

# INCREASING POTENTIAL OF VALORIZATION IN TECHNICAL UNIVERSITIES THROUGH INTERNATIONALIZATION

Artūrs Zeps

Faculty of Economics and Management, Riga Technical University  
Riga, Latvia LV-1568, Latvia

Juris Iljins

Faculty of Economics and Management, Riga Technical University  
Riga, Latvia LV-1568, Latvia

Leonīds Ribickis

Faculty of Power and Electrical Engineering, Riga Technical University  
Riga, Latvia LV-1568, Latvia

## ABSTRACT

Valorization or creation of new products and services through innovation process is an important task for all technical Universities that want to maintain strong bond with the industry and capitalize on this process. Especially topical this task is for technical Universities in Baltic States that have deepened this activity during the last decades. Since science and valorization no longer can be performed within the borders of one single University, there is a need for collaboration and internationalization. This means establishing new contacts in other leading Universities, joining different networks and working jointly with international partners. But the task of management is to monitor the outcomes of valorization and efforts of internationalization to define if the university reaches its aims.

This paper analyzes the importance of valorization for Baltic technical Universities and indicates the importance of internationalization in promoting the valorization as a process. As well paper indicates the indicators that could be set as measurements of the valorization process and introduces the potential of IT systems in maintaining this task.

The purpose of the study is to analyze the importance of internationalization for the valorization in Baltic technical Universities and introduce the monitoring system for this process.

**Keywords:** Internationalization, valorization, technical universities, Baltic states, strategic management.

## 1. INTRODUCTION

Article explores the connection between internationalization factors and their effect on valorization in technical universities based on the example of Universities in Baltic States. Through the research process survey in Estonia, Latvia, and Lithuania was conducted with 112 respondents that revealed which internationalization factors have strongest correlation with valorization process. Authors, based on research results suggest that such internationalization factors as - full time equivalent international staff, co-publication with international industry, co-publications with in international co-authors, international doctoral students and post-docs, international industry presence on campus and international patents - has the strongest impact on valorization in Universities. These factors should be introduced

at the stage when technical university defines its strategy with clear action plan and factors defined as key performance indicators (KPI's). Authors propose, that IT software tools should be introduced to monitor and control defined KPI's.

## 2. INTERNATIONALIZATION AND VALORIZATION

### Internationalization

The term internationalization in economics is understood as a process of increasing involvement of enterprises in international markets suggested Susman, Welch & Luostarinen. [1] [2] Usage of the term in scientific literature is used since 1776 when Adam Smith formed theory of "Absolute cost advantage". Lyles mentions that Internationalization is decade's most important strategic concept. [3] An absolute advantage existed when the country could produce a commodity with less costs per unit produced than could its trading partner, so landing to basics of Internationalization of enterprises mentioned Ingham. [4] Another important aspect of internationalizations is creation of business networks, that becoming increasingly important in the internationalization process proposed by Holmlund & Kock. [5] In Baltic States society began to talk about Internationalization after independence in early nineteen nineties, but after 2009 this term was put in the context of Higher Education due to changes in demographical situation and world economic crisis.

In this research with term internationalization authors understand process of Higher Education Institutions becoming more international externally and internally. Externally – increasing collaboration with other international partners, working on joint projects and recruiting of foreign students and professors. Internally – adjusting University to be more open to international collaboration – through structural, cultural and other changes.

### Increased importance of Internationalization

In Baltic States Universities are still in development stage, recovering after crisis in 2008, reshaping structure and opening new branches of education and research, actively seeking new partnerships. HEI across Baltic States are becoming more internationalized internally and externally.

For technical Universities internationalization is seen as current driving force behind Higher Education system development. Main reasons for increased role of internationalization in Baltic States are the following:

- European Union structural fund availability,
- Rapid increase of foreign students in region,

- Political pressure,
- International rankings,
- Development of English though study programs,
- Increased staff/student mobility and others.

As internationalization has occurred internally throughout the technical universities it has impacted other processes within the institution.

Styles & Genua 2008 proposes, that pattern of behavior of internationalizing firms developed through the commercialization of academic research will differ from that of such firms that are not internationalizing.[7] The primary cause of ability to internationalize is technological change [8], where Knight and Cavusgil highlight the role of advances in communications and digital technology.[9] Oviatt and McDougall stress that faster and more efficient transportation of both goods and people decreases the costs of foreign trade and investment. [10][8] It is suggested that internationalization increases firms ability to sense, seize and apply globally scattered knowledge and capabilities, therefore hence the competence to arbitrate globally spread opportunities.[11] This is extremely important if we are speaking about valorization process in higher education environment.

Internationalization globally plays an important role for attractiveness for higher education systems and universities tend to see internationalization as priority in strategy to achieve international competence in fields of science, valorization and studies. This paper explores link between increased valorization and internationalization.

**Valorization**

Today’s University must be an institution that fosters interdisciplinary, internationalization, organizational excellence, financial efficiency along with high quality study and research process and valorization. All this can be achieved through University’s strategy that allows defining the path for excelling itself among other institutions and thus attracting and creating new talents within the institution. The core task is to create a clear strategy by synchronizing all of above mentioned elements. But especially valorization start to pay an important role in each University’s daily life. Valorization can be described as value-creation out of knowledge, by making this knowledge suitable and available for economic or societal utilization and to translate this into high-potential products, services, processes and industrial activity [6]

Universities can no longer afford to work on stand-alone basis just offering industry technical solutions and cooperating on research projects and consultations. To really understand business needs, a University must work jointly and cooperatively with industry partners. In short, to be part of the business activity itself. A University must guide its research process to generate the innovations demanded by industry and together to identify the trends that will shape the commercial and social future or in other words – work to foster valorization – high quality technology transfer and commercialization. Close links with the business world helps in the product commercialization process and ensures maintenance and development of highly advanced and demanded products in the University laboratories. It provides a stronger and more relevant focus for research.

**3. METHODOLOGY**

Research analyzes the valorization as a task for technical Universities and studies the indicators applied by Universities and different ratings for measurement of valorization and internationalization. Focus group approach is applied to define

the most significant elements that stipulate internationalization within the University. A survey implemented within the technical Universities of Baltic States analyzes the most influential elements of internationalization that affect the valorization process. 112 experts from Baltic States participated in the research.

**4. RESEARCH**

This articles explores how internationalization affects valorization process in technical universities in Baltic States. To better understand the relations between internationalization and valorization it is important to determine which internationalization factors affect valorization.

**Focus Group**

For purpose of this article focus group consisting from eight representatives from technical universities across the Baltic States were created. Participants in focus group are key responsible persons for internationalization and valorization within their represented intuitions. As result of discussions numerous factors of internationalization influencing internationalization were identified. These defined initial factors were used to create and implement survey.

**Initial Factors**

Authors for further research based on findings proposed by focus group, scientific literature and currently applied methodology by leading world rankings selected twelve possible factors for further research. Factors were categorized in three main groups: International Personnel, Industry Orientation and International Research. Initial factors are proposed in Table 1.

**Table 1. Factors of internationalization affecting valorization**

International Personnel	Industry Orientation	International Research
Full time equivalent international staff	International industry presence on campus	Co-publications with in international co-authors
International doctoral students and post-docs	Number of international spin-off companies	University journals published
Number of exchange students (inbound and outbound)	Co-publications with international industry	Collaboration in international research projects
Number of full degree international undergraduate students	Databases of research equipment available to industry	International patents

Source: Developed by authors

Based on factors in Table 1 survey in technical universities in Baltic States was carried out. Experts had to evaluate and select key factors for effective valorization. Totally for purposes of this article 112 experts participated from Estonia, Latvia and Lithuania.

**Survey**

The survey implemented through the August - November, 2015. Survey was made to gain the experience from experts working with valorization activities in Universities. And survey provided more detailed insight on factors that promote valorization in

Universities. Total number of respondents that participated in the survey constituted 112 persons.

In survey experts had to agree or disagree with factors they find most important. Respondents had to choose do they totally disagree, disagree, neither agree or disagree, agree, totally agree with the statement. The most important questions was how respondents evaluate valorization of their institution in scale from one to five.

Analysis of survey data allowed to define the factors that influence valorization process in Universities and contrast these answers to the self-evaluation of success of University's valorization activities done by respondents.

Since prior the creation of survey focus group discussions was implemented survey data allowed to shell the most important factors fostering valorization in Universities.

Survey asked following 13 questions:

- Do you agree that international full time staff is important to promote valorization?
- Do you agree that international doctoral students and post-docs are important to promote valorization?
- Do you agree that number of inbound and outbound exchange students are important to promote valorization?
- Do you agree that number of full time international degree students is important to promote valorization?
- Do you agree that number of international industry presence on university campus is important to promote valorization?
- Do you agree that number of international spin off companies are important to promote valorization?
- Do you agree that number of co-publications with international industry are important to promote valorization?
- Do you agree that database with available research equipment is important to promote valorization?
- Do you agree, that co-publications with international co-authors are important to promote valorization?
- Do you agree that number of university published journals are important to promote valorization?
- Do you agree that collaboration in international research projects are important to promote valorization?
- Do you agree that number of international patents are important to promote valorization?
- How do you evaluate your University's valorization level?

#### 4. FINDINGS

Based on survey results it was possible to define most important internationalization factors that affects valorization categorized in three main groups:

- International Personnel:
  - Full time equivalent international staff;
  - International doctoral students and post-docs.
- Industry Orientation
  - International industry presence on campus;
  - Co-publications with international industry.
- International Research
  - Co-publications with in international co-authors;
  - International patents.

#### Regression and correlation analysis

Mathematical analysis confirms the findings. Regression and correlation analysis was done to take a deeper look into the survey results.

Correlation coefficients are shown in table 2 with the evaluation of valorization level at the university. We can see, that mentioned

has the strongest correlation with overall level of valorization. Strongest positive correlation has Full time equivalent international staff and International doctoral students and post-docs.

**Table 2 Factor Correlation with level of valorization**

Factor	Correlation
Full time equivalent international staff	<b>0.883251</b>
International doctoral students and post-docs	<b>0.80368</b>
Number of exchange students (inbound and outbound)	<b>-0.03223</b>
Number of full degree international undergraduate students	<b>0.028284</b>
International industry presence on campus	<b>0.483818</b>
Number of international spin-off companies	<b>-0.61011</b>
Co-publications with international industry	<b>-0.7598</b>
Databases of research equipment available to industry	<b>-0.02602</b>
Co-publications with in international co-authors	<b>0.075938</b>
University journals published	<b>-0.04388</b>
Collaboration in international research projects	<b>0.001201</b>
International patents	<b>0.133577</b>

Regression analysis show that Results statistically are quite good, where Calculated  $R^2=0,86$ . Confidence level = 0,95 and significance level is less than 0,05.

After looking at the P-value we determine, that Full time equivalent international staff, International doctoral students and post-docs, International industry presence on campus, Co-publications with international industry, Co-publications with in international co-authors and International patents are statistically significant, due to the reason, that P-value was less than 0,05.

Further regression analysis shows the coefficients for statistically significant calculation

**Table 3. Calculated coefficients for statistically significant factors**

Factor	Coefficients	P-value
Full time equivalent international staff	0.834671	Less than 0,05
International doctoral students and post-docs	0.174781	Less than 0,05
International industry presence on campus	0.125769	Less than 0,05
Co-publications with international industry	0.253122	Less than 0,05
Co-publications with in international co-authors	0.195562	Less than 0,05
International patents	0.057444	Less than 0,05

After we can determine and make valorization equation for technical universities in Baltic States.

Valorization = 0,75 + 0,83 Full time equivalent international staff + 0,17 International doctoral students and post-docs + 0,13 International industry presence on campus + 0,25 Co-publications with international industry +0,2 Co-publications with in international co-authors + 0,06 International patents.

**5. DEFINING AND MONITORING OF KPI**

After findings were empirically conformed analysis of gathered date from technical Universities of Baltic States confirmed, that Universities performing best at innovation and technology transfer also recognizes concluded factors as most important for promotion of valorization. Therefore, based on the factors listed in findings KPI for Universities are developed and regularly monitored. These factors with margin borders can be adopted to specific institution and its current needs and incorporated in strategies of Universities.

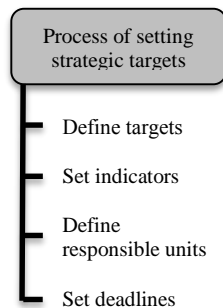
**Defining strategy**

Strategic planning can be used as a tool for University development and it has been used not only in individual organization and national level, but also in much broader scope. Strategy sets development direction for Universities many years ahead. Some Universities set their strategic aims to become the leading University in the country, region or even the whole world; others differentiate themselves by defining the field they want to excel in. Technical Universities tend to set as their strategic goals development of new innovations, promotion of creativity and technology transfer processes. Strategy for University must be made with detailed Action Plan that guides University towards its strategic aims and shows what the exact steps to achieve the defined targets are.

**Creating Action plan**

University management must create a clear Action plan with detailed strategic targets based on which University is able to plan clear tasks, set measurable indicators, responsible units and deadlines. Figure 1 depicts process of setting strategic targets for units of University and elements that must be defined.

**Figure 1. Process of setting strategic targets**



Source: Developed by authors

Valorization and internationalization factors, that affect valorization, must be defined as clear targets with following KPI's incorporated in yearly tasks for each University unit:

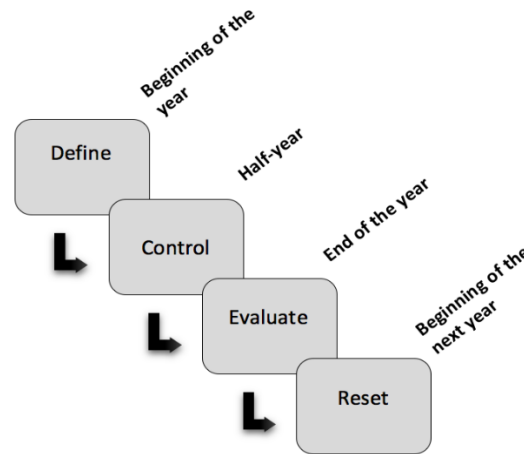
- Full time equivalent international staff;
- International doctoral students and post-docs;
- International industry presence on campus;
- Co-publications with international industry;
- Co-publications with in international co-authors;
- International patents.

**Monitoring and controlling of KPI's**

Implementation of the strategy and Actin plan can start, when organization has developed the according organizational structure, defined governance mechanisms and internal ethics system and set internal control system to monitor implementation of the strategy and action plan.

University must develop a control mechanism for strategy implementation to spot the deviations from the set targets. If management lacks such mechanism, them it has no power over strategy. It is important to constantly receive data based on the indicators set in the strategy and develop a system how the tasks are cascaded. Control process within University allows management to monitor the implementation of the set tasks and targets. It is crucial that management set appropriate control systems – constantly monitor the data and analyze them.

**Figure 2. Process of monitoring and controlling KPI's**



Source: Developed by authors

Figure 2. depicts control mechanism for University, that allows to set clear targets as well monitor and reset them if the desired results have not been achieved. It is important for University management to evaluate the results and understand if the results have not been achieved what is the reason for that – internal or external and if there are means to influence the reason. If there are no possibilities to influence the cause of bad result then targets should be reset, if University can influence the cause, target should be maintained and additional help provided to the units.

**IT Software support**

Software must be applied and to increase the successful implementation of the set targets and valorization potential. Software introduction is not only IT solution, but requires mindset and shared value concept from participating divisions and employees. To successfully utilize the IT resources, University must create databases, which show the actual information of University statistics. This information must be linked with set measurable criteria and regularly monitored to understand how units are implementing the set targets. If there is no such IT support management cannot control the strategy implementation.

**6. CONCLUSIONS**

1. In Baltic region internationalization is seen as one of major driving force for currently shaping and developing HEI system.

2. For technical Universities of Baltic States to become more successful in valorization process most important criteria are FTE international staff, number of international patents, international industry presence on campus, number of international doctoral students, international post-docs, co-publications with in international co-authors and international industry.
3. Valorization equation with weight coefficients has been developed.
4. Mentioned KPI and ranges should be introduced based on certain specifics of technical university.
5. Monitoring, re-evaluation and controlling of KPI outcome are important to sustain results in long run.
6. Software design can be applied to and introduced to increase the valorization potential. Software introduction is not only IT solution, but requires mindset and shared value concept from participating divisions and employees.
7. Further research should be conducted to compare results between other regions and analyze the difference.

## 7. REFERENCES

- [1] Susman, Gerald, I. (2007). **Small and Medium-sized Enterprises and the Global Economy.**
- [2] Welch & Luostarinen, (1988). **Internationalization: Evaluation of a concept**, Journal of General Management, 14(2), pp. 34-55
- [3] Lyles, M. (1990). **A research agenda for strategic management in 1990's.** Journal of Management studies 27(4), pp. 363-3'5.
- [4] Ingham, Barbara. **International economics: a European focus.** Pearson Education. p. 336. ISBN 0-273-65507-8, (2004)
- [5] Holmlund, M. and S. Kock. (1998) **Relationships and the Internationalization of Finnish Small and Medium-sized Companies.** International Small Business Journal 16, (4): 46-63.
- [6] Buzink R., Cauffman C., Cruijssen M., Massar K. (2014) **Valorization of knowledge** 1-7
- [7] Styles C., Genua T. (2008). **The rapid internationalization of high technology firms created through the commercialization of academic research.** Journal of World Business, Volume 43, Issue 2, Pages 146–157.
- [8] Murmann J.P., Ozdemir S.Z., Sardana D. (2015). **The role of home country demand in the internationalization of new ventures.** Research Policy, Volume 44, Issue 6, July 2015, Pages 1207–1225
- [9] G.A. Knight, S.T. Cavusgil (1996). **The born global firm: a challenge to traditional internationalization theory.** Adv. Int. Market., vol. 8, pp. 11–26
- [10] B.M. Oviatt, P.P. McDougall (2005). **Defining international entrepreneurship and modeling the speed of internationalization.** Entrep. Theory Pract., 29 (5), pp. 537–553
- [11] Riviere M., Suder G. (2015). **Perspectives on strategic internationalization: Developing capabilities for renewal.** International Business Review.