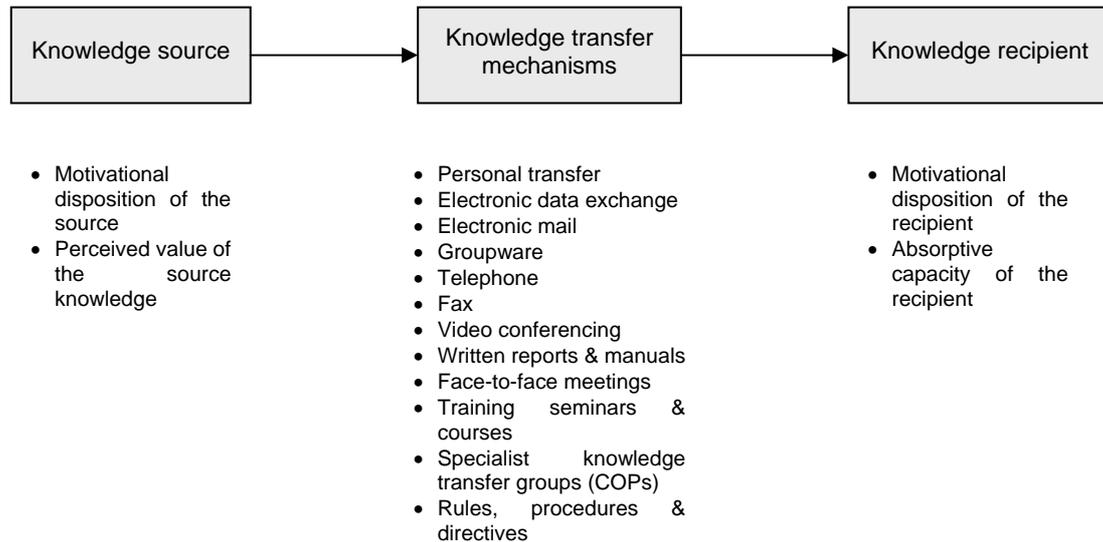
Factors	Description
Context	1. Highly regulated industry; 2. International workforce.
Organisation	1. Remoteness of management and workforce; 2. Low organisational commitment.
Relationship	1. Linguistic barrier; 2. Different cultural backgrounds; 3. Temporal relationship due to high mobility; 4. Strict hierarchy; 5. Low trust.
Individual	1. Lack of willingness to share and low motivation to learn due to low trust; 2. Low commitment to the organisation; 3. Lack of motivation to learn due to the temporality of the career.
Knowledge	Highly experiential vs. written rules and instructions.
Mechanisms	1. Apprenticeship/cadetship; 2. Formal/informal networking; 3. Job rotation; 4. Formal/informal training; 5. Written reports, procedures and manuals.

### 4. Effective knowledge transfer practices in the shipping industry – a knowledge transfer model

The main aim of employing knowledge management practices in the shipping industry is to retain the knowledge carried by individuals so that the knowledge becomes a part of the OKB even if individuals leave. This can be achieved through effective knowledge transfer practices where knowledge of leaving personnel is shared with those who are still staying with the organisation (as illustrated in figure 4). Drawing on Gupta and Govindarjan (2000) and Almeida and Grant (1998), Abou-Zeid (2002) builds an inter-organisational knowledge transfer model. Figure 5 is an adaptation of this model to capture the knowledge transfer related factors discussed previously. For an organisation in a given industry, the context in which knowledge transfer occurs is decided. The remaining five factors can be grouped into individual-related (individuals and their relationships), organisation-related, and knowledge-related (characteristics of knowledge and relevant transfer mechanisms). For knowledge transfer to be smooth and successful, the organisation needs to address the barriers and creates a supportive climate for transfer. The knowledge transfer enablers or facilitators include technology, culture, leadership, and measurement (O'Dell & Grayson 1998).

### 4.1 Technology

Technology is one of the infrastructures that an organisation can provide to facilitate the knowledge transfer process. A variety of information systems and technologies supports knowledge management processes such as creation, storage, transfer, and application of knowledge. For example, data mining techniques such as neural networks find new patterns in data and enhance knowledge creation; knowledge repositories store and retrieve knowledge; electronic bulletin boards, discussion forums, knowledge directories, and other knowledge networks enable efficient and accurate transfer of knowledge.



**Figure 5:** A knowledge transfer model source: adapted from Abou-Zeid (2002: 35)

In Almeida and Grant's (1998) knowledge transfer mechanisms, four of them are technology related:

- electronic data exchange (for codifiable information with highly standardised format and low ambiguity, efficient for both limited and wide dissemination);
- electronic mail (characterised by versatility with regard to format and information types and increasingly capable of expressing individuality and subtlety);
- groupware (characterised by versatility in its ability to transfer and integrate many types of information and to provide platform for integration of different individuals' tacit knowledge); and
- Video conferencing (video capability permits richer inter-personal context conducive to joint problem-solving processes).

However, for IT to be effective in knowledge transfer, there requires participants share similar knowledge, background and experience (Zack 1999).

Technology is a helpful tool in facilitating knowledge transfers not the driver, because most tacit knowledge is too complex and too experiential to be captured electronically, and because the incentives for and barriers to sharing are not technical (O'Dell & Grayson 1998). For example, database only complement the personal networks of those seeking answers to problems. Employees of an organisation usually turn first to friends and peers to learn where to find relevant knowledge rather than engaging in an extensive search through an organisation's database, regardless of how robust the search functionality or how customised the database is (Cross & Baird 2000).

Moreover, the ability of IT in facilitating knowledge transfer is limited by the characteristics of the knowledge being transferred. When mainly tacit knowledge is involved, the face-to-face approach to communicate knowledge should be facilitated, rather than an attempt to store it (Hansen, Nohria & Tierney 1999). In addition, articulation of knowledge runs the risk of losing finer aspects of the knowledge (Boisot, Griffiths & Moles 1997) therefore should be avoided (Grant 1996). However, by stopping diffusing tacit knowledge, an organisation will not be able to reap the benefits of leveraging knowledge (Sanchez 1997). The point is then to balance these two through identifying appropriate approach for relevant knowledge.

In the shipping industry, technology such as EDI has been widely used for a long time and the application of information technology in shore-based administration has no difference from any other industries. However, while readily available onshore, information technology is sometimes a luxury exception on ships. Only a small percentage of modern ships have installed advanced equipment that allows internet access. Even for those who have access to internet on ships, the high cost associated with the usage stops many to use these onboard facilities. Due to the remoteness of onboard workplace, the provision of affordable information technology will to a great extent facilitate communication between crew and onshore management, which in turn strengthens their relationships and nurtures mutual trust, thereby facilitating knowledge transfer. In addition, affordable internet access facilitates the establishment of communities of practice where participants tend to willingly share their experiences and expertises through informal networking. Moreover, the access of information technology is an important means by which explicit knowledge is obtained. It is therefore clear that technology plays an important role in facilitating effective knowledge transfer in a shipping organisation.

## **4.2 Culture**

Technology by itself is insufficient, since people are central to creating and sharing knowledge. Information technology can only help to store and transfer knowledge and does not facilitate creation or sharing of knowledge if an organisation does not have a culture favouring these activities (Davenport & Prusak 1998). Besides, for barriers caused by culture differences, technology cannot overcome all, but can reduce some cultural nuances (Soley & Pandya 2004).

De Long and Fahey (2000) identify four ways in which culture influences the behaviours central to knowledge management. Two of them are related to knowledge transfer and sharing in an organisation. According to De Long and Fahey (2000), culture dictates what knowledge belongs to the organisation and what knowledge remains in control of individuals. The culture of individualism versus collectivism affects the extent to which knowledge can be transferred or shared in an organisation. Where norms and practices that advocate and reinforce the supremacy of individual knowledge, activities of knowledge transfer and sharing are limited. Furthermore, the level of trust that exists between the organisation and its employees greatly influences the amount of knowledge that flows both between individuals and from individuals into the organisation's databases, best practices archives, and other records. Moreover, perceived status differences among units lead to adoption of defensive measures to protect knowledge assets of individual units, therefore impeding the sharing and transfer of knowledge within the organisation. The ease or difficulty of moving knowledge is a reflection of its social context. Technologies inevitably have an enormous role to play, but they play it only to the extent that they respond to the social context. A great deal of new technology attends primarily to individuals and the explicit information that passes between them. To support the flow of knowledge, within or between communities and organisations, this focus must expand to encompass communities and the full richness of communication (Brown & Duguid 1998). This calls for the building of networks either formal or informal.

Informal human networks provide sources for people to seek knowledge they need. Individuals in these networks develop strong personal relationships over time and trust each other and feel obliged to sharing knowledge with each other (McDermott 1999). While informal relations often occur naturally, they can be fostered through internal social arrangements that promote horizontal communications and interactions among different organisational units (Ghoshal, Korine & Szulanski 1994; Gupta, Govindarajan, & Malhotra 1999; Tsai 2002). Rather than building new networks for knowledge sharing, an organisation can formalise or lightly authorise existing informal networks by giving them a budget, information systems, space, library support, time for network coordinators to manage network affairs, and recognition of their contribution (McDermott & O'Dell 2001).

One of the unique phenomena the shipping industry has is the absence of a genuine link in many shipping organisations between the employer and its employees, for instance, between the shipowner and its seafarers, due to factors such as flagging out and outsourcing of crew management. In organisational culture where commitment and loyalty are non-existent as the result of disconnected employment linkages, knowledge integration hardly happens. This situation can be mitigated through the proper acknowledgement of the contributions made by those outsourced personnel (contracted seafarers for example) at the organisational level. In addition, the allocation of resources by an organisation to encourage personal development is another indicator of organisational commitment to its employees which, when properly organised, can facilitate knowledge transfer. Furthermore, the absence of genuine employment link does not stop informal networking among employees.

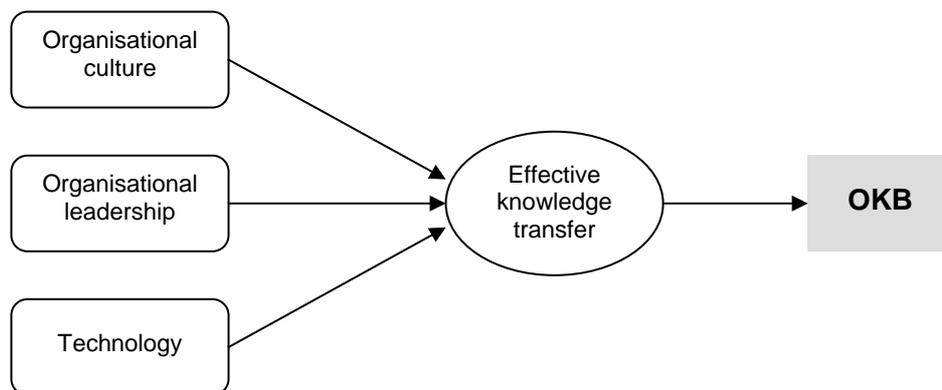
Encouragement of such informal networking from the organisation can foster the development of communities of practices therefore increasing the likelihood of knowledge sharing among personnel.

### 4.3 Leadership

It is clear that apart from organisational culture, organisational leadership plays a vital role in facilitating knowledge transfer through establishing and reinforcing a supportive culture. Tactics include the creation of a mission or a vision statement that endorses and sustains learning and transfer (Leonard 1995; Levinthal & March 1993; Von Krogh 1998), recognition of successful stories, reinforcing and rewarding positive behaviour, showing commitment to learning through action and removing barriers to progress.

In many onboard workplaces, hierarchy is still strongly maintained and respected. In such working environment, a role model from the top level (the captain, for instance) will have a strong influence on the rest of the members. In the same way, a strong commitment of top management to knowledge sharing activities will affect onboard management teams. The consistent leadership of an organisation has much to play in maintaining a healthy organisational knowledge base through facilitating knowledge transfer and sharing activities.

In summary, instead of using only incentive systems to mitigate internal stickiness, scarce resources and managerial attention should be devoted to developing the learning capacities of the organisation (Hamel 1991; Szulanski 1996). The appropriateness of resource deployment, both human and support assets, shapes the learning outcomes (Hamel, Doz & Prahalad 1989; Pucik 1988). Adequate staffing, involvement of high quality personnel and provision of appropriate information processing and communication capabilities, supported by favourable organisational culture, facilitate the process of knowledge transfer. An effective knowledge transfer model then can be drawn from above discussion and expressed as in figure 6 where factors have been grouped into organisational culture, leadership and technology.



**Figure 6:** Effective knowledge transfer practices (source authors)

### 5. Conclusion

The competitiveness and effectiveness of an organisation will ultimately depend on the knowledge assets an organisation possesses. The proposed application of knowledge management concepts and related practices into the shipping industry is expected to be more effective than conventional human resource management practices in terms of managing organisational knowledge assets, where knowledge dissemination and assimilation is more efficient and effective. The implication to the global shipping industry would be a significant reduction of knowledge wastage as the result of outflows of personnel identified in this paper, which in turn will effectively mitigate the problem of severe shortage of qualified personnel in the industry.

The main task for the shipping industry in general and shipping organisations particular, is to maintain a rich knowledge base through proactive knowledge management practices, given the high mobility nature of the workforce in the industry. Practical tools include the application of information technology to facilitate knowledge transfer and leverage of culture and leadership mechanisms to foster an environment of learning and sharing. Once a dynamic knowledge base is established, a shipping organisation can use the knowledge source to train and develop personnel in a more effective and

efficient way. This practice will not only shorten the time span for training and development therefore reducing costs, but also through the process of knowledge integration and transfer, a learning and sharing culture is nourished and appreciated which in turn benefit the organisation as a whole.

High personnel mobility can be harmful to the shipping industry if there is no mechanism in place to retain experiential knowledge. However, mobility could be used as lubricant or a catalyst of knowledge flows within an organisation if related activities are managed in a correct way. The outcome of such activities and management will be an increase of the organisational knowledge base therefore the strengthening of organisational competitiveness and effectiveness. At the industry level, such practices effectively increase the knowledge base of the whole industry from which individual shipping organisations will benefit greatly. It is therefore the responsibility of all organisations in the shipping industry to dedicate their resources to effectively develop and manage their knowledge assets in order to mitigate the problem of skill shortage.

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