Study of Software Development in Developing Countries: Case of Croatia

Nikola Vlahovic, Ljubica Milanovic Glavan and Anja Frankovic

***Abstract*—**High demand for software developers from leading global software development companies has encouraged education of software developers, software architects and programmers all over the world. In developing countries this trend was additionally pronounced as the cost of software experts from developing countries was more competitive in global markets than those of developed countries. Consequently developing countries initiated establishing small but profitable software industries that have shown some remarkable properties during the recent challenging economic fluctuations. The global economic crisis during 2008 and 2009 has resulted in the recessive trends for most industries initiating decline in industrial production and economic expansion. Software industry has proven to be one of the most resilient industries.

In this paper we will present the research of key features of software industry in developing countries that makes it resilient to difficult economic fluctuations. Despite their relatively small proportion in overall industrial structure they can be used as a basis for international competitiveness.

The goal of this paper is to identify most important structural and organizational features as well as the sources of comparative advantages that empower software companies in global international software markets. For the purpose of this paper research was conducted on the case of Croatia. Research is twofold: Firstly, structural and economic effects and properties will be analyzed from secondary statistical data about Croatian software companies and secondly, additional survey will be used to explain additional details pertaining to software development approaches and market strategies of these companies. Based on the results software industry structure, market targeting and software development practices are identified and outlined explaining how they contribute to strengthening competitive advantage of small national software industries in developing countries on the global software markets.

***Keywords*—**Agile software development, Cloud computing, Comparative advantages, ICT industry, Offshoring, Software development methodologies, Software industry.

N. Vlahovic is the associate professor at the Informatics Department of the Faculty of Economics and Business, University of Zagreb in Croatia. Trg. J.F. Kennedyja 6, 10000 Zagreb, Croatia (phone: +385-1-238 3220; fax: +385-1-233 5633; e-mail: nvlahovic@ efzg.hr).

Lj. Milanovic Glavan is postdoctoral researcher and assistant at the Informatics Department of the Faculty of Economics and Business, University of Zagreb in Croatia. Trg. J.F. Kennedyja 6, 10000 Zagreb, Croatia (e-mail: ljmilanovic@ efzg.hr).

A. Frankovic is bachelor of Economics who graduated the Managerial Informatics Study Program at the Faculty of Economics and Business, Universty of Zagreb in Croatia. Trg. J.F. Kennedyja 6, 10000 Zagreb, Croatia (e-mail: anja.frankovic@ gmail.com).

I. Introduction

SOFTWARE industry is one of the most important and most profitable industries in global economy. It is one of the fundamental areas of the development of high technologies, as it employs highly educated workers that use knowledge as the main resource. Recent economic crisis has also showed that software industry can withstand fluctuations in global financial and economic markets during recession better than most of other industries. In some parts of the global markets there have been recorded smaller rates of decline in revenues than other industries, while others national software industry centers reported no influence whatsoever. A good example is Germany where after the initial decline during 2008 and 2009 software and IT industry recovered in short period of time. Thai software industry reported no influence of the crisis as it readjusted its strategies and turned successfully to Asian markets for support [19]. European commission has even relied on these industries (particular consumer electronics, gaming industry, and telecommunications and high technology sector) to lead the path to economic recovery believing that these industries can induce higher personal consumption expenditures.

Developing countries experienced similar effects as more developed countries with significantly larger and more robust software industry sector. But comparatively national software industries' have showed to perform with smaller decline in business activities than other national industries during the recent economic crisis. Since national economic stability is primary goal in developing and transitional countries of South Eastern Europe, investigating the foundations of this emergent resilience and advantage in comparison to other industry sector is required.

In this paper focus is given to software industry in developing countries. The main motivation is to analyze the specific context for this type of industry within developing countries. As recent statistics show there is a great potential for the development of software industry in developing countries, but also there are benefits for these countries' economies that need to me explored more thoroughly. In order to better understand these specific features of software industry in developing countries we will investigate main features of structure, market strategies and software development practices they employ. Next, we will try to determine how these features contribute to comparative advantage in

international markets.

Goal of this paper is to determine current state of software industry in Croatia. Goal of the paper is twofold: Firstly, statistical information about the demographic of the registered companies will be presented. Secondly, results of the survey conducted among small and medium sized companies of the software industry sector will be presented.

Structure of this paper is as follows: in Section II we will discuss the main topics in software development. Understanding how specific features of software as a product or service influence the development process and management of that process is crucial when considering the strategic role, potential and influence on national or international economies. In Section III we will analyze current trends in software industry that define the context for every national sector strategy. Understanding the current trends will help better evaluate current features of software industry in Croatia.

In Section IV we will present the analysis of software industry in Croatia as well as the main findings that describe relevant features of structure and strategies that companies employ. Analysis is twofold: first part of the presented analysis is based on the secondary data retrieved from the The Croatian Company Directory of the Croatian Chamber of Economy, and partially from the Croatian Bureau of Statistics, while the second part is based on primary research conducted in early 2015. In Section V discussion of results in relation to current trends will be given. Main determinates for potential and comparative advantages will be presented. Finally in Section VI we will present the conclusions and indicate future trends.

II. Overview of Software Development Issues

Software is different from all other types of goods due to its intangible nature. By definition software represents the unity of computer programs and their documentation [1] which allow the computer system to operate and be used by their end users. This is what it makes software specific type of good in terms of economic trade and business activities.

In this section we will therefore make a brief overview of main features and theories concerning software, but also main approaches to software development and management of software process life-cycle.

A. Defining Software in Terms of Economics

Software is intangible component of computer systems. Over time it has become inseparable part of other electronic and, traditionally mechanic, devices as an embedded component of these systems. By definition software represents the unity of computer programs and their documentation [1] which allow the computer system to operate and be used by their end users. This definition can be applied to all the devices that make use of microchips. Computer programs represent an organized set of digitalized instructions intended for computer systems that allows them to perform specific tasks for their users [2]. Software documentation describes program functionalities. It consists of technical documentation and user documentation that is usually part of the software solution presented through user interface during software execution but also in separated form as external resource. Software can also refer to other intangible assets of computer systems, such as database definitions and models and data contained in these systems, as well as various protocols used in computer communication.

Software is a digital good and as such, from an economic perspective it has three fundamental properties: indestructability, transmutability and reproducibility [3].

1) Indestructibility. Using software over time does not degrade its quality notwithstanding the length of usage or number of uses. This may lead to conclude that value of created software does not change, but external influences have a decisive influence on software value. In this respect software value may deteriorate over time [4], as technological advancements change working environment of existing software solutions.
2) Transmutability. Personalization, customization, modification and other altering practices of existing software systems are easily achieved which results in cost-effective production of software variants. This is particularly important for customer segmentation and price discrimination market targeting strategies [5].
3) Reproducibility. Since high-quality copies of the original software can be produced at low cost may authors agree that the marginal cost of production is almost zero [6]. Structure of production cost for software products contains primarily fixed cost for the software provider. Production of each additional unit does not significantly increase the total cost. In this respect the potential reproducibility deliver to software assets also significantly improves its value.

Chronologically, through these fundamental features of digital goods, software evolved from a particular product delivered recorded on a material medium (such as data disks) towards less materialized forms. This transition was driven by the potential of creating additional value for customers and comparative advantage for its developers. Through habituation of end users developers were able to take advantage of lock-in effects in targeted market segment and build a solid foundation of stabile customer base.

In order to achieve these potential advantages software companies started taking advantage of digital distribution of software using corresponding Internet services reduced or even eradicated the costs of logistic and inventory, while additionally promoting convenience for customers, allowing for automatic update of software components.

Finally, dematerialization of software distribution and the further development of Internet's communication capacities led to creation of cloud computing where software itself is not even delivered to users as a compact set of computer programs and components. Software is radically being transferred to the cloud paradigm and being offered as a service. This transition was also gradual as we can see in Figure 1.

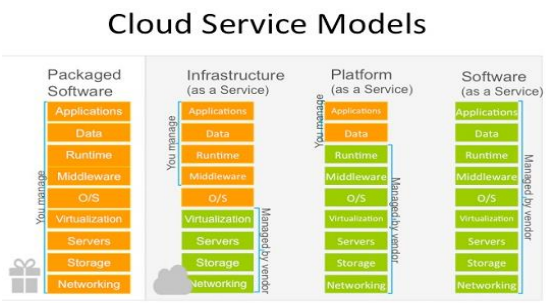

Fig. 1 Comparing stand-alone applications and Cloud computing services

Cloud computing refers to a specific computing paradigm based on virtualization of information and computing resources [20]. This paradigm can be achieved in different levels, depending on the level of virtualization of resources such as hardware (i.e. memory, computing power or storage) or even software (i.e. platform, application or services). There are three distinctive levels of virtualization that create different working environments and potential software models as shown and compared to traditional packaged software in Figure 1.

Providing Infrastructure as a Service (IaaS) opened up new opportunities for network and internet provider businesses, providing. Platform as a Service (PaaS) opened up new opportunities for software developers. Providing Software as Service (SaaS) offered additional benefits for end users.

This radical change has raised the dynamics in the software markets, bringing new concepts for both Internet providers and software developers in terms of decreasing the investment and maintenance costs while improving efficiency [25, 26]. In turn end customers benefit from lower prices for their information needs, more fair pricing models and higher robustness and longevity of their data as ubiquitous computing concepts become implemented. Overall, digital transformation of customer experience is achieved.

All of these trends have been recognized not only by large multinational companies but also smaller entrepreneurs that recognized the opportunity to acquire powerful tools and start innovative businesses.

B. Software Development Methodologies Overview

As we discussed in previous section fundamental characteristics of software distinguish it from most of other trade goods. Furthermore software is characterized with additional versatility as it can be traded like regular trading good on the markets, but it can also be used to provide services and in that way become a part of services markets.

All of these features draw the attention to the software development life cycle which is also specific due to the aforementioned versatility and other characteristics. Software development methodologies and best practices are based in software engineering. Finally, due to recent trends these methodologies have been drastically changed in order to accommodate for new expectations and higher level of quality required from contemporary software.

Traditional software development methodologies include aspects of sequential development (such as Waterfall model) or incremental development (such as Prototyping or Spiral models) [1]. Traditionally, depending on the chosen model, software development process involves a number of typical development stages, such as: software specification, design and implementation, software validation and software evolution. Original traditional methodologies include very extensive documenting of the software process, extensive and slow development with usually significant costs.

In order to alleviate shortcomings of the traditional development models and due to additional pressure in creating fast quality software solutions, the use of agile software development methodologies is promoted.

There are twelve principles of agile development, as defined in Agile Maniphesto [7] that describe the values and standpoint in which agile methodologies for software development should be founded. Primarily, agile approaches focus on individuals instead on the process while promoting improved communication among team members and other stakeholders. Key is the development of working software that can be easily and quickly changed to adapt to changing user requirements and dynamic environment. Some of the most important agile methodologies include Scrum, eXtreme programming (XP), Kanban, Feature-driven development, etc. [8]. Limitations that all of these methods share is the size of software system developed since agile approach works best with small development teams and systems with limited complexity. Large software systems developed by large development teams which may rely on legacy infrastructure cannot directly benefit from agile approach. This is way combinations of more traditional approaches such as sequential ‘waterfall’ development, incremental development approaches or unified process approaches, with agile methods tried to implement agile principles to larger complex software systems[27]. Resulting methodologies have been implemented, such as Agile Unified Process (AUP), Scaled Agile Framework and Large-scale Scrum.

Along with Agile development different practices pertaining to one or more of its methodologies have encouraged the development of more recent tools that are based on approaches such as Behavior-driven design (BDD), Domain-driven design (DDD), Continuous Integration (CI), etc.

Still, for legacy systems and large-scale complex heterogeneous system traditional structured approaches are still widely used.

C. Selected Software Management Issues

One of the most important basis for decision making in strategic management is the assessment of economic value assets. Even more importance for appropriate decision making is the precision in assessing the economic value of intangible assets as their value may be harder to realistically judge.

Currently, software value estimation in practice is based on three possible approaches [21]: (1) cost-based; (2) demand-

driven or value-based and (3) competition-oriented.

The cost-based approach is widely used as it is covered by the International Accounting Standard 38 – Intangible Assets (IAS 38). Main purpose of IAS is to standardize financial reports for all countries that accept the standard in order to make their financial statements comparable, basic accounting principles are adopted. For asset measurement this means that there is a preference for underestimating the asset value rather than overestimate it. This is why most of the value estimates are based on historical value which is usually lower than current value, or market value, especially for intangible assets.

Demand driven approach is based on the level of demand for a particular software product or service. This approach relies on economic theory of supply and demand, and is highly dependent on the precision of estimating current demand for a particular software product (or service). In practice it is used in determining software prices rather than the value of software assets.

Competition-oriented approach is based on the competitive prices of comparable software in a particular market segment where there is the availability of substitutive software products or services offered by different suppliers. The scope of this approach is also very limited as most of the software developers try to customize their solutions.

Recently, more adequate and precise models of estimating software asset value are proposed. Groote et al. [22] propose software valuation based on technical debt and technical interest. Technical debt is a type of opportunity cost defined as a set of quality issues or problems in software that will cost the organization that owns the software greater expanses if they are not resolved [23]. Furthermore, there are two major components of technical debt [24]:

1) principle, as cost to repair a software system in order to achieve ideal level of quality and
2) interest, as additional maintenance cost due to the lack of quality.

Using these two components, all of the specific characteristics of software as intangible goods are taken into account, specific quality of software methodology used and organization aspects of managing software process life cycle.

III. CURRENT TRENDS IN SOFTWARE DEVELOPMENT

Software industry along with information and communication technology is one of the most important sectors of international economics in the information age. Product and services that are provided through this economic sector are of essential importance to overall economic development, business development and scientific research. It provides an essential incentive to both business spending and personal consumption expenditure which in turn generate economic growth. On the other hand software industry has stayed elusive to industry analyzers and financial markets longer than any other sector [13], [14]. This is primarily due to a high level of variation that this industry provides to the constraints exhibited by analytical methodologies and their categorizations. Furthermore this industry is characterized with one of the highest levels of innovation resulting in creation of distinctly varied products and services spanning over not only software industry but also spilling over and expanding to numerous other industries in various forms and approaches. Yet software industry has anchored itself as a unified industry proving to be highly stabile and resistant to economic fluctuations and market instabilities.

Some of the most important characteristics of the industry include the fact that its main products are the most complicated man made products and yet intangible in its nature. This fact alone calls for highly skilled professionals that open up a demand for highly trained professionals such as computer programmers, software architects and software designers. In turn, high expectations and use of high-technology in their work is compensated by above average salaries that for over a decade have positioned these job positions in highest paid job positions rankings.

Additionally, with the development of Internet and Internet services, particularly the World Wide Web service, and due to intangible and digital nature of software products, additional access both to job positions and customer markets was alleviated and raised to international and global level. Currently the most important characteristics that drive the growth of software industry market share along with the innovation potential it offers heavily rely on the definition and repositioning of software products from products to services and efficient organization of software development process.

There is also a trend of increasing number of small and medium companies that have the chance to enter international markets using this virtual “online” market. They combine versatile and agile software development practices in order to become more competitive and able to respond better to high dynamics of the software markets. In turn, small and medium companies form the major share of software industry in developing countries providing their national software industries with additional resilience against local and global market instabilities.

In order to better understand the position of these companies in global arena in the remainder of this Section we will present current trends in software industry and markets.

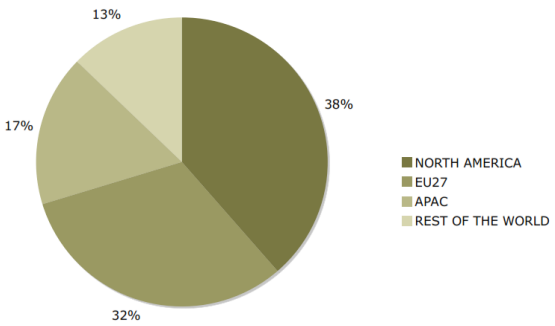

Fig. 2 Global Software Markets by Region

European software market is second largest software market in the world with more than 231 billion EUR of global market share [9]. It is ranked after Northern America and ahead of Asia & Pacific Region (including Japan) (Figure 2).

This is the main driving force for software industry that has shown positive trends over the last decade, despite global economic fluctuations and occasional economic crises. Appropriately, R&D spending in software industry is also second largest in the world (after United States and Canada), increasing year after year. In the last five years, though, the rate of market grow is decreasing and profits have fallen below the R&D spending (Figure 3).

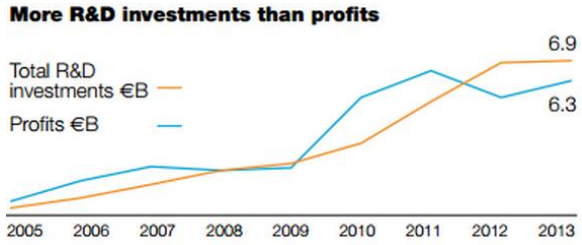

Fig. 3 R&D spending and profits of EU software industry (*Source: Truffle Capital*)

The main contributor to the EU software market is Germany that accounts for half of the revenues, followed by United Kingdom with 13% revenue share, France 12% revenue share, Sweden with 6% revenue share, The Netherlands with 5% revenue share, and other countries with less than 3% share each [10].

For the most part, software industry along with accompanying ICT sectors was the driving force of resisting the restrictive fluctuations and economic recession during 2008 and 2009. During that period software market lost about 5% but recovered quickly in the following years [11]. This is the exact timeframe for increased innovative spur that took the advantage of new trends in ICT and software. Some of the most important innovative products and services include business intelligence software, IT security software, Enterprise Content Management, SOA and software as a Service (SaaS). Dominant number of innovations relied on cloud computing.

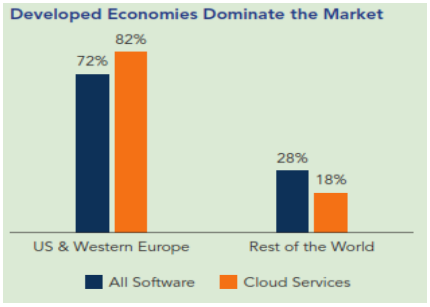

Fig. 4 Global software market shares between developed and developing countries

As we can see in figure 4 globally, developed countries intensified development of cloud based services while developing countries followed. The same trend is seen in European region.

As cloud computing constituted only 9% of global software market in 2013 [12] currently it still dictates leading trends in terms of IaaS/Paas and SaaS challenging the potential for innovation in software industry (Figure 5).

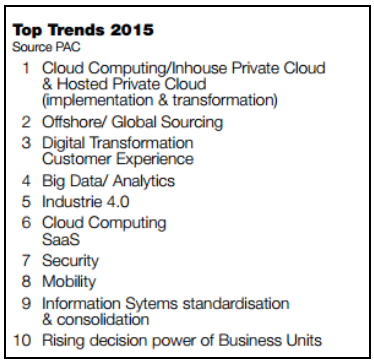

Fig. 5 Top trends in software industry in 2015

In the past decade developing countries have taken the opportunities for offshoring of software by the leading developed countries [15], [17]. For East and Central European countries this trend was additionally enhanced as they had the opportunity to develop the required information infrastructure using financial support of the EU funds.

Benefits are mutual for both developed and developing countries. Cost of software development reduces for the leading software industries of developed countries while creation of new software producing regions promotes overall economic development in developing countries. It has been also shown that developing countries that were initiating growth of their software industries through direct foreign investment, such as Estonia and Romania, have been able to establish and develop software industries more successfully than countries that relied primarily on domestic investment, such as Bulgaria [16].

These investment circumstances and open possibility for offshoring developed countries in software development tasks provided additional resilience to national economic fluctuations observed in the past 5 to 8 years in transitional countries.

Still, features of developing countries' software companies that allow for offshoring and comparative advantage remain

unclear, insufficiently investigated and defined. In the rest of the paper we will present a study on the case of Croatia trying to establish the main features of software industry in developing transitional country. Main focus will be on the research of diversification in market coverage and internationalization, as well as innovation since current research indicates that these elements are most important characteristics of software industries that resisted oscillations during global economic crisis.

IV. Case Study: Software Sector in Croatia

For the purpose of this paper a twofold research was conducted. First secondary data was analyzed to determine the structure of active companies with main activities pertaining to production of software and delivery of software services. In the second part a primary research using survey was conducted in order to better understand the competitive position of Croatian software industry. The obtained data can be used as a model of small software industry for developing countries. Subject of the study was focused on active companies that are according to Croatian chamber of economy registered for activities that include computer programming, consultancy and related activities and information service activities services. Also, the study included only companies that have reported a minimum of 12.000 euros of revenue in 2013.

Goal of the survey was to determine the demographics of the companies included in the research, understand the market they are selling their products and services and finally understand their internal organization with additional emphasis on software development methodology that is prevalent in their business operations.

A. Research Methodology

The research was based on acquiring data from secondary sources (i.e. Company Register of the Croatian Chamber of Commerce), and primary source through a survey dedicated to the earlier described goals of the study.

In the first part of the preliminary study structure of registered companies was analyzed (Table 1).

Company size	Active		Inactive	
	with employees	no employees	with employees	no employees
Large	2	0	0	0
Medium	19	0	0	0
Small	1873	825	0	6
Uncategorized	462		226	

Table 1. Structure of software industry in Croatia

As we can see in Table 1, most of the active companies of the software industry sector are categorized as small companies, 1873 of them, while only 19 companies are categorized as medium and two companies as large. There is 462 companies that are not classified even though most of them would be categorized as small as well, according to data from that sample. However, there are 825 companies that are active formally but that do not have any employees. Among inactive companies there are 6 small companies and 226 uncategorized companies. Furthermore, industry is centralized as most of the companies (2240) are registered in Zagreb administrative area followed by Rijeka with 245 and Split with 242 registered companies. Most profitable companies are also based in these areas with majority of companies originating in Zagreb and one from Rijeka, Split and Pula. The overall impact of software industry on the global industry sector is not pronounced as the company with highest revenue comes at 357 place by its revenue compared to all of the other registered companies.

In order to better understand the specifics of software companies a dedicated survey was conducted. It was organized in three sections. First section contained question pertaining to the demographics of companies including size of company, revenue, geographical location and number of employees. Second section of the survey was used to investigate target markets and the ratio between domestic consumer markets and international market segments. Finally, in the third section of the survey information about the methodology used in during the software development life cycle was collected.

The survey was sent electronically to 650 companies, addressed to middle-level management. Exactly 100 of companies sent their responses which equals to 15,4% response rate.

Responses were then processes and descriptive statistical analysis was conducted.

B. Research Results

The average age of companies is 12,6 years as the registration of companies first began in 1990 when Croatia gained independence. Some of the companies registered in first couple of years were actually active even before, but overall we can say that software industry in Croatia is a young industry with average rate of growth of 4 companies with yearly revenues of at least 12.000 EUR each year.

Software companies gravitate towards Zagreb city area as this is the major financial and business area in the country. 63 companies are registered in Zagreb while the others are registered in other cities.

While only two of largest companies had more than 100 employees, majority of 71 companies in 2013 had less than 10 employees, while further 23 companies had between 10 and 50 employees (Figure 6).

45% of companies estimated that their revenue in 2014 will remain in vicinity of 100.000 EUR or less.

In Figure 7 we can see that more than 60% of companies

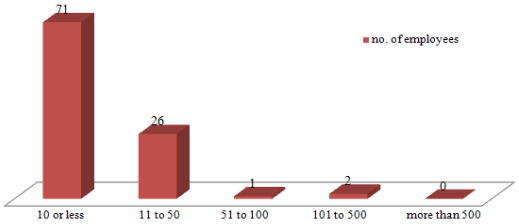

Fig. 6 Software companies by size – number of employees

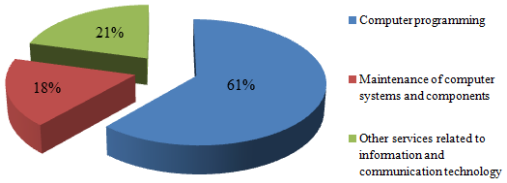

Fig. 7 Software companies by dominant business activity

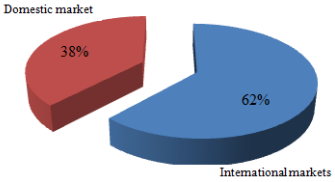

Fig. 8 Ratio of domestic and international markets

produce software i.e. computer programs, 18% provide services in maintenance of computer systems and equipment. The rest of the companies provide other types of information services and consultancy.

Companies earn majority of their revenue on domestic markets in 38% while remaining 62% earn their revenue abroad (Figure 8).

Those that export their products and services primarily export to European countries (40%) and countries of the neighboring South-Eastern countries (35%). About one fifth of export is realized on the American market (Figure 9).

48% of companies have adopted primarily agile methodologies for the development of their software products.

While Scrum is the methodology most widely accepted, companies in most cases use a combination of agile methodologies such as combinations of Scrum, Adaptive Software Development and eXtreme Programming. There is a significant 15% of these companies that rely on the Open Source development (Figure 10).

Rest of the companies (52%) use more traditional approaches to software development. In this case companies mostly use component-based development taking the advantage of reusability (55%) and RUP Methodology (19%). Other methodologies that are used in lesser extent are Joint application design and other rapid software development methodologies (Figure 11).

There is a good representation and diversification of various architectural designs of software solutions covering desktop

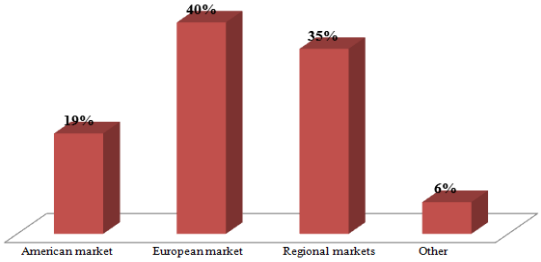

Fig. 9 Software companies exports by region

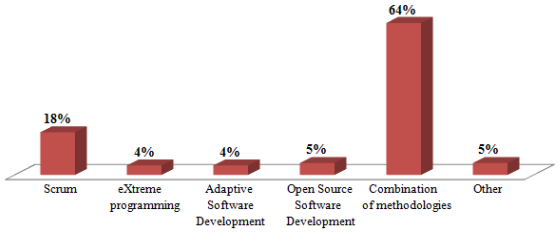

Fig. 10 Companies that adopted agile methodologies and most dominant methodologies used

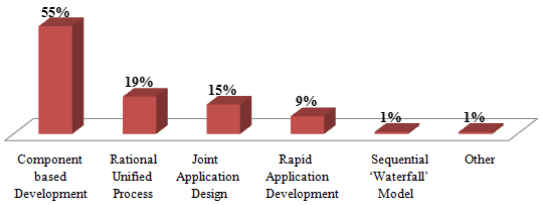

Fig. 11 Companies that use traditional approaches to software development and most dominant methodologies

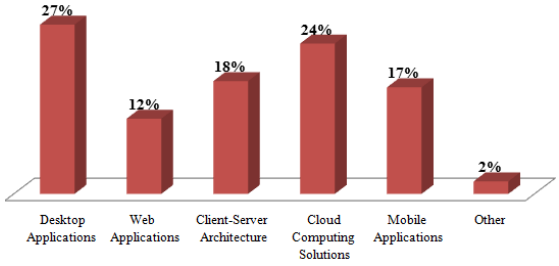

Fig. 12 Dominant Software Architecture of developed solutions

applications, client-server architecture and service oriented architecture (SOA), but also significant number of solutions of web applications, mobile applications and cloud computing implementations (Figure 12).

Acquired data also showed that majority, 53%, of solutions companies produce are commissioned custom made software solutions, 34% of solutions are modified Component-of-the-Shelf (COTS) and the remaining 13% belong to Open source solutions.

V. Discussion

According to Croatian Bureau of statistics production of software in Croatia between 2008 and 2012 has been continually increasing following the more general trend in EU software industry, despite global economic crisis (Figure 13).

On the other hand during that same period Croatian GDP had negative growth rate. Hence, software industry showed remarkable resilience to negative global trends. As we can see this is also true for other developing countries in EU that we described earlier. This means that specific nature of software industry, its position and opportunities can be used to alleviate negative trends in economic fluctuations. This opportunity was not fully realized due to overall small fraction of software industry in total national GDP.

Results of the research show that Croatian software industry consists of only several large companies and a group of young

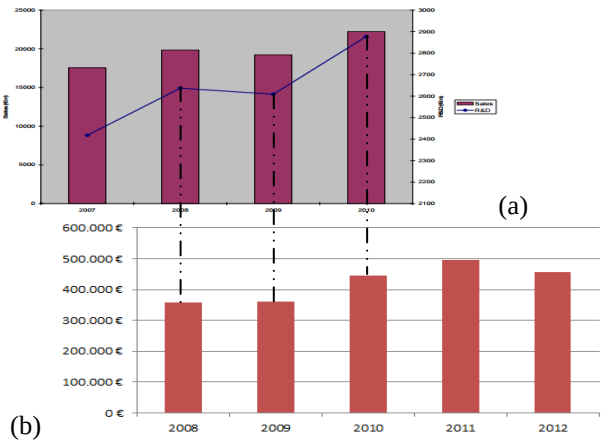

Fig. 13 Comparing trends in revenue from software in (a) EU and (b) Croatia

small and medium companies (Figure 6). Unlike large companies, these small and medium companies have adopted agile approach to software development as their main competitive edge both in domestic but also in international markets. Fast development, quick-win strategies in discovering and targeting new markets, infrastructural readiness and familiarity with recent technologies are the main attributes that allow dynamics and readiness to follow global trends in software industry.

If we cross-reference the main findings of the research with recent trends in software industry we will see that:

1) One third of revenues of Croatian software companies (Figures 8 and 9) comes from two leading software markets (Northern America and Europe in Figure 2), testifying significant level of offshoring to developed economies. This strategy allows for better inflow of international capital in situations when domestic capital is scarce or too expensive. Also offshoring improves domestic knowledge, as well as it may empower domestic companies that can make use of code and components produced as by-products for initiation of propriety software projects and services. This is possible due to reproducibility and transmutability of software.
2) Even though packaged/desktop software is dominating Croatian production (Figure 12) as in any developing country (Figure 4), cloud computing is well represented (Figure 12) allowing for participation in global trends (Figure 5) through innovation of these services reassuring continued growth.
3) Agile methodologies and high number of small and medium companies make national software industry agile and prepared for dynamics typical to the global markets.
4) Strengthening software industry by national strategies and institutional support can help overall initiation of economic activity since all industries rely on ICT in greater or lesser degree. Taking advantage of international support through European institutions offering financing of infrastructural projects, regional development projects and scientific research projects through EU Funding my develop a long-term comparative advantage [18].

VI. Conclusions

In this paper we have presented a study of main characteristics of the Croatian software industry, as an example of a small software industry model in developing countries. We have analyzed current secondary sources in order to understand the size, influence and structure of software companies, while retrieving additional information using a primary research based on the survey conducted among these companies. In order to understand these findngs we have also reviewed current trends and main characteristic of global software markets and world software centers. We have indicated current trends in terms of technological innovation but also in terms of business practices and macroeconomic conditions.

Distinction between developed and developing countries and their respective software industries was made. Even though both developed and developing countries have shown a great level of resilience to economic fluctuations in performance of software industries. Developing countries such as Croatia are more suspect to suffer from economic fluctuations so we tried to determine key features of software industries in Croatia and its comparative potential that make this type of industry more resilient to macroeconomic conditions than other types of industries even in small and developing economies.

In this context research of further structure, market strategies and software development approaches was conducted among Croatian software companies.

Results have shown that there is a significant comparative advantage of strengthening software industry in developing and transitional countries since its benefits on the entire economy are valuable. Stabilizing effect during decrease of economic activity, investment potential especially through direct international investment, and innovation are the main benefits detected during the research. The main perquisite of obtaining these advantages is agile orientation of software companies, openness to international markets and solid infrastructure.

References

[1] I. Sommerville, *Software Engineering*, 10th Edition, Pearson Publishing, 2015.
[2] R. M. Stair and G. W. Reynolds, *Fundimentals of Information Systems*, Sixth Edition. Course Technology, Cengage Learning, 2012.
[3] S. Y. Choi, D. O. Stahl and A. B. Whinston, *The economics of electronic commerce: the essential of doing business in the electronic marketplace*. Indianapolis: Macmillan, 1997.
[4] J. Zhang and A. Seidmann, "The optimal software licencing policy under quality uncertainty", in *The Proceedings of the 5th international conference on electronic commerce*, New York: ACM Press, 2003, pp. 276–286.
[5] S. Lehmann and P. Buxmann, "Pricing Strategies of Software Vendors" in *Business & Information Systems Engineering*, vol. 6, Heidelsberg: Springer Verlag, 2009, pp. 452 – 462.

[6] S. Royer, *Strategic Management and Online Selling: Creating competitive advantage with intangible web goods*, New York: Routlege, 2005.
[7] K. Beck et al., *Maniphesto for Agile Software Development*, Agile Alliance, 2001.
[8] Versionone, *State of Agile Development Survey Results*, available at http://www.versionone.com/state_of_agile_development_survey/2011/, 2011.
[9] Pierre Audoin Consultants, *Economic and Social Impact of Software & Software-Based Services*, 2010.
[10] Truffle Capital, *Top 100 European Software vendors: the best software companies*, available at http://www.truffle100.com/2014/countries.php , 2015.
[11] IBP, *Germany – Doing business for everyone guide: Practical information and contacts*, International Business Publications, USA, 2013.
[12] BSA, *The Compliance Gap: BSA Global Software Survey, Autumn 2014*, BSA, 2014.
[13] European Commission, "The European ICT industry at the crossroad: economic crisis and innovation", Pillar 5 of *Digital AgendaScoreboard 2011* , EC, 2011.
[14] K. Lukac, " Software project management at Republic of Croatia" in *Economic review(in Croatian), Ekonomski pregled*, vol. 53, no. 1-2, Zagreb: Hrvatsko društvo ekonomista, 2002, pp.164 – 190.
[15] A. Arora and A. Gambardella, "The Globalization of the Software Industry: Perspectives and Opportunities for Developed and Developing Countries" in Innovation Policy and the Economy, Volume 5, MIT Press, 2005, pp.1 – 32.
[16] S. Mancheva, *Successful Industry Building in Transition Countries: Foreign Direct Investment or Local Effort? Software Industries of Bulgaria, Estonia, and Romania*, Saarbruecken: VDB Verlag, Germany, 2008.
[17] D. A. Vogel and J. E. Connelly, "Best practices for dealing with offshore software development", in *Handbook of Business Strategy*, Vol. 6 Issue 1, Emerald Group Publishing, 2005, pp. 281 - 286
[18] B.H. Rudall and C.J.H. Mann, "Emerging technologies: software-intensive systems and other current developments", in: *Kybernetes*, Vol. 38, Issue 3/4, Emerald Group Publishing, 2009, pp. 549 – 555.
[19] A. Pornwasin, "Economic crisis no threat to software industry – ATSI" in *The Nation*, available at http://www.nationmultimedia.com/2009/01/13/technology/technology_30093086.php, 2009.
[20] A. Shawish and M. Salama (2014) "Cloud Computing: Paradigms and Technologies". In: F. Xhafa and N. Bessis (eds.), *Inter-cooperative Collective Intelligence:Techniques and Applications, Studies in Computational Intelligence*, vol. 495, Springer-Verlag, Berlin, pp. 39-67.
[21] C. Homburg and H. Krohmer, *Marketing Managment: Strategy – Instruments – Implementation – Governance, 2nd Ed. (in German)*, Wiesbaden: Gebler, 2006.
[22] J. de Groot, A. Nugroho, T. Back and J. Visser (2012) "What is the value of your software?" in *Proceedings of the Third International Workshop on Managing Technical Debt (MTD), 5th June 2012*, Zurich: IEEE, 2012, pp. 37–44.
[23] W. Cunningham, "The WyCash portfolio management system," *ACM SIGPLAN OOPS Messenger*, vol. 4, no. 2, 1993., pp. 29–30.
[24] B. Curtis, J. Sappidi and A. Szynkarski (2012) "Estimating the Size, Cost, and Types of Technical Debt", in *The Proceedings of the International Workshop on Managing Technical Debt*, 2012, Zurich, Switzerland.
[25] G. Feuerlicht and N. Margaris (2012) "Cloud Computing Adoption: A comparative study", *Latest Trends in Information Technology Proceedings of the 1st WSEAS International Conference on Cloud Computing, Viena, Austria, 10-12 November, 2012*, WSEAS Press, pp. 441- 448.
[26] L. Alnaji and H. Salameh (2015) "Cloud Computing Drivers: Benefits, Fears, and Implementations: A GCC Study", *Advances in Business and Economic Development, Proceedings of the 9th International Conference on Business Administration*, Dubai, United Arab Emirates, 22-24 February 2015, WSEAS Press, pp. 115-121.
[27] F. Dumitriu, D. Oprea, G. Mesnita (2011) " Issues and Strategy for Agile Global Software Development Adoption", *Recent Researches in Applied Economics, Proceeding of the 3rd World Multiconference on Applied Economics, Business and Development*, Iasai, Romania, 1-3 July, 2011, WSEAS Press, pp. 37- 42.