COMPETITIVE AND SUSTAINABLE GROWTH (GROWTH) PROGRAMME

APPLICATION OF NEW TECHNOLOGIES AND THEIR IMPACTS ON HUMAN RESOURCES

Working Paper

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Application of new technologies and their impact on human resources

“Technology” means the entirety of processes of the production of goods and services available to a society.

1.) Review (state of the art)

1.1) Historical development of inland navigation in Europe

Though inland navigation is highly efficient and one of the oldest means of transports, it is the carrier, which is only rarely noticed by the population.

1.1.1) Beginnings of inland navigation

People have already settled close to rivers since ancient times. The river supplied them with the most essential basic food – water. However, the river was similarly the most important transport route for goods. Those who had to transport large amounts of goods had only two alternatives: the cart pulled by either farm animals or men themselves or the transport by vessel.

Picture 1: archetype of a log-boat

Very early in history, men have begun to learn that it is easier to transport the needed goods with easy means on log-boats than to carry them. The archetype of a log-boat as presented in picture 1 can be visited the Museum of German Inland Navigation (Museum der deutschen Binnenschiffahrt[1]) in Duisburg.
In the antiquity, ships have already been used for the supply of Roman colonies such as Cologne and Xanten. The vehicles were adapted to the conditions of the estuary and food as well as building material was carried to the settlements. The material, which was used for the building of Roman fortresses was often transported for hundreds of kilometres via waterways.
Picture 2 presents a reconstruction of a Roman harbour in the ancient Roman town of Xanten[2].

Picture 2: Drawing of the harbour temple in Xanten

[1] http://www.Binnenschiffahrts-Museum.de
[2] http://www.Xanten.de

1.1.2) Inland navigation in the context of the economic growth of the regions

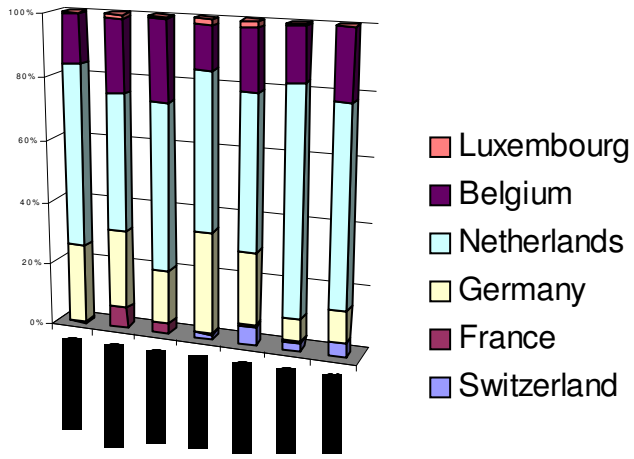
Among other factors, the economic development of villages and regions was dependent on their reachability by ship until the development of railways and cars.
Being located close to a river guaranteed on the one hand the supply with drinking water and, on the other hand, access to the trade routes.

During the Roman supremacy not least artificially built waterways such as Fossa Carolina assured not only the supply of the troops stationed in the Lower Rhine region. Even Charlemagne is said to have supported his troop movements with a channel built in 793 and rebuilt respectively to fight the Avars who had invaded Bavaria.
A further example for the economic and strategic importance of inland navigation at that time is the channel project "Fossa Eugenia". With this project, the Spanish wanted to connect the rivers Maas and Rhine and cut off the apostated Dutchmen from the trade routes of the Rhine.

1.1.3) Meaning of inland navigation within the framework of industrialisation

During the industrialisation within the continent, the importance of inland navigation was furthermore increased. The steelworks close to the rivers Rhine and Ruhr were dependent on ores, the engineering works in Saxony on steel and growing cities like Berlin and Paris on coal as energy sources.
Most of the German channels were built between 1850 and 1930 in reply to the rising industries' increasing need of transport. With the strengthening of the steel industry after World War II and the following post-war reconstruction, the inland navigation fleet similarly grew. This culminated in a boom of inland vessel newbuilding in the 50's and 60's. Since that time the number of new-built vessels ordered by German owners has highly been decreased.
Picture 3[3] shows the dominance of ships built between 1950 and 1969 in the fleets of the Netherlands, Belgium and Germany.

number of Rhine motor vessels



[3] Zentralkommission für die Rheinschiffahrt "Wirtschaftliche Entwicklung der Rheinschiffahrt Statistiken 2002"

1.2) Definition of „new technologies“

To describe the effects of new technologies on the crews, it is necessary to define the term „new technology“, as many different areas of inland navigation were / are affected by changes of technology.

1.2.1) Changes of the vessels

In the course of time, various alterations of the ships occurred which had, along with other factors, an impact on the technology of the system inland navigation. These changes are in detail:

1.2.1.1) Change of ship size

While the measurements of the ship types „Gustav König“ and „Johan Welker“ – 67 m x 8.2 m x 2.00 – 2.80 m or 85 m x 8.2 m 2.00 – 2.80 m – were especially decisive in the boom years of ship new building, the measurement of ships increased in the following years. Particularly the ship type “Europa-Schiff” with the measurement 85 m x 9.5 m x 2.8 m and a deadweight capacity of approximately 1,350 tons was propagated in the 70’s of the last century. From the 80’s onwards, new-built ships were ordered with the measurement 110 m x 11.40 m x 3.2 m. The ship-size was again increased in the 90’s to a measurement of up to 135 metres length and 22.40 m width.

1.2.1.2) Change of drives

The usual standard-drive of inland navigation vessels consists of one or more diesel engine-powered propeller units. In the course of time, number and shape of the propeller blades were altered. Furthermore, propeller nozzles were increasingly installed. Both steps resulted in an increase of productivity but also in a reduction of noise while running.
While in the boom years of the 1950’s and 60’s mainly new-built ships and barge conversions were equipped with slow-running, direct-reversible engines with rates of revolution of up to 500 r.p.m, this tendency was followed by medium-speed engines up to 1,000 r.p.m with a reverse-reduction gear.
At present, new-built vessels and conversions are mainly equipped with high-speed engines with a regular rate of revolution above 1,500 r.p.m and reverse-reduction gear. These engines have a number of electronic sensors for the alarming as well as for the regulation of the engine.

1.2.1.3) Change of the supply of energy

The vessels’ supply with electric energy was mainly insufficiently ensued by a battery-operated tension of 24 volts until the middle of the 1970’s.

This was most often exclusively designed for providing the lightning and less for the supply of the navigational instruments. Only after that, the vessels were equipped with generators for a supply with 230 / 380 volts that were primarily utilised for the increased use of auxiliary aggregates such as anchor engines. When it came to a standstill of the vessel, the generator was generally interrupted.
At present, it is usual that at least one generator ensures the supply of 230 / 380 volts at day and night, so that standard devices such as TV, washing machine etc. can be used in the accommodations of the crews.

1.2.1.4) Changes of navigation

In the boom years of inland vessel newbuilding in the 1950's and 60's, wheelhouses were usually equipped with the following devices:

- Capstan or trick wheel
- machine operating and control instruments
- switch gears and control instruments for navigating lights

Usually, navigation was practised in a standing position. A high stool was only rarely used to rest during long straightaway distances.
At first, the hand capstan was supported by an electric engine. Later on, hydraulic systems for the operation of the rudder were set up. These allowed the use of high-performance rudders and rate of turn regulators. Due to this, wheelhouses with one-man control positions became possible.
Similarly, the use of radar units, which technologically arouse from ocean navigation and were later developed into high-performance radar units for inland navigation, changed navigation decisively. Thus, journeys had stopped at night or in thick weather.
Those control positions which are installed in ship newbuildings and conversions at present – with ergonomic, round forming, narrow console foundations, which allow a freedom of foot movement, teak-wooden control panels jutting out, built-in touch-screens for a signalling as well as alarming and operating of the nautical and technical equipment of the vessels - rather remind one of navigation bridges of science fiction space shuttles or motor-yachts than of wheelhouses of the beginnings of motor shipping or the design suggestions for control positions of the Binnenschiffahrtsberufsgenossenschaft (German trade union of inland navigation).
Control positions are normally equipped with two radar units and, furthermore, a GPS-supported river map as well as a camera system for a video controlling of the complete vessel.

1.2.2) Change of the structure of goods

The goods transported by inland navigation are a reflection of the changing structure of society and economy. Thus, it has to be observed that in context with the increased traffic of all carriers, inland navigation achieves constant traffic (picture 4 “Traffic efficiency of all carriers in detail”).

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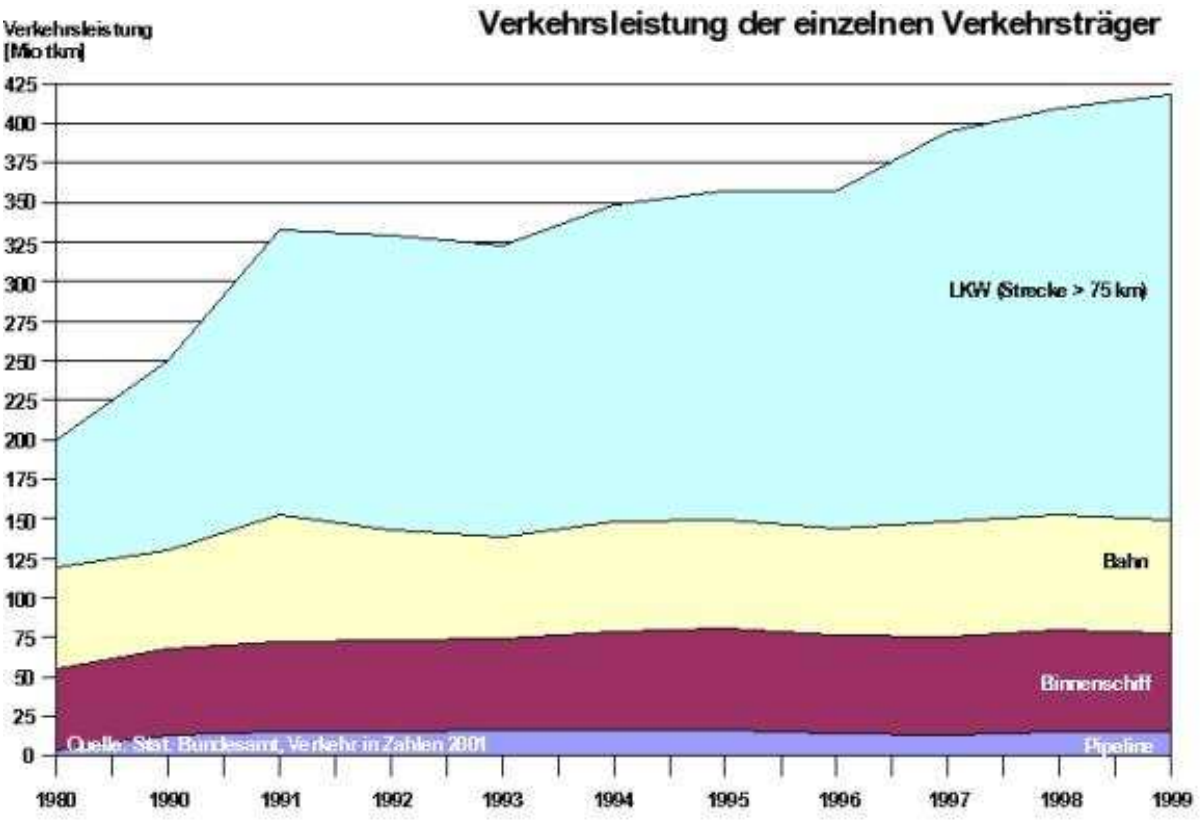
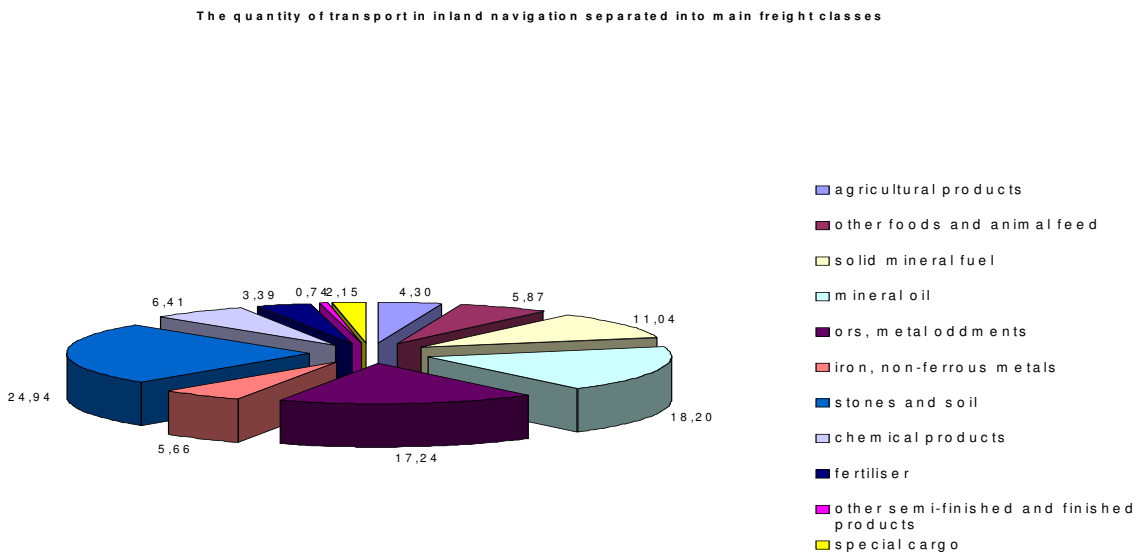


Picture 4: traffic efficiency
LKW - heavy goods vehicle (distances above 75 km)
Bahn – railway
Binnenschiff – inland navigation vessel

1.2.2.1) From general cargo to bulk cargo and back to general cargo

The proportion of classical general cargo on the structure of goods of inland navigation decreased more and more with the slow beginning of an economic shift from the secondary to the tertian sector after World War II.



Picture 5: freight classes

Especially the growing demand for fast and flexible logistic services made the proportion of the slow inland vessel fall behind in this sector. Picture 5 presents the proportional disposition of freight classes in inland navigation in 1995. "*Containers*", which have not been explicitly mentioned in the above picture focusing on bulk cargo, „*belong to the ‚modern' goods of inland navigation. While the quantity of bulk cargo decreases due to a change of the economic structure, the number of containers with international traded goods rises. There is no end in sight with regard to the positive development of container transport with inland vessels. At the end of the 1990's, the Planco-Institute by order of the Bundesverkehrsministerium (German Ministry of Transport) elaborated a prediction for container traffic with inland vessels. According to this, container transport with inland vessels should double between 1997 and 2010 from one million TEU to two million TEU. In 2002, the amount of containers on German waterways was already 1.5 million TEU. If this development continues, the predicted quantity of 2 million TEU in 2010 will be achieved a couple of years earlier"*[4]. Yet containers are nothing more than general cargo. One factor for the return of general cargo to inland navigation is the traffic density on the roads.

1.2.2.2) Changes of tank navigation

Due to the introduction of stainless steels, aluminium and plastics used as tank material or tank coating and accompanied by the chemical resistance, it became possible to meet the demands of the growing chemical industry. Tank motor vessels, based on the shape of cargo vessels, developed into special-purpose vessels for the transport of mineral oil, chemical substances and gases.

[4] Bundesverband der deutschen Binnenschiffahrt Homepage Transportgüter Container

Many of the tank vessels running today are from the 1960's and 70's. Chemical tankers characterise the picture of tank vessel newbuilding, as their range of transported goods is wider than that of bulk-oil carriers due to existing regulations. Similarly, the technical equipment requires a high degree of training for handling the products.

1.2.2.3) Changes of the technique of cargo-handling

The change on the structure of goods also caused a change of cargo-handling. In in tank shipping, deep-well pumps in single-tanks supersede threaded spindle pumps, formerly constructed centrally by default, in ship newbuildings. With it, information about pipeworks, necessary valve arrangements etc. are given up for lost.
Today only specialised vessels receive there own unloading systems in inland navigation with dry-cargo. Since the beginning of the last century, the setting up of a specific discharging gear on these vessels was more and more neglected. Instead, ports were increasingly equipped with cranes. As a consequence, ship-owners lost their influence on the logistics of loading and unloading of their own vessel. However, presupposing an efficient planning of the port operator, the lay period was reduced, having a decisive influence on the social life of the crews.

1.2.3) Logistic changes

Competition within the modern industrial societies leads to production processes that are well coordinated in time. In the past years, the division of labour and, with that, transport, increased. Along with the transport of semi-finished products, the logistic of basic products, the main cargo of inland navigation as described in 1.2.2.2, gained an important role. To take advantage of the expenses of storekeeping and even minor price fluctuation, goods have to be delivered just on time.
With the competition of carriers, inland navigation achieved a fixed proportion in the market due to free capacities obtained by this carrier in the traffic network and, similarly, the large number of vessels. The price that has to be paid for this, is a nearly 24-hours stand-by, resulting in a strain of crew and material.

1.3) Definition of „work force"

In inland navigation the composition of the crew is in no way homogenous but dependent on nationality, ship type and owner-structure.

1.3.1) Change of the owner-structure of vessels

Being part of the service industry, European inland navigation is mainly operating as a carrier of agricultural products, basic products and feedstock for the common industry and the building and construction industry. On the Rhine, the main sphere of action, goods are usually transhipped from and to the Dutch and Belgian seaports to and from the German hinterland. That means that the state of the German economy significantly influences the status of European inland navigation.

Within the framework of the German economic miracle after World War II, especially the already existing large German combines equipped their traffic sections and the affiliated shipping companies for the supply of their companies with motor vessels built at that time.
Due to the introduced system of fixed minimum freight rates at that time, the existing structure of the shipping companies could continue after the so-called Erhard-crisis. Furthermore, the coasting trade protected the shipping companies from international competitors in the domestic German traffic. The number of private ship's owners or rather the number of vessels run by private persons was low. Within the European countries adjacent to Germany, especially the Netherlands and Belgium, more private ship's owners, predominantly family-ran, existed.
After the discontinuation both of the system of fixed minimum freight rates in the diverse countries and the coasting trade and, furthermore, the collapse in the building and steel industry accompanied by a decay of freights, the German shipping companies were in many cases no longer profitable due to high personnel costs. As a consequence, shipping companies parted from their personnel staff. Having the industrial law in mind, first of all younger employees were dismissed and the training of new crews neglected. The vessels, at that time usually 20 or 30 years on duty, were sold, hired or leased, quite often to former crews. From this point, the former shipping companies worked mostly as dispatchers. The composition of market members on the internationalised transport sector was far more inhomogeneous then before the complete market release:

shipping companies
- with own vessels
- with vessels rented or leased from shipping companies

private ship's owners in the following line-up:
- old private ship's owners, which have already been self-employed before the conversion

new private ship's owners:
- with vessels bought from old private ship's owners with vessels bought from shipping companies
- with vessels hired or leased from shipping companies

As former employees of shipping companies, the new private ship's owners usually had only little experience with their new position as traders. Furthermore, the national market conditions were and are not aligned on the cross national market with regard to social and tax laws as well as administrative and financial support.

One example for this is the different financial support of the countries for the accommodation of children of boatmen in boarding-schools. Shipping companies, who could, due to their market sector, financially support their crews, were later forced to reduce personnel costs by hiring and leasing vessels to their outsourced companies or even to Rhine riparian states.

1.3.2) Change of crew-size

The introduction of the Revised Convention for Rhine Navigation resulted in the fact that trainees not longer belong to the crew but are additionally kept on board. In view of the results of the market release as explained in chapter 1.3.1, this change in the conventions led to a further decrease in the number of trainees. Furthermore, the revision of the Convention for Rhine Navigation resulted in a reduction of the crew-size.

1.3.3) Change of the composition of the crew

Resulting from the changes described in paragraphs 1.2.1 and 1.3.2, a further change of the composition of the crews took place.

As the size of the vessels altered, the vessels of the Dutch and Belgian old private ship's owners, which had formerly mainly been run by the family, had to increase their crew-size with external personnel to the requested size.
German old private ship's owners even used external personnel before the decline of the shipping companies as the state support for children had early been cut for political and financial reasons. Nevertheless, the change of size resulted in an increased need for personnel.

Due to the dismissal of personnel by the shipping companies, the private ship's owners' need for personnel should have easily been covered. Due to the experience that even before the crash of the system of fixed minimum freight rates only about 30 – 35 % of a year of trained inland boatmen stayed in job after having finished training, the shipping companies had been trained in excess of demand. This means that the industry has absorbed inland boatmen with a wide range of manual skills without any problems. The dismissed mainly young – as described in chapter 1.3.1 – personnel did not have any incentives to stay in this trade. Old and new private ship's owners could not fulfil the wage or salary claims and free-time demands.
A labour shortage in this trade existed before the disruption of the system of fixed minimum freight rates. Right after the disruption, a labour surplus shortly existed, followed by a shortage, increased by an age-related leaving of workers. In this period happened the opening of the Main-Danube-Channel whereupon the mainly as Western European characterised inland navigation was connected to the as East European characterised Danube shipping.
Due to the economical and political decay of the socialist countries bordering on the European Union and increased by the war in the former republic of Yugoslavia, personnel was withdrawn in this region and the labour shortage on Western European vessels could be compensated. The mixing of Rhine and Danube navigation as well as a huge difference in the salary level made working on a Western European vessel appear interesting for East European crews. Since this time, only the management, usually at the same time owner or shipping agent, on many private-run vessels is Western European. Many shipping companies fill their vessels completely with East European crews. From the beginning of the 1960's, an integration of southern European and Turkish fellow citizens, brought to the industrial societies as foreign workers by the industry, took place. Those had only marginally

found their way to inland navigation. The entry of East European personnel on Western European vessels was mainly accompanied by cultural and linguistic problems. Moreover, administrative impediments brought insecurity with regard to the allocation of work permits.

Due to the predominance of the Dutch and Flemish fleet and the mainly in Germany located dispatchers, Western European inland navigation is dominated by the two working languages Dutch and German. In the practical navigation of the Danube region, German is the working language above Hungary, Russian below Hungary. The crew originating from East Europe therefore normally has basic knowledge of German. This results in the fact that also on board of Dutch vessels German is more and more spoken among the management and the deck hands. The deck hands, in case there are crew members of other language areas at all, are talking in the mother tongue. Moreover, on board the Dutch and Flemish vessels, exchange of information within the family takes place in Dutch. The trilinguality on board hinders the integration of East European colleagues, thus leading to an increased isolation. Especially the vessels of Dutch private ownership are, due to regular adaptations to the changes of technique, on a high nautical and technical level, which highly distinguishes itself from the equipment conditions of the Danube fleet. Furthermore, the after all close structure and familiar of the crews on these vessels, which are only increased by the East European personnel, leads to the fact that practical training on the nautical and technical equipment mainly does not take place and further possibilities to rise in the hierarchy of the crew are denied.

1.3.4) Change of the demands on the crew

The demands on the nautical and technical skills of the personnel have always been highly diverse, taking the mostly narrow areas, the self-sufficient and mobile character of the workplace vessel and the variety of the structure of goods into consideration. The changes presented in the previous chapters have increased these demands.
Though technologically increased nautical equipments, propelling plants with an improved sensor technology and modern equipments are generally at disposal, not every vessel is equipped with these products. Especially vessels, which have been built during the boom years of the last century and lengthened repeatedly afterwards before being handed over to private owners after the removal of the system of fixed minimum freight rates, are with regard to the equipment on a middle level.
The engines are, after diverse more or less extensive overhauls, either ready for discard or have already been exchanged for cheap and fast-running aggregates. The nautical equipment is in many cases exhausted and especially its order in the steering position does no longer meet today's ergonomic needs due to a permanent modernisation or exchange of faulty, no longer available devices.

This mixture of modern and exhausted pieces of equipment requires a huge knowledge of the technical context of the crew so they can intervene in case that an exhausted aggregate is breaking down or is about to break down. On the other hand, as much technical knowledge is required to assess up to which point modern aggregates with electronic sensors and regulation can be used. The same contrast exists with regard to the accommodation of the crew. On the one hand, there are the living compartments of the modern or modernised vessels, equipped with every

imaginable comfort and, on the other hand, these kinds of accommodations, which have not been maintained but just exhausted during 40 years of duty. These contradictions require crews with a high level of flexibility.

Furthermore, low freight rates lead to a deficiency in the rate of return resulting in an investment backlog and a reduction of costs. The cost reduction leads, as reported in chapter 1.3.3, to an employment of underpaid, most often East European, deck hands, requiring not only high nautical and administrative skills but also a special degree of integrative skills from the masters and ship owners. In contrast to workplaces ashore, where people of different nations and cultures work together, it is usually not possible to return to the familiar social surroundings daily after work. This means that these people of both a different linguistic, cultural and training background and of different mentality have to live and work together in cramped conditions for weeks and months without the support of their families or with only minor contacts to their surrounding.

2.) Barriers to change

To determine the restraints in the change of the consisting status quo it is necessary to have a look at the reasons for these changes and their correlation as well as to look at the interests of the actors.

2.1) Reasons for these changes

Technical and logistical changes in inland navigation mainly refer to an economic background - as many social political tendencies do:

- The deadweight-capacity is being permanently increased to use the administrative effects of size.

- In spite of increasing fuel costs, the existing efficiency of vessels has been increased by cheaper and faster engines. So, lower investments result in a higher velocity of circulation and thus in a higher income.

- The investment in improved navigation systems has been made because of the renewal of older systems and the daily-extended use of the vessel. This again leads to a higher velocity of circulation and thus to a higher income.

- The changes of the structure of goods within inland navigation result from the shift of the manufacturing sector to the service sector in the economy.

- The change of the owner-structure, the crew composition and the number of crew members is just a result of economic restraints.

If the economic backgrounds of the technical and logistical changes, which led to the mentioned effects on the crew (paragraph 1), are accepted, it is necessary to look at the economic correlations in inland navigation.

2.2) Economic correlation in inland navigation

As already mentioned in paragraph 1.2.2.1 inland navigation keeps a service business, which mainly carries agricultural goods as well as basic and raw materials for the industry and the building business. The transport clients often belong to medium-seized businesses or to large combines.

In the course of the development, where shipping companies arose from transport departments of big concerns and the industry or the building businesses wanted to secure their transports without a separate shipping company, very different intermediate stops have been formed, which are between the dispatcher and the inland boatman:

- Shipping companies, which are not working to capacity for their parent company and, therefore, are looking for further offers to load their vessels

- Shipping companies, which belong to no parent company and, therefore, fully depend on offers of an external ship-owner

- Dispatchers, who have committed an amount of private ships to their company

- Co-operatives of private ship's owners, which appear as a shipping company

- Freight exchanges

Shipping companies, which belong to a parent company have become a rarity, as already mentioned in paragraph 1.3.1. Today, as a rule, a shipping company only has few vessels on its own, but some private ships to load. There are further dispatchers without any ownership of vessels.
Shipping companies, dispatchers and co-operatives conclude a transport contract with the ship-owner. Within these contracts, a freight rate for the transport is agreed. For the actual carrying out of the transport, either an intermediate dispatcher or a private person is brought in. The private person then concludes a contract with his dispatcher. The agreed freight rate within the contract is reduced for the commercial margin in favour of the dispatcher. The amount of the commercial margin depends on the general state of the market, the number of intermediate dispatchers and on the private ship's owners ability to stand trial as he does not know the original amount of the freight rate. Normally, a commission of the original freight rate is kept back. This commission usually comes to approx. 5%.

The freight profit of a private person, who is associated with a dispatcher, a shipping company or a co-operative, consists of the following:

*private ship's owners freight = {1 – ship-owner's commission} * {freight rate – commercial margin}*

Recently, several electronic freight exchanges have come onto the market. These exchanges offer ship-owners and private persons a kind of platform to bring together freight offering and cargo capacity. Therefore, the transport contract is directly concluded between ship-owner and private person. The freight exchange gets a

commission. In that case, the profit of a private ship's owners consists of the following:

*private ship's owners freight = {1 – commission of freight exchange} * freight rate*

But the current market share of these freight exchanges is minimal.

2.3) Interests of the market member

The interest of the market members, shipping agents, despatchers and inland boatmen are very different.

2.3.1) Interests of the shipping agent

While allocating transport contracts, differences between single loads and transports of an annual quantity occur. A single load comes up only once or at irregular and long intervals of time. In transports of an annual quantity, the transport of basic material and consumables comes up regularly. Transports of an annual quantity are for example:

- Coal for power stations to convert it into electricity
- Salt for the chemical industry to produce sodium hydroxide or chlorine
- Kerosene for airports to fuel planes
-

It is in the shipping agent's interest to find an inexpensive and reliable signatory and it should not depend on a single load or transport of an annual quantity.
A transport is inexpensive, if it causes low costs compared to the sum-total including pre- and on-carriage as well as handling costs and, similarly, the time-related aspect. All carriers and all transport companies compete with each other.
A signatory is reliable, if it is possible for him to carry out the cargo without any damages and by the scheduled time. In the eyes of the shipping agent, no private person is usually able to meet the demands of reliability, as he is only rarely capable of providing compensation on schedule in case of a damage-related break-down of the vessel.

2.3.2) Interests of the dispatcher

The interests of the dispatcher, including the activities of shipping companies and co-operatives, are on the one hand to get a fleet as big as possible and on the other hand to gain a high commercial margin of the original freight rate.
The bigger the fleet unit, the higher the possibility to conclude attractive transport contracts, because there is a higher supply guarantee for the shipping agent. Apart from other economic considerations, for example to get more profit by selling a vessel than by scrapping it, some shipping companies sell or lease their vessels to private persons. The higher the commercial margin, which is subtracted of the agreed freight rate, the higher the profit margin for the dispatcher. As already described in paragraph 2.2, the amount of the commercial margin depends on the general state of the market and the private ship's owners ability to stand trial. Therefore, the dispatcher does not want the private person to have an excellent

overview of the market. At the same time, the dispatcher wants his fleet to be as modern and efficient as possible.

2.3.3) Interests of the inland boatman

The interests of the inland boatman are based on making continuously sufficient freight rates to pay the costs and the deductions of the ship operation, as well as to pay off mortgages, repairs and modernisations on the vessel. Further, it is in the inland boatman's interest to get a sufficiently high profit to pay and to train the crews.

2.3.4) Incompatibility of the interests

It is in the nature of things that the interests of the shipping agent and the transport company (inland boatman) are opposing. However, the position of the dispatcher is very contradicting. He wants to have a fleet as modern as possible. At the same time, old vessels last on the market as long as possible, because they enlarge the fleet unit.
Furthermore, the modernisation of the fleet requires a sufficient freight rate for the inland boatman. But this would diminish the commercial margin, the dispatcher's main source of income.

The present experience of giving orders to inland boatmen as well as distributing reimbursement leads to the fact that the economic conditions to the crew's appropriate reaction on changes are reduced.

3.) Strategic recommendations

To speak of strategic recommendations, it is first necessary to bundle the previous explanations. Afterwards the recommendations will be discussed.

3.1) Summary of the changes

Through the years, changes have influenced society and economy as well as inland navigation. These changes belong to technical, sociological and economical kinds, whereas each technical or technological change has an immediate influence on sociological and economical components.
Negative economic changes directly influence the sociological component, but indirectly influence technical or technological kinds by delaying repairs and modernisations, respectively by doing them inadequately. Further, negative economic changes lead to a drop in the level of training within this sector. This again has an effect on the technical installation.

Technical / economical changes have influence on:

- Size of vessels
- Driving forces
- Supply of energy
- Navigation

Economic changes have influence on:

- Structure of goods
- Cargo-handling technology
- Logistic
- Owner-structure
- Crew-size
- Crew composition
- Demands on the crew

3.2) Recommendation for improving the consequences of the altered technological conditions

As already illustrated in paragraph 2, the reasons for these changes refer to the economy and the business management. That is why the recommendations mainly aim at the improvement of the economic provision of ship-owners.

3.2.1) Tax and administrative conditions

(Small) companies of different European nations act on the international transport market. This means that there are different economic conditions for the companies because of a different legislation. These conditions refer to:

- Social security contributions
- Bureaucratic burdens
- Training
- Support in teaching children of ship-owners
- Admission of foreign workers

To build equal economic conditions, it is necessary to align the tax and administrative conditions in Europe. According to the changes of regulations, it is important to bring together all representatives. Shipping companies play a minor role in this part of occupation and act more as a dispatcher. Therefore, they do not necessarily represent the interests of all ship-owners.

3.2.2) Standardised training

As described in paragraph 1.3.3 ”The crew compensation“ today the crew consists of a Western European ship management and an East European deck crew. This constitution leads to linguistic problems. Furthermore, varied standards of training as well as hierarchical ways of thinking of East European crew members – that partly derive from the time of socialism – result in different attitudes towards the work process.
Further, in paragraph 1.3.1 “Changes of the owner-structure of vessels“ it was said that the main parts of the inland vessels belong to private persons. This leads to the point that persons, who definitely stay in this business after their training, not only do

navigational / technical work but also take part in the economy as company-owners and traders.

To do justice to these changes, it is necessary to intensify training as follows:

- Knowledge of Dutch, German and Russian
- Standardised training in manual skills
- Business management with the main focus on
    1. commercial law
    2. personnel law
    3. cost accounting
    4. cover of contribution
    5. profit accounting
    6. investment accounting
    7. tax law

3.2.3) Improvement of the economic basis of ship-owners

As described earlier, technological changes and their effects mainly result from economic restraints.

Money makes the mare to go

The improvement of the economic situation of ship-owners will presumably result in

- an improved technical equipment of vessels
- an improved training of the crew
- a lower strain on the crew

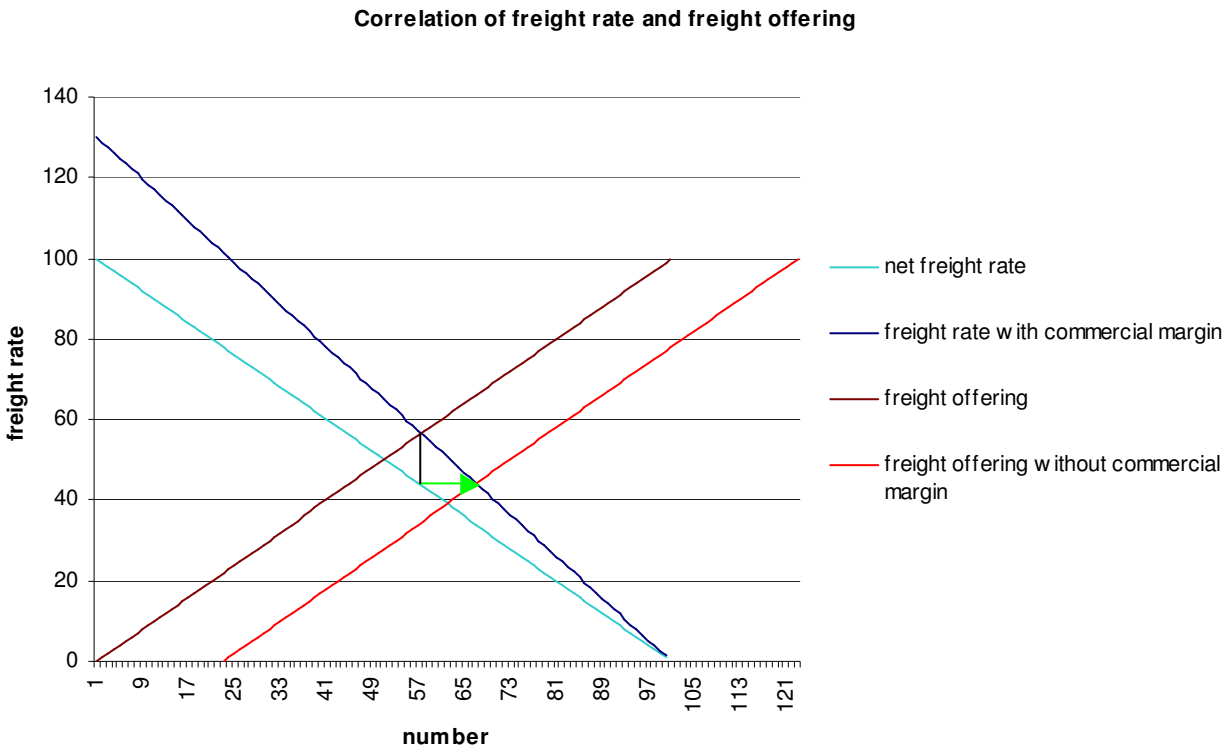
The present economic situation of ship-owners is characterised by freight rates, which are a reproduction of the cargo offering and the offer of cargo capacity.
An improvement of the economic basis of ship-owners animates the market members to increase the offer of cargo capacity. This again leads to an expansion of a cargo offering in some lines of this business.

Paragraph 1.2.2.1 “From general cargo to bulk cargo to general cargo” dealt with the structure of goods in inland navigation. This structure is characterised by bulk cargo and rather decreasing in a society, which is moving towards the tertian sector.
An expansion of the offer of cargo capacity for bulk cargo will cross each improvement of the economic situation of ship-owners.

Paragraph 1.2.2 “Changes of the structure of goods“ described by means of picture 4, that an increase in the cargo offering within the last decades only took place in transports of an individual size of 0 to 20 tons. That is an individual size, which was only taken into consideration by inland navigation for the container transport. But the size of ships, which enlarges continuously, results in a limitation of the geographical flexibility. At the same time, the insistent refusal of the shipping regulatory to build movable bridges, limits the economic viability of the container transport.

An increase in the offer of bulk cargo can only be reached by competing with railway and street traffic. Here, the decisive aspect is the question of price.

Picture 6 shows a typical diagram of supply and demand in correlation with inland navigation. One line stands for the net freight rate, which is given to the ship-owner. With this freight rate, he has to pay all transport costs. Another line in picture 6 stands for a freight rate, which is 30 % higher than the net freight rate. This freight rate contains the commercial margin of the dispatcher. This margin is chosen arbitrarily.



Picture 6: Supply and demand in connection with the commercial margin of the dispatcher

The diagram also shows the line of freight offering and the respective intersections between the lines of the freight rates. There is another intersection approximately at number 56 between freight rate with commercial margin and freight offering. This example illustrates that the net freight rate for the ship-owner amount to about 44. If the commercial margin is omitted, an expansion of freight offering without any loss for the ship-owner would be the result. This has the meaning of a parallel shifting to the right of the freight offering line with a new intersection approximately at number 70.

As described in paragraph 2.2 “Economic correlation in inland navigation” an omission of the commercial margin is only possible, if the freight is distributed via freight exchanges.

To reinforce the economic basis of ship-owners the following steps are necessary:

- limitation of enlarging the cargo capacity
- support of small vessels to expand the flexibility, i.e. by changing the manning scale so that a single person is allowed to sail a small vessel on his own
- support of movable bridges to expand the economic viability of the general cargo transport
- support of freight exchanges

3.3) Summary

Inland navigation is one of the oldest continental transport services in Europe. Economic restraints have led to technological changes. These changes affect on the one hand the changing of the vessels' size and, on the other hand, the nautical part by improving the navigational aids.
Economic changes have led to changes of the owner-structure, the number of crew members and their composition. The market members naturally have different interests.

To face effectively the consequences of the changes for the crews, it is mainly necessary to reinforce their economic responsibility and position.