

The Importance of Co-operation of Scientific Community and High-tech Industry in Transforming Croatia into a Knowledge Based Society

S. Krajnović, D.Huljenić

Ericsson Nikola Tesla

Krapinska 45, Zagreb, Croatia

Phone: +385 1 3654730 E-mails: sinisa.krajnovic@ericsson.com

Phone: +385 1 3654734 E-mail: darko.huljenic@ericsson.com

ABSTRACT: The paper analyses some of the critical business factors and business challenges in the modern global economy based on knowledge, through the example of Croatia and is primarily related to the project management discipline. The critical importance and characteristics of project management as a competitive tool is elaborated. The importance of knowledge and innovations in securing long-term business success is stressed and analyzed. The relationship and co-operation between the scientific community and high-tech industry in a field of project management is discussed and presented. This analysis is performed on two examples: Project Management Institute activities in Croatia and its impact on the future competitiveness of Croatia as well as cooperation between the Croatian ICT industry and academic community. The results show a great existing potential and a fine alignment with global trends.

I. INTRODUCTION

In today's global and highly competitive economies, it is crucial for a company success, but as well for the success of the national economy as such, to define and secure competitiveness based on its unique competitive advantages. In this paper we analyze some of the critical success factors for the Croatian economy, focusing on the successful companies in the ICT industry. [1]

The dominant, and perhaps we can even say the only source of competitive advantage, as well as the key economic resource in the modern world, is knowledge. Therefore, the importance and volume of the investments in knowledge and intellectual capital should surpass those in physical capital, and innovations should be perceived as a strategic resource. [2]

The credit in popularizing the term goes to Nonaka who highlighted that "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is

knowledge. Successful companies are those that consistently create new knowledge, disseminate it widely throughout the organizations and quickly embody it in new technologies and products". [3]

Project management as a profession and as a discipline has continuously been developing and its importance is now recognized in almost every industry segment within the global economy. In the highly competitive global ICT industry, where effective project management is perceived as a key success factor for the organization, this is even more the case.

In the paper we present and elaborate these arguments.

In the section II the basis of project management is presented. The section III deals with some aspects of project management in Croatia and its importance for the long term competitiveness of Croatia. In the section IV the importance of innovation and knowledge management for the successful ICT companies is elaborated, while in the section V the analysis of critical importance of the cooperation between scientific community and high-tech industry is discussed.

II. PROJECT MANAGEMENT

Project management is the discipline of organizing and managing resources in such a way that these resources deliver all the work required to complete a project within defined scope, time and cost constraints. [4] [5] [6] [7]

A project is a temporary and one-time endeavor undertaken to create a unique product or service. This property of being a temporary and a one-time undertaking contrast with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over and over again. The

management of these two systems is often very different and requires varying technical skills and philosophy, hence requiring the development of project management.

The first challenge of project management is ensuring that a project is delivered within the defined constraints. The second, more ambitious challenge is the optimized allocation and integration of the inputs needed to meet those pre-defined objectives. The project, therefore, is a carefully selected set of activities chosen to use resources (time, money, people, materials, energy, space, provisions, communication, quality, risk, etc.) to meet the pre-defined objectives.

As a discipline, Project Management developed from several different fields of application, including construction, mechanical engineering, military projects, etc. The forefather of project management is Henry Gantt, called the father of planning and control techniques, who is famously known for his use of the bar chart as a project management tool. His work is the forerunner to many modern project management tools, including the work breakdown structure and resource allocation.

The 1950s mark the beginning of the modern project management era. Prior to the 1950s, projects were managed on an ad hoc basis using mostly Gantt Charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed: the "Program Evaluation and Review Technique" or PERT, and the "Critical Path Method". These mathematical techniques quickly spread into many private enterprises.

In 1969, the Project Management Institute (PMI) was formed to serve the interest of the project management industry. In 1981, the PMI Board of Directors authorized the development of what has become The Guide to the Project Management Body of Knowledge, containing the standards and guidelines of practice that are widely used throughout the profession. [8]

III. PROJECT MANAGEMENT IN CROATIA

Modern global telecommunications are a highly competitive industry. In order to be successful, both in short term and in long term, in such

business environment, the companies within ICT industry have to develop outstanding project management capabilities.

Project management as a profession and as a discipline has been continuously developing and its importance is now recognized in almost every industry segment within the global economy. This is valid for Croatia, as well.

As an example of the global project management organization, in this article the Project Management Institute activities in Croatia are presented. Project Management Institute is recognized as a pioneer in the Project Management field and its membership represents a global community with more than 200,000 professionals, representing 125 countries. In 2004 PMI Zagreb Croatia Chapter has been established, as a subsidiary of the global PMI organization and as the center of excellence of project management discipline in Croatia. Fig. 1 shows an exponential membership growth of the PMI Croatia in the last couple of years. [9] [10]



Fig. 1. PMI in Croatia, a membership growth

The objectives of the Croatian PMI Chapter are promotion of project management, development and advancement of the profession of project management, increased quality of project management work and productivity of the profession and established connections with the international project management community. By supporting and actively developing project management as a profession and as a discipline in Croatia, the Croatian PMI Chapter supports the global competitiveness of the Croatian economy and participates in the transformation of Croatia into a knowledge based society.

IV. KNOWLEDGE MANAGEMENT AND INNOVATION IN ICT INDUSTRY

Knowledge management is the formalization of and access to experience, knowledge, and expertise that create new capabilities, enable superior performance, encourage innovation, and enhance customer value. It is a strategic, systematic program for capitalizing on what an organization ‘knows’. Knowledge management is a set of processes for transferring intellectual capital to value. These processes include innovation and knowledge creation, as well as knowledge acquisition, organization, application, sharing and replenishment. Knowledge Management refers to a range of practices used by organizations to identify, create, represent, and distribute knowledge for reuse, awareness and learning across the organization. Knowledge Management programs are typically tied to organizational objectives and are intended to lead to the achievement of specific outcomes such as shared intelligence, improved performance, competitive advantage, or higher levels of innovation. [11] [12] [13] [14] [15] [16]

When implementing knowledge management in an organization, there are few vital prerequisites to consider:

1. executive leadership and commitment;
2. healthy organizational culture;
3. expertise;
4. IT infrastructure.

The authors would like to stress that having a healthy corporate culture is imperative for success in knowledge management. Without a trusting and properly motivated employees, knowledge is rarely shared or applied, innovation and risk-taking cease, and organizational cooperation and alignment are nonexistent.

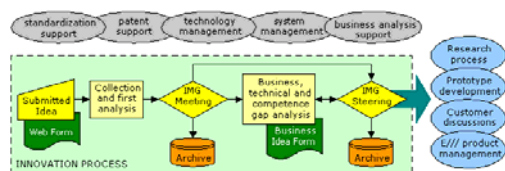


Fig. 2. An example of the innovation process

While there is awareness about the importance of innovations and research and development, and their pivotal role in competitiveness, growth and

success of modern companies and economies, current practices in many companies are far below the needed standards. Ideas and concepts are today’s critical resources and knowledge is the key to success and wealth.

Although innovation is difficult to achieve, it is a highly important undertaking, the mastery of which is vital for the long-term success for both companies and national economies in general. Fig. 2 shows an example of the innovation process in research and development center within ICT industry.

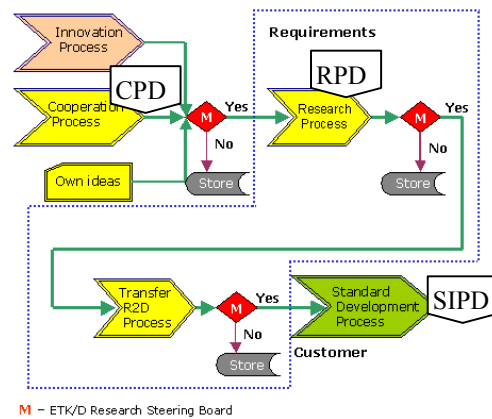


Fig. 3. An example of the cooperation between innovation and research

The importance and implementation of the innovation management is presented on the example of the industrial research and development center in Croatia.

Fig. 3 illustrates complete process chain that enables controlled environment (eco system) for ideas from creating to transferring from prototype to the standard development. A knowledge based company’s success is mainly based on effectiveness of proposed innovation process chain. To secure potentially better results at the end of innovation chain project management discipline has been introduced in the three main processes. The first is the Cooperation Project Discipline (CPD). The second process in the innovation chain is the Research Process with the application of the Research Project Discipline (RPD). The third one is the Standard Development Process with the application of the Standard ICT Project Discipline (SIPD).

In terms of requirements, the research project often starts from a discussion about the framework of what will be done, in contrast to development projects where real customer requirements and expectations on outputs are discussed. In terms of expected outputs, there is fundamental difference as well, which the project sponsor must accept: the result of research project may be negative, but still worthwhile – for example, produce a kind of evidence that something is not feasible. A good prototype, on the other hand, may progress towards a prototype for development project, but again – not many prototypes are that good (typically, one out of ten makes it). For example, a failed (or faulty) prototype costs the company infinitesimally less than a bad product. Accepting a “positive negative” result from a research project may thus be difficult, and it is in strong disagreement with development projects where a project must result with positive output or product for the customer.

This brings us to the issue of business orientation. In applied research projects in business oriented companies, it is implied that results of research project should be used as an input for development projects. In development projects, goals are related to current and future products and technologies, rather than to fundamental research topics. As a consequence, and since other project(s) may closely depend on the particular research project result, planning, controlling and scheduling activities are performed more strictly.

There are two important elements that can be seen from this analysis: the first one is the importance of achieving a result (it does not matter if it is positive or negative, but it must be presented) at the end of the project, and the second element is forcing the documented activities, which enables further repetitiveness. These basic achievements enable company in elementary organizational knowledge acquisition.

The Standard ICT Project Management Discipline is in essence the standard project discipline but it is expected from a project leader to have additional functional knowledge in ICT domain, in order to understand the technology trends and to better prepare project execution scope (delivery plans) according to a very dynamic environment (for example standards) change, like the one in IP world. These facts make a fine granulation in project discipline

elements and enables successful companies to include better organizational knowledge acquisition into the scope of project development and output of internal results.

V. COOPERATION BETWEEN SCIENTIFIC COMMUNITY AND HIGH-TECH INDUSTRY

One of the main competitive advantages of the successful ICT companies in Croatia are their close links and successful co-operation with the Croatian scientific community. The importance of the co-operation between industry and academic organizations is high and it requires continuous enhancements. This co-operation is the key both for the long-term success of a company based on knowledge and for the society in general. Today a global trend in knowledge based economy is the regulative forcing of cooperation.

Ericsson’s Research and Development Center in Croatia has a long track record in the cooperation with the academic community and it is with very good achievements. The period of the formal cooperation between the University of Zagreb, Faculty of Electrical Engineering and Computing, Department of Telecommunications and Ericsson’s Research and Development Center in Croatia is longer than 30 years. Different layers of cooperation were applied over this period, but we can divide layers in three main categories.

The first category is “request – response” layer, which means that industry sees some potential new challenges but does not have enough qualified resources or time to investigate their technological potential and find potential theoretical solutions, so it orders a related study from the University. The industry proposes time when study must be ready and expects qualified presentation of the solution. The university processes order and execute job in the form of scientific research and presents final result. That is a reason why this model can be classified as “request – response”, since there is no or there is very little intermediate interaction. In the sense of project management discipline, the company does not start any project (except opening cost category in the budget) and acts like a customer by setting requirements regarding cost, time frame and a potential area of interest. At the end, the company expects the presentation of results

of work from the University. In that case the University chooses a way to execute the job – it can be executed by applying project discipline or some other way of working.

The second category or upper layer is yearly framework of work that is expected to be executed with main focuses (for example technology elements of interests and expected project areas). In that case a higher degree of formality must be introduced in work environment and some sort of program management that take responsibility about potential projects. A common methodology has to be chosen for project controls. Within this layer, the company has to engage, part time or full time, dedicated own employees to take care of setting the multiproject goals and to control and track execution phases. In the case of Ericsson's Research and Development Center in Croatia at that moment a small Research department was formed, with employees dedicated to cooperation with the University. The main request for the Research department is establishing operative control of the framework for cooperation and to report progress or potential escalations to the higher management in the industrial environment that enables continuous control of the cooperation progress and achieved results. As it is presented on the Fig. 3, in case of Research and Development Center in Croatia the Research department takes over the control of organizational innovation process, too. From the project discipline perspective it is important that two technical roles are established: the main researcher from both sides (the University and the company) and the project manager, who is always nominated by the company, as it is logical that the side which is interested in result and which finances the project wants to control the execution with proper sense of urgency. In that sense the academic organization supports the project execution with the research and theoretical work, while industry canalizes the directions through real problem needs.

The third category or layer is the full integration of all phases from the idea of potential technological improvement through the research cooperation project scope definition, the project execution and the presentation of results. It is important to emphasize that in that layer a broader base of potential resources is involved, which means that from the industry side key drivers are from the Research department, but all

employees that are on a postgraduate study or employees that are interested in participation in the scientific or research work are involved. From the University side dedicated experts for the cooperation (professors, assistants) are included, but the students, too. The form of including students is twofold: through their lab work or seminar work and by organizing summer workshops or camps in the industry environment. The project discipline in that case is very important and in the case of Ericsson's Research and Development Center in Croatia a standard research project discipline with formal quarterly steering of the projects is used. Members from the university and members from the industry (higher managers) are included in the steering.

The current situation in Ericsson's Research and Development Center in Croatia is that all layers of cooperation are present with the University of Zagreb, Department of Telecommunications and Informatics and Department of Electronics, Microelectronics, Computing and Intelligent Systems, as well as with the University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture. In all cases we are using all three layers of cooperation and we are cooperating very successfully. One additional element is that the employees from Ericsson's Research and Development Center in Croatia take part in teaching at the University courses for the students.

Some results of the cooperation between a scientific community and hi-tech industry, based on the experience of Ericsson's Research and Development Centre in Croatia are:

- 2 common patents
- more than 100 articles on international and national conferences
- 20 articles in journals
- 25 prototypes
- more than 300 students included in cooperation work
- more than 20 seminars for competence build and shift.

This type of layered cooperation builds a full win-win situation for hi-tech industry, for the scientific community, as well as for the entire society. The appropriate project management discipline helps the Research and Development Centre in Croatia to have remarkable results. Another important thing is that such cooperative culture is fully aligned with the European Union

Framework Program directions and requirements about research projects.

VI. CONCLUSION

The strategy of the modern companies has to be based on knowledge and innovations, where knowledge management is the key organizational tool for increasing competitiveness and securing both short and long term sustainable business growth and success.

In order to secure and achieve sustainable business success, companies within the modern and highly competitive global ICT industry have to develop outstanding project management capabilities. Project management as a profession and as a discipline has continuously been developing and its importance is now recognized in almost every industry segment within the global economy. By supporting and actively developing project management as a profession and as a discipline in Croatia, the Croatian PMI Chapter supports global competitiveness of the Croatian economy and participates in the transformation of Croatia into a knowledge based society.

Competitiveness based on knowledge as well as close cooperation of industry with scientific and academic community in Croatia are the key success factors for locally and globally successful Croatian companies. In that way, they set the example for others and lead the way in positioning Croatia in the global competitive economy and community.

REFERENCES

- [1] S. Krajnović, "An Insight into Business Challenges in Research and development centers within the ICT Industry", CTI, *Mipro2004*, 2004.
- [2] P.F. Drucker: "Managing in the Time of Great Change", *Truman Talley Books/Dutton*, New York, USA, 1995.
- [3] I. Nonaka, H. Takeuchi, *The knowledge – creating company*, Oxford University Press, 1995.
- [4] H. Kerzner, "Project Management: A Systems Approach to Planning, Scheduling and Controlling", Eight Edition, John Wiley & Sons, 2003.
- [5] H. Kerzner, *Strategic Planning for Project Management Using a Project Management Maturity Model*, John Wiley & Sons, 2001.
- [6] A. Hamidović, S. Krajnović "An Example of a Novel Approach to Measuring Projects Success within ICT Industry", *ConTel2005*, 2005.

- [7] http://en.wikipedia.org/wiki/Project_management
- [8] A Guide to the Project Management Body of Knowledge, PMI (Project Management Institute), 2004.
- [9] <http://www.pmi.org/info/default.asp>
- [10] <http://www.pmi-croatia.hr/default.asp>
- [11] S. Krajnović, D. Huljenić "An Insight into Challenges of International and Multicultural Knowledge Transfers within ICT Industry", *ConTel2005*, 2005.
- [12] W.L. Miller, L. Morris: "Fourth Generation R&D: Managing Knowledge, Technology, and Innovations", *John Wiley & Sons*, 1999.
- [13] J. Liebowitz: "Knowledge Management Handbook", *Interpharm CRC*, 1999.
- [14] S. Krajnović, "An Approach to the Development of Software Engineering Processes", *Mipro1999*, CTE, 1999.
- [15] D. Morey, M.T. Maybury, B.M. Thursingham: "Knowledge Management, Classic and Contemporary Works", *MIT Press*, 2002.
- [16] E.M. Awaday, H.M. Ghaziri: "Knowledge Management", *Prentice Hall*, 2003.