



ASPECTS OF STABLE DEVELOPMENT OF THE SHIPBUILDING BRANCH IN LATVIA

Yuri Kochetkov, Balajar Aliev
Baltic International Academy, Riga

Annotation

Nations living near the Baltic Sea have constructed fishing boats since ancient times, as well as large commercial vessels for trading along the sea routes. Therefore, even nowadays the marine industry – vessel/ship or other watercraft construction, repair and maintenance are the important element of the industry of the country. The number of permanent employees in this branch is larger than 2 thousands and the number of enterprises exceeds several tens. The important factor that influences vessel construction development is the necessity to decrease the vessel construction costs and to increase the operational efficiency due to the rise of fuel prices. It is a necessary condition for stable development of branch to constantly improve business with the aim to increase competitiveness and output of the “mechanisms” for management thereof. Object of study: Latvian branch of construction, maintenance and repair of marine vessels. The aim - to develop recommendations for a successful development of the industry in a global competition. The problem - the need to identify and provide the prerequisites for a successful development of the industry. The originality of the paper is that the peculiarities of operation of vessel construction branch in Latvia after the regain of independence were considered for the first time. Analysis of aspects providing successful development of Latvian traditional branch of vessel construction has been done and substantiated recommendations have been elaborated. The novelty is that the main obstacles, which hinder the development of the industry, are identified and analyzed. Furthermore, this paper offers methods of solving these problems. There is an acute problem of development and improvement of human capital, the training of professionals who are able to accept the achievements of science, technology and to promote an innovation-based development of companies. Innovation with the participation of highly qualified professionals is regarded as the main solution, which will ensure competitiveness and sustainable development of the industry. It is necessary to develop a state program for innovative development of Latvian traditional shipbuilding industry.

KEY WORDS: shipbuilding branch; competitiveness; mathematical modelling; innovation; human capital.

Introduction

Historically and geographically Latvia has always been a maritime state. Nations living near the Baltic Sea have constructed fishing boats since ancient times, as well as large commercial vessels for trading along the sea routes. Therefore, even nowadays the marine industry – vessel/ship or other watercraft construction, repair and maintenance are the important element of the industry of the country. The number of permanent employees in this branch is larger than 2 thousands and the number of enterprises exceeds several tens. During seasonal periods, usually in warm seasons, the number of employees working in marine industry rises by 3-4 times. During the world economic crisis from 2008 till 2010 in the back of the fall of production volume there was a slowdown in the development of maritime traffic and ship construction, large shipping companies refused procurements of new vessels. The market value of vessels significantly decreased.

During the economic recovery period there appeared a tendency for the need in vessels with qualitatively new performance parameters in respect to their functions, economical efficiency, ecological safety etc. The following requirements in respect to new vessels came to the foreground: flexibility and multitasking of the structural layout that satisfy the customer's requirements; no need for capital repair or other type of repair of the vessel within the whole period of operation; significant

decrease (by 10 – 15%) of vessel construction costs and further operation thereof, etc. The main requirement at the vessel construction phase becomes the possibility, by using the advantages of automated computer modelling, to create a project, which fully corresponds to individual customer's requests, taking into account the future operation of the vessel. Powerful motives for development of technologies in the field of vessel design and construction are the requirements of national and international structures, marine registers and organisation responsible for vessel traffic safety, environmental protection and qualification of the crew and others that constantly become more severe. On the other hand, the important factor that influences vessel construction development is the necessity to decrease the vessel construction costs and to increase the operational efficiency due to the rise of fuel prices.

Nowadays the requirements in respect to vessel engine production, the operational efficiency and ecological qualities thereof, become stricter. Development of the branches relevant to vessel construction occurs at high rate: new materials for marine equipment, electronic devices, electro-technical equipment, vessel navigation computer systems and other equipment are produced. In the field of material science new technologies and materials are elaborated: composite, heat-insulating materials; titan, aluminium alloys, etc. The leading vessel construction enterprises start using brand new methods of vessel hull construction

minimising manual labour. A brand new method of corrosion protection (metallic coating) of vessels and maritime structures is introduced without using traditional protective coatings. The new generation robust, reliable and heat-insulated reservoirs are produced for transportation of liquefied natural gas.

Subject and relevance. The growth strategy of the developed countries is built taking into account the peculiarities of globalisation and intensification of competition. The economical systems for stable development should be regularly improved as well as increase the own competitiveness to successfully compete with the systems of other countries and regions.

Competitiveness of the branch is the ability of branch enterprises to produce competitive output that has certain advantages in comparison to the similar production in other countries. In the foreseeable future establishment of integrated, open world market of technologies, labour, services and products is not anticipated, whereas competition is becoming even more severe (Кастеллс 2000). It is thought that stable development of an economical system in the long view leads to higher rates of growth in comparison to other systems, which are in similar conditions. The inner structure of the system has to be adapted to the changing outdoor environment. Stable and reliable development of separate branches of economics and regions usually means high growth rates of GDP and other macroeconomic indicators of a country. This also increases the competitiveness of these branches. Stable development of the system (a branch of economy) firstly means high growth rates of incomes that exceed average indicators in group of comparable branches. The growth can be of medium or long-term with possible short-term drops due to various reasons. It is a necessary condition for stable development to constantly improve business with the aim to increase competitiveness and output of the “mechanisms” for management thereof.

An important condition of stable development of economic systems is admitted to be stimulation of introduction of new technologies, increase of the added value. This can be achieved by attracting wide range of investments, leading experience in management and innovations. The word “innovations” is usually understood as the final result in the form of a new or improved product in the market or in the form of a new or improved technological process in practice. In order to achieve the synergetic effect companies are usually consolidated or merged. At the micro-level the positive effect is achieved by horizontal links with production suppliers and buyers, improvement of finance management on the assumption of long-term interests of the firm and growth of capitalisation, but not the current profit. One of the main sources of improvement of economy branch competitiveness is development of human capital assets, constant training of employees. Already in the middle of the XX-th century the expenses for training and upgrading of skills were considered as investments into development of companies (Schultz 1963, Becker 1962). Nowadays, in the conditions of globalisation and critical need in innovations, the role of human capital assets significantly increased (Hudson 1993, Machlup 1994). This is proved by the models of endogenous economic growth (Romer 1990). In the end of the XX-th century the World Bank performed the monetary evaluations of the national wealth in world regions, highlighting three main components:

human capital assets, natural capital and reproducible capital (main industrial and non-productive assets, circulating assets, household goods). It was computed that, for instance, in the North America the human capital assets make $\frac{3}{4}$, whereas in the Middle East they make 0,4 of the total national wealth. Ignoring the modern principles of creation and implementation of the human capital assets adjudges the economical system and the country to be outsider.

The computations of experts showed that development potential of modern economical systems depends mostly on two indicators: human capital assets and level of investment-innovation activities. The correlation coefficient showing dependency of development potential on the human capital assets is 0,65 – 0,70, whereas for the same dependency on investments and innovation – about 0,60. This correspond to moderate (average) strength of correlation relationship, the correlation dependency is quite significant to be taken into account.

The tasks of the paper are to assess the condition of the shipbuilding industry in Latvia and to explore the ways for improving the competitiveness of the industry. *The originality of the paper* is that the peculiarities of operation of vessel construction branch in Latvia after the regain of independence were considered for the first time. Analysis of aspects providing successful development of Latvian traditional branch of vessel construction has been done and substantiated recommendations have been elaborated. *Object of the research:* Latvian branch of construction, servicing, repair of vessels and other watercrafts. *Aim of the research:* analysis of the condition of the branch and elaboration of substantiated recommendations for increase of stability of development and competitiveness thereof in the conditions of global competition. *Methods of research:* analysis of statistical data, mathematical modelling, correlation and regression analysis.

Computations and analysis

In Latvia, the majority of businesses, more than 95%, are small and medium-sized enterprises. There are a few relatively large enterprises in the country. The shipbuilding industry is also mainly represented by small and medium-sized enterprises. There are only two relatively large shipbuilding companies: Riga Shipyard and Liepaja Tosmare Shipyard. Most companies are involved in the construction of sports boats and small recreational vessels. In different years, they accounted for 70%–85% of the total number of industry companies engaged in the construction of vessels and boats. Between 2005 and 2011, the total number of enterprises operating in the shipbuilding industry in Latvia increased despite the economic crisis of 2008–2010 (Fig. 1, Table 1).

In the paper, all computations were performed on the basis of the data provided by the Central Statistical Bureau of Latvia (Central...2014). Within the period specified above, quite the contrary, the number of persons employed in the industry decreased. The regression equations and graphs obtained in computations demonstrate this fact visually: the number of enterprises increases directly proportionally and the number of workers decreases inversely proportionally with the time. The determination coefficient R^2 and correlation

coefficient r are greater than 0.85 and 0.93, respectively, in the cases referred to above. This indicates that these equations explain more than 85% and 93% of variation of the number of enterprises and workers in a given time period, which is quite a large variation. Consequently, the correlation coefficients $r = 0.923$ and $r = -0.966$ demonstrate the strong power of correlation dependence of indicators under consideration on the time. The testing of the significance of obtained regression equations by the Fisher LSD (F-test) showed that in both cases the actual values $F_{act.}$ exceeded critical values $F_{crit.}$ (Table 1). The hypothesis H_0 on the insignificance of the equations is rejected; the equations are found to be reliable, statistically significant and can be used for practical conclusions.

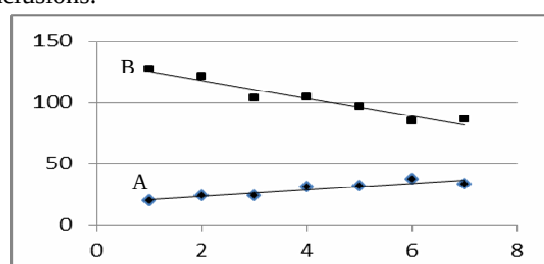


Fig. 1. Change in the number of enterprises and the number of permanent workers in the shipbuilding industry of Latvia, 2005 – 2011. A – the number of enterprises, B – the number of workers ($\times 10$). The OX axis: 1 – 2005; 2 – 2006; ... 7 – 2011.

All dependences investigated in the paper are related to time series. Therefore, the regression equations obtained in computations were tested for autocorrelation of residuals of the first order by the Durbin–Watson (DW) test at the significance level $\alpha = 0.05$ (Table 1). In all cases, the DW statistic computations indicated the need for acceptance of the hypothesis $H_0: \rho = 0$ on the absence of autocorrelation. Only in the study on the dependence of number of workers in the shipbuilding industry on the employment rate in Latvia, the DW statistic falls into the area of uncertainty ($d_L < DW < d_U$) (Fig. 4). However, the graphical analysis of residuals also showed the absence of autocorrelation.

The volume of sales of enterprises engaged in the repair and maintenance of vessels, boats and other watercraft was steadily increasing from 2000 to 2012 (Fig. 2, Table 1).

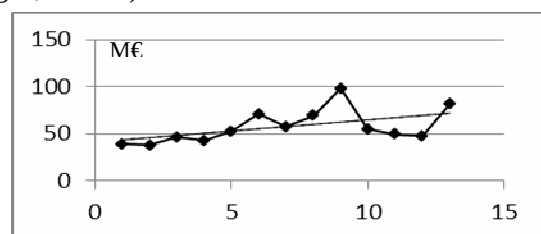


Fig. 2. The volume of sales: the repair and maintenance of ships and watercraft, 2000 – 2012. The OX axis: 1 – 2000; 2 – 2001; ... 13 – 2012.

The testing of significance of the computed regression equation by F-test showed that the statistics $F_{act.}$ was somewhat less than $F_{crit.}$. Therefore, the null hypothesis H_0 is not formally rejected, and the regression equation is not reliable enough. This can be explained by a relatively large variance of data ($MS = 1065.7$) and a small determination coefficient R^2 . However, the obtained equation can be used as an indicator of general tendency towards changes. The correlation coefficient $r = 0.53$ demonstrates a moderate degree of dependence of factors; therefore, it should be taken into account. From 2009 to 2011 due to the crisis, there was a sharp decrease in the volumes of sales: they declined by more than two-fold in comparison with 2008. In 2012, the volume of sales almost returned to its previous level. This indicates a high sensitivity of the shipbuilding industry of Latvia to fluctuations in the global economic indicators.

The period of 2005–2010 was characterized by the fact that the investment in tangible assets for the repair and maintenance of vessels in the industry enterprises mainly decreased (Fig. 3, Table 1). Some increase in investment was observed before the economic crisis from 2006 to 2008, and then in the period of crisis investment fell sharply. To ensure the successful development of this business area, after the crisis it is necessary to increase investment in the acquisition of modern technologies and equipment – there is a need for innovation. The testing of the statistical significance of the obtained regression equation by the F-test showed that $F_{act.}$ was somewhat less than $F_{crit.}$, and the null hypothesis H_0 on the insignificance of equation could not be formally rejected. Taking into account a sufficiently large value of the determination coefficient R^2 and a high degree of correlation dependence ($r = -0.811$), the obtained equation can be used as a general indicator of the tendency of changes in investment in the specified time period.

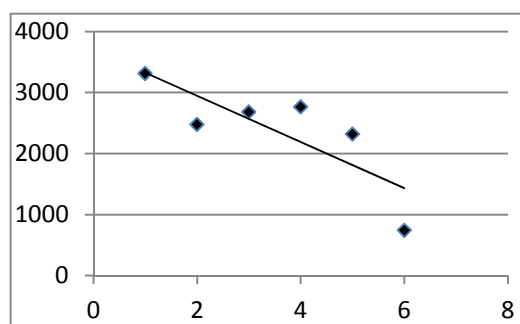


Fig. 3. Investment in tangible assets for the repair and maintenance of vessels, 2005 – 2010. The OX axis: 1 – 2005; 2 – 2006; ... 6 – 2010. The OY axis: thsd €.

To determine how the number of workers in the shipbuilding industry is correlated with the employment rate in Latvia, the corresponding equation of the straight line regression was computed on the basis of the statistics and analyzed (Fig. 4, Table 1). It was found that the number of workers in the industry varied in direct proportion to the employment rate. The determination coefficient is large enough: almost 59% of variation of the number of workers in the shipbuilding industry is related to a change in the employment rate in the country.

Table 1. The results of computation of factor dependence

No	Dependence, years	Regression equation $y=f(x)$	R - squared	Correlation coefficient r	Fisher Statistics		DW statistics
					F act.	F crit.	
1.	Change in the number of enterprises in the shipbuilding industry, Fig. 1. (2005-2011).	$y = 2.607x + 18.286$	0.852	0.923	28.74	6.61	2.416
2.	Change in the number of workers in the shipbuilding industry, Fig. 1. (2005-2011).	$y = -7.132x + 131.9$	0.934	-0.966	70.87	6.61	2.588
3.	Change in the volume of sales, Fig. 2. (2000-2012).	$y = 2.42x + 40.485$	0.280	0.530	4.31	4.84	1.684
4.	Change in investment in tangible assets of the industry, Fig. 3. (2005-2010).	$y = -377.69x + 3704.4$	0.658	-0.811	7.682	7.71	1.695
5.	Dependence of the number of workers in the shipbuilding industry (y) on the employment rate in Latvia (x), Fig. 4. (2005-2011).	$y = 21.507x - 862.46$	0.586	0.766	7.087	6.61	1.142
6.	Dependence of the volume of sales of ship repair (y) on GDP per capita (x), Fig. 5. (2000-2012).	$y = 0.004x + 30.974$	0.407	0.638	7.56	4.67	1.782

The degree of correlation dependence of factors is moderate and close to high $r = 0.766$. Since it is found that Fisher LSD $F_{act.}$ is larger than the critical value $F_{crit.}$, it can be stated that the computed regression equation is statistically significant and can be used for drawing practical conclusions. It can be stated that the number of workers in the shipbuilding industry varies proportionally to the total employment in Latvia.

The dependence of the volume of sales of ship repair in the industry on GDP per capita in Latvia is shown in Figure 5 and Table 1. The computed equation of straight line regression indicates a directly proportional dependence of the given factors. The obtained determination coefficient is small $R^2 = 0.407$, which is explained by a relatively large variance of data ($MS = 1548.4$). The degree of correlation dependence of factors is obtained to be moderate, and the correlation coefficient $r = 0.638$. The computed observable Fisher LSD $F_{act.}$ is larger than the critical value $F_{crit.}$. Therefore, the obtained linear regression equation is statistically significant, and it can be used. It can be concluded that the volumes of sales of ship repair in the industry are correlated with the level of GDP per capita in Latvia, which rather well characterizes the state of the national economy as a whole. Thus, the number of workers in the shipbuilding

industry of Latvia and the volumes of sales are closely related to the state and development of the national economy: the successful functioning of the economy of Latvia implies the successful and sustainable development of the shipbuilding industry.

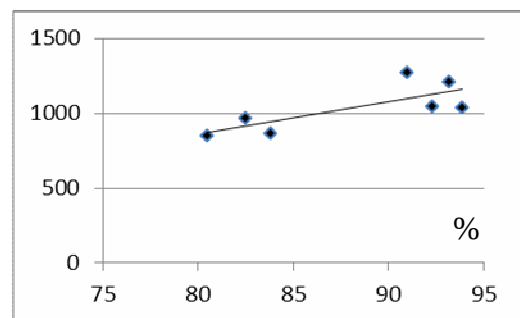


Fig. 4. Dependence of the number of workers in the shipbuilding industry (y) on the employment rate (%) in Latvia (x), 2005 – 2011.

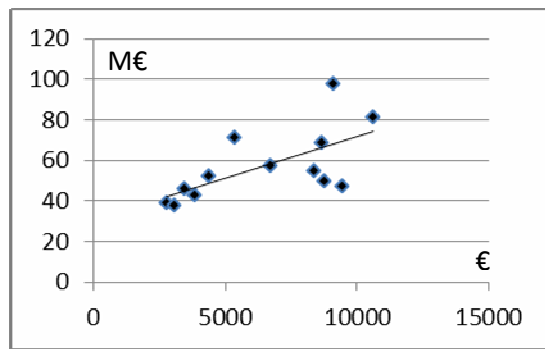


Fig. 5. Dependence of the volume of sales of ship repair (y) on GDP per capita in Latvia (x), 2000 – 2012.

The volume of output produced by the majority of small companies involved in the construction of sports boats and small-sized recreational vessels varied greatly in the period from 2005 to 2011, mainly because of the financial and economic crisis of 2008–2010 (Fig. 6). In the crisis years, the volume of output decreased by more than three-fold compared to the pre-crisis year of 2007. In 2011, the volume of output increased and reached two-thirds of the pre-crisis level. This again demonstrates the large dependence of the industry on fluctuations in the demand for products in the world markets, as they are mainly exported.

The performed analysis of statistical data on the shipbuilding industry of Latvia showed that the number of workers in the industry and the volumes of sales were closely correlated with changes in relevant indicators of the national economy as a whole. In the unfavorable economic situation arisen in the world, the crisis of 2008–2010, basic performance indicators of the industry deteriorated sharply, likewise the indicators of the economy as a whole. This is an expected process, because the shipbuilding industry is closely integrated into the world economy, the products are mainly exported, and competitors are scattered across the globe. Under the conditions of globalization, successful economic development requires constant improvement of production and competitiveness.

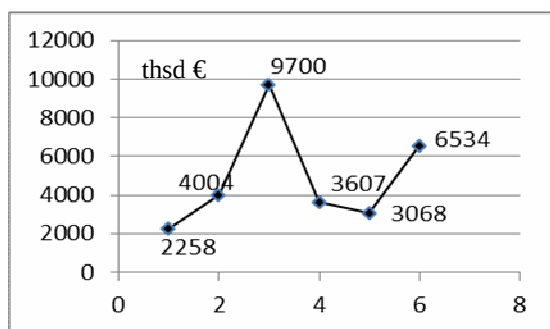


Fig. 6. Change in the volumes of output of sports boats and recreational vessels, 2005 – 2011. The OX axis: 1 – 2005; ... 3 – 2007; 4 – 2009; ... 6 – 2011.

Globalization means a new phase of business activity in the world economy and is characterized by the following attributes: a faster growth rate of foreign direct investment; extensive use of outsourcing, manufacturing

of individual units of goods in countries with cheap labor force and often transfer of the whole production there; joint ventures, the absorption of some companies by other ones. In such circumstances, the Pareto Principle or the 80/20 rule becomes more stringent: 90/10 and even 99/1. Therefore, 90% or 99% of efforts in the business yield 10% or 1% of results, and the remainder is provided by 10% or 1% of the time and resource consumption. Exactly this opinion is held by most economics experts in the early 21st century. The right point of application of efforts rather than their amount is of major importance, but the former cannot be found using conventional algorithms of the 20th century. Such circumstances result in the increasingly significant role of human capital, people who are able to accept new ideas and possess the knowledge and skills necessary to turn the ideas into reality in the form of innovation (Truch 2001, Henning 2001). By innovation one understands the result of intellectual, scientific and technical or any other activities in any field concerning the effective change of management object through innovation implementation. Innovation – goods of inventions, patents, discoveries, new products, technologies, know-how, scientific principles, methods, etc. that are introduced into production. Innovation is the main vector of the successful economic development; there are many types of innovation (Nelson 1993). Exactly innovation, combined with a perfect human capital – highly qualified specialists, enthusiasts of their own business –, improves the competitiveness of individual companies and the industry as a whole (Πoprep 1993).

In recent years, Latvia has been experiencing an acute shortage of highly qualified specialists in many sectors of the national economy. This is also the case for the shipbuilding industry, which has scarce resources of highly qualified specialists in the field of metalwork in particular, such as welders, cutters, scaffolders and others. This is due to several different reasons. Workers should undertake special training, receive international certificates confirming their qualification, and have practical experience in shipbuilding. Working conditions in the construction, maintenance and repair of vessels are severe enough and often unhealthy. Therefore, although remuneration in the shipbuilding industry is competitive enough compared to other industries in Latvia, many young people, having worked for some time and become highly qualified specialists at the expense of enterprises, resign and go abroad to earn money, because they are paid more for the same work. Likewise other sectors of the economy, such as sewing, there is a high labor turnover.

The negative effect is exerted by the overall low level of remuneration in Latvia at a relatively high cost of living. As it is known, Latvia takes one of the last places in the EU by the level of remuneration. In terms of its economic development, in comparison with highly developed countries of the EU, Latvia can be referred to the so-called “catching-up” states, despite a relatively high level of GDP per capita and the fact that the income per capita accounted for \$ 14,180 in 2012. In the World Bank ranking, Latvia takes the 66th place based on this indicator in the group of high-income countries (The World Bank...2013). Latvia has many negative attributes

of “catching-up” countries: a large difference in income between the rich and the main part of the population, low level of remuneration of most employed people. For example, in 2011 the Gini coefficient was 35.7 K_G that was much compared to the developed countries in the EU (Central...2013). This exerts a negative effect on the development of human capital.

To overcome these difficulties in the shipbuilding and ship-repairing industry that is characteristic of Latvia, it is necessary to develop a program of measures for the improvement of human capital. The system of training and retraining of qualified personnel should be developed. Training programs in the required specialties can be implemented at the existing educational institutions of Latvia by entering into appropriate contracts with them. Internships should be undergone as well as the term papers should be elaborated at shipbuilding companies. If it is not possible to educate and train specialists at the existing educational institutions, training should be provided abroad, covering a tuition fee. To keep trained and certified specialists from leaving Latvia in search of well-paid jobs, the remuneration system should be competitive and meet the European level. Only highly qualified and motivated specialists will be able to adopt and apply new appliances and technologies, to improve production and to implement innovation.

The company is considered innovative if it satisfies a number of criteria: at least 25% of volumes of sales account for products not older than 5 years; profit from products not older than five years is at least 10% of the total annual income; annual increase in the volume of new products or services is not less than 5%. According to these criteria, the number of innovative enterprises in Latvia accounts for a little more than 20%, in Lithuania it exceeds 25%, and in Estonia – more than 35%. In general, in the EU there are over 50% of such companies. The situation with innovative enterprises in Latvia is at a low level, the country takes one of the last places in the EU by investment in R&D. It is necessary to increase output with increased added value by raising the volume of intellectual property embedded in goods or services. Only those companies that annually allocate not less than 2% of total turnover to the development of new products or services become innovative.

A study carried out in Latvia in the early 21st century by the World Bank has shown that only large enterprises with more than 250 people employed are quite successful in the sphere of innovation. Small enterprises with fewer than 50 people employed, who make up the largest share of all enterprises in the country, are much less active in regard to innovation. In highly developed countries, large enterprises make a major contribution to the funding and support for science and high technologies that form the basis for innovation. For example, the expenditure on R&D accounts for almost 70% in the USA, approximately 73% in Japan, and more than 55% in the EU. In absolute terms, the USA annually invests in research more than 280 billion \$, EU – approximately \$ 200 billion, Japan – more than \$ 100 billion. Many entrepreneurs in Latvia poorly understand the importance of innovation in the development of their companies or understand, but do not have the funds for it. In Latvia,

more than 70% of GDP constitute services, rather than products of high-tech sectors of the economy. Number of innovative enterprises in the services sector is also percentagewise higher than in the manufacturing industry. This is a significant obstacle to increasing the competitiveness of the country. The President of the Association of Mechanical Engineering and Metalworking Industries of Latvia Vilnis Rantins has pointed out that in the present conditions of global competition it is not possible to manage without innovation. It is necessary to look for new opportunities to reduce production costs in order to achieve the best relationship between price and quality of products, competing with the leading manufacturers in the world markets.

Virtually all successful cases of rapid overcoming of backwardness of countries, socio-economic breakthrough occurred when a “catching-up” country managed to find its original measures, creative solutions to overcome the problems and improve competitiveness (Rodrik 2007). World practice also demonstrates that the greatest success is achieved by companies and countries that use the model of development based on human capital. The number of relatively large enterprises is limited in Latvia. These include two shipbuilding and ship-repairing yards in Riga and Liepaja. Innovative development of these companies and the whole shipbuilding industry, which is characteristic of Latvia, may be exactly one of the main key aspects of the successful solution to the problem of transition of Latvia to a post-industrial economy.

Therefore, certainly, the state and the Central Bank should in every possible way contribute to the transition process of the shipbuilding industry to the innovation-based development. To achieve this, it is necessary to attract the EU structural funds and enhance guarantee programs for entrepreneurship. At the same time, to develop programs of state support for business it is necessary to attract the entrepreneurs themselves and banks. The state should jointly take over some of the risks of innovation-based development of the shipbuilding industry. Good support for innovative companies would be rejection of income tax on profit if it is invested in the development of companies. As international experience shows, the determining conditions of the investment and innovation activity of the state and companies are as follows:

- a sufficiently high level of development of science and its practical application, a large proportion of expenditure on research in the total budget (4 – 5%) and GDP (1.5 – 2%);
- the development of globally competitive innovation projects supported by the state;
- favorable legal framework that provides financing and crediting of large-scale national projects;
- the establishment and use of substantial investment funds in terms of volume that may become the basis of innovation.

Thus, the Latvian state has an important task: to increase the level of development of science, its funding and to implement a range of activities necessary for the successful development of innovation and competitiveness of the national economy.

Conclusions

Latvian shipbuilding industry is developing quite simultaneously with the national economy, other sectors of the country. Its growth was adversely affected by the global financial and economic crisis of 2008–2010. Since 2010, the industry again has begun increasing the volumes of output. The shipbuilding industry faces the same problems as the other sectors of the economy. There is an acute problem of development and improvement of human capital, the training of professionals who are able to accept the achievements of science, technology and to promote an innovation-based development of companies. Only innovation in the presence of highly qualified and motivated human capital can ensure a reliable increase in competitiveness and sustainable development of companies under conditions of global competition. It is necessary to develop a special program for improving human capital, a system for training and retraining of qualified personnel. It is necessary to improve the system of remuneration, bring it in line with European standards.

The largest shipbuilding companies of Latvia in Riga and Liepaja can and should become leaders of innovation-based development of the industry. This will facilitate the transition of economy of Latvia to a post-industrial path of development and increase the competitiveness of the country. To successfully achieve these objectives, the government should create a favorable environment to promote by all possible means the innovation-based development of industry: in the tax and banking spheres, to allocate funds for research, apply its results in practice, etc.

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Summary

Historically and geographically Latvia has always been a maritime state. Therefore, even nowadays the marine industry – vessel/ship or other watercraft construction, repair and maintenance are the important element of the industry of the country. During the world economic crisis from 2008 till 2010 in the back of the fall of production volume there was a slowdown in the development of maritime traffic and ship construction, large shipping companies refused procurements of new vessels. During the economic recovery period there appeared a tendency for the need in vessels with qualitatively new performance parameters in respect to their functions, economical efficiency, ecological safety etc. Powerful motives for development of technologies in the field of vessel design and construction are the requirements of national and international structures, marine registers and organisation responsible for vessel traffic safety, environmental protection and qualification of the crew and others that constantly become more severe.

The economical systems for stable development should be regularly improved as well as increase the own competitiveness to successfully compete with the systems of other countries and regions. Stable development of the system (a branch of economy) firstly means high growth rates of incomes that exceed average indicators in group of comparable branches. Competitiveness of the branch is the ability of branch enterprises to produce competitive output that has certain advantages in comparison to the similar production in other countries. An important condition of stable development of economic systems is admitted to be stimulation of introduction of new technologies, increase of the added value. This can be achieved by attracting wide range of investments, leading experience in management and innovations. The word “innovations” is usually understood as the final result in the form of a new or improved product in the market or in the form of a new or improved technological process in practice. One of the main sources of improvement of economy branch competitiveness is development of human capital assets, constant training of employees. The computations of experts showed that development potential of modern economical systems depends mostly on two indicators: human capital assets and level of investment-innovation activities. *The tasks of the paper* are to assess the condition of the shipbuilding industry in Latvia and to explore the ways for improving the competitiveness of the industry. *The originality of the paper* is that the peculiarities of operation of vessel construction branch in Latvia after the regain of independence were considered for the first time. Analysis of aspects providing successful development of Latvian traditional branch of vessel construction has been done and substantiated recommendations have been elaborated. *Object of the research*: Latvian branch of construction, servicing, repair of vessels and other watercrafts. *Aim of the research*: analysis of the condition of the branch and elaboration of substantiated recommendations for increase of stability of development and competitiveness thereof in the conditions of global competition. *Methods of research*: analysis of statistical data, mathematical modelling, correlation and regression analysis.

In the paper, all computations were performed on the basis of the data provided by the Central Statistical Bureau of Latvia. The performed mathematical analysis of statistical data on the shipbuilding industry of Latvia showed that the number of workers in the industry and the volumes of sales were closely correlated with changes in relevant indicators of the national economy as a whole. The shipbuilding industry is closely integrated into the world economy, the products are mainly exported, and competitors are scattered across the globe. Under the conditions of globalization, successful economic development requires constant improvement of production and competitiveness. Innovation is the main vector of the successful economic development. Exactly innovation, combined with a perfect human capital – highly qualified specialists, improves the competitiveness of individual companies and the industry as a whole. In recent years, Latvia has been experiencing an acute shortage of highly qualified specialists in many sectors of the national economy. This is also the case for the shipbuilding industry. The system of training and retraining of qualified

personnel should be developed. Only highly qualified and motivated specialists will be able to adopt and apply new appliances and technologies, to improve production and to implement innovation. The Latvian state has an important task: to increase the level of development of science, its funding and to implement a range of activities necessary for the successful development of innovation and competitiveness of the national economy. The largest shipbuilding companies of Latvia in Riga and Liepaja can and should become leaders of innovation-based development of the industry. This will facilitate the transition of economy of Latvia to a post-industrial path of development and increase the competitiveness of the country. To successfully achieve these objectives, the government should create a favorable environment to promote by all possible means the innovation-based development of industry.

KEY WORDS: shipbuilding branch, competitiveness, mathematical modelling, innovation, human capital.

Yuri A. Kochetkov. Dr.sc.ing., Professor. University study: Riga Polytechnic Institute (1966 – 1971), mechanical engineer. Post-graduation: Moscow Institute of Instrumental Equipment (1977 – 1981), Candidate of technical sciences (1982). 1993 – Dr. sc. ing. (Latvia). Yuri Kochetkov is Professor of Econometric in Baltic International Academy (Latvia). Also he is scientist in Mathematical and Information Technologies Institute of Liepaja University. Publications: 75 scientific papers and 3 patents, teaching aids and synopses – 4. Current research interests: social economical statistics, mathematical modeling and analysis of systems. Yuri Kochetkov is a member of Latvian Association of Statistics. Address: 4 Lomonosova St., LV-1019, Riga, Latvia. Phone: +37163480858, Fax: +37163480858, e-mail: Jurijs.Kocetkovs@rtu.lv

Balajar Aliev. Master of Business Administration (MBA), Doctoral student in Baltic International Academy (Latvia). University study: Baltic International Academy (2011-2013), MBA. Balajar Aliev is President of Administration of Shipbuilding company in Liepaja (Latvia). Scientific interests are regional economy and development, competitiveness and innovation issue, analysis of systems. Address: 4 Lomonosova St., LV-1019, Riga, Latvia. Phone: +37129623317, Fax: +37163480858, e-mail: boris@albjs.lv