HIGH-TECH ENTREPRENEURSHIP IN DEVELOPING COUNTRIES: WAY TO SUCCESS

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ABSTRACT

High-tech industry is one of the most perspective and promising areas. Moreover, high-tech are core component of entrepreneurship. Hence, development of successful high-tech projects may open new horizons for entrepreneurs. Research considers using of project management tools as a factor for development high-tech projects that may be a key of successful entrepreneurship. The study investigates conditions for successful development of high-tech projects that ensure innovative entrepreneurship in developing countries. Lack of technological knowledge and lack of high-qualified human resources make it difficult to achieve high-tech project success in developing countries. Kazakhstan was chosen as representative of developing countries. Study compares project success level and factors that affect to success of high-tech projects in developing countries and developed countries. Japan was chosen as developed countries representative.

The objective of the study is to identify which factors affect to high-tech project success in developing countries from the viewpoint of project management. Literature review reveals a luck of researches about how developing countries run their high-tech projects. Research findings show that high-tech projects run by project managers differently in developing countries than in developed countries, and, accordingly, success level is much lower in developing countries. For example, Kazakh managers show worst result in cost overrun (25.96%) and in schedule overrun (32.9%). These results impacted by low extent of use cost and time planning processes. It may be due to the specific national culture, that describe Kazakh managers as don't focused on time management. In addition, Kazakhstani projects` results related to other two dimensions of success as technical performance (3.9) *and customer satisfaction* (4.8) *are lower than in developed country. Furthermore, study reveals specific knowledge areas of project management that high correlated with project success dimensions. Thus, critical knowledge areas for high-tech project success in developing countries as Kazakhstan are project integration and scope management, communication management, risk and quality management. Study suggests to focus on these factors during high-tech project management in developing countries, because these factors have significant impact on high-tech project success dimensions.*

Keywords: High-Tech Entrepreneurship, Developing Countries, Project Management, High-Tech Project, Project Success.

INTRODUCTION

Market conditions rapidly change and entrepreneurs have to be ready to respond quickly. They have to change their plans and looking for new ways of surprising and saving a customer. Therefore, entrepreneurs offer high-tech products and services for satisfying customers' growing expectations.

High-tech industry is one of the most perspective and promising areas. High-tech are core component of marketing, innovation, entrepreneurship, and diffusion. High-tech can boost innovation in tourism, services, branding, and products. By the way, entrepreneurship highly relates to innovation (Huarng and et al., 2015). Thus, how to provide successful and advanced high-tech products, services, and systems is a focal issue nowadays. Technology implementation may solve significant problems in higher level. Technology drives an industrialization that affects economy at individual, organization, sector, and global levels (Karmarkar, 2004). Hence, development of successful high-tech projects may open new horizons for entrepreneurs. There is luck of practical and methodological recommendations about how to manage high-tech projects. Research considers using of project management tools as a factor for development of high-tech projects that may be a key of successful entrepreneurship.

The study investigates conditions for successful development of high-tech projects that ensure innovative entrepreneurship in developing countries. Authors choose Kazakhstan as representative of developing country and Japan as developed country. Then compare the results of these two countries. According to the United States State Department report, Kazakhstan is widely considered to have the best investment climate in the Central Asia region and it attracts projects with world`s leading companies such as American "*Grace*", the Japanese "*Nuclear Projects*", the Israeli "*Halfa*", the French "*Air Liquide*", the German "*Linde group*", Chinese "*South West roads Projects*". Results of this research may be significant for entrepreneurs from different areas of business. Kazakhstan is developing country that leads in Central Asia and focusing on innovative development (Mukhamediyev and Khitakhunov, 2015).

The objective of the study is to identify which factors affect to high-tech project success in developing countries from the viewpoint of project management. Authors compared two countries high-tech projects results. Our research investigates project management knowledge areas, organizational support processes and success dimensions of enterprises` projects for better understanding success factors in perception of project management tools and techniques. The study would like find answers for next questions:

1. What are the level of high-tech project success in developing countries?
2. What are the critical project management knowledge areas that affect to high-tech projects success in developing countries?
3. What are the critical processes performed by local managers affect to project success in developing countries?

The paper includes 5 sections. First section describes research relevance, research problem and objective. Section 2 includes literature review for previous studies in chosen area. Section 3 research methodology: model and data collection. Section 4 presents results of the research and discussion part. Section 5 concludes the study.

LITERATURE REVIEW

Statistics data indicate that the success rate of high-tech venturing project is only about 20%, so striving for becoming one of the lucky 20% is the most concern of many entrepreneurs (Yang and Wang, 2009). New product development in the context of high-tech manufacturing cannot be effective without the use of project management approach (Pokharel et al., 2006). The Project Management Body of Knowledge (PMBOK) identifies planning as of major importance to a project because it`s help to select the best of the alternative courses of action to attain the objectives that the project was undertaken to address (PMI, 2008). It`s important to study the planning phase, because project planning identified as one of the major factors which affect to project success or failure (Zwikael and Sadeh, 2007; Milosevic, 2002).

Ngai et al. (2008) conducted a literature review on Critical Success Factors (farther CSF) in the implementation of enterprise resource planning across 10 different regions. When considering project management, they state that a clear and defined project plan including goals, objectives, strategy, scope, schedule, and so forth was frequently cited in CSFs for in almost all of the regions and countries examined in their study.

Moreover, Zwikael and Smyrk found discrepancy in the literature and found that most scholars and practitioners agree planning improves project success (Zwikael and Smyrk, 2011), others claim there is no correlation between planning and various success dimensions in regarding to research and development projects (Dvir et al., 2003). For clarifying this question Zwikael and others explore cultural differences in project planning quality between New Zealand, Japan and Israel (Zwikael et al., 2015).

This study investigates project success in developing countries. We found it important, because developing countries are often ill-resourced (Jugdev and Muller, 2005) and for various political and social reasons, developing countries are realizing that a dependence upon on more affluent countries (Canon, 1994). Moreover, this question is relevant due to the reasons for poor management performance in the developing countries (Munns and Bjeirmi, 1996). Developing countries` organizations have little experience and need modern management (Yanwen, 2012). In developing countries, Project managers work in different context and face a different set of issues from those in industrialized countries (Avots, 1972). Ogunlana (1996) classified the major problems faced in developing countries: problems imposed by the industry's infrastructure; problems of inaccurate information and frequent changes in instructions and failure to meet obligations on the part of clients and consultants; problems imposed by their own shortcomings. These findings make us sure that developing countries have many barriers during project running.

Further, we focus on studies that reflect cultural differences between chosen countries. Because they may affect the project managers' behaviours and project completion respectively. By the way, Zwikael et al. (2009) examined differences in project management style between Japanese and Israeli cultures. Authors found that Japanese project managers pay more attention to "*communications*" and "*cost*" management (Zwikael et al., 2015). Japanese managers prefer to develop personal relationship first before going forward with any business transaction. Therefore they pay more attention to communication when execute projects (Jonathan and McCalman, 2008). In addition, Japanese managers believe that project team is the main success factor (Jacobs and Herbing, 1997). Regarding to success dimensions, Japanese projects face higher schedule and cost overruns than other countries. Furthermore, Japanese projects don`t deliver all outputs to the customer, so, the level of customer satisfaction is low (Zwikael, 2009).

Literature reveals lack of researches about high-tech project management in developing countries such Kazakhstan. Study found an inconsistency of information about Kazakhstani entire PM style. Below presented explanations of different authors regarding to PM evolvement in Kazakhstan. Karmazina et al. (2014) claim that the actual process of promoting project management in Kazakhstan began in 2003 and the process of promoting project management demonstrates slow dynamics, because academic training in Project Management is carried out in the Republic only since 2008. As a result, there is lack of qualified PM specialists in Kazakhstan. The country's national project management system is only beginning to emerge. Because all transformations in the Republic in the 20 years took place under the supervision and with the support of the state. Managers are not "*In good relations*" with PM tools (Abdramanova, 2014).

Another groups of scholars claim that currently there is a formed environment for productive promotion of project management, increased interest in the use of project management techniques, in all sectors of Kazakhstan`s economy (Tsekhovoy and Statsenko, 2014). According to the survey, conducted by Union of Project Managers of Kazakhstan 70% of Kazakhstani companies today use the PMI standards, therefore they use project management tools and techniques in practice (Karmazina et al., 2014). Kalymbekova and Yerkinbayeva (2015) claims that Kazakhstani enterprises adapted to market conditions and become innovative.

Some scholars investigated high-tech market, especially, green technologies development in Kazakhstan and claimed that successful commercialization increases entire economy (Mukhtarova and Zhidebekkyzy, 2016).

Thus, literature review emphasizes the high impact of using project management during high-tech project execution, and reveals that there is luck of information about how developing countries run their high-tech projects. Are they having conditions for development such projects?

RESEARCH METHODOLOGY

The Model

The study uses Project Management Planning Quality (PMPQ) model to evaluate high-tech projects success level in different enterprises of chosen countries. The model is a valid and reliable for measuring the quality of project planning and its affect to success dimensions. Models reliability checked by using a number of statistical tests as Cronbach`s alpha (0.91 and 0.93) and t-test (Zwikael and Globerson, 2004). Furthermore, this model used by another scholars (Ress-Caldwell and Pinnington, 2012; Papke-Shields et al., 2010). The model consists of the two following components: project manager's know-how and organizational support. Finally, there are 33 products in model.

It was found that PMPQ index was highly correlated with the perception of projects' success, as measured by cost, time, project performance and customer satisfaction, as well as with the perceived quality of planning (Zwikael and Globerson, 2004).

As can be seen in Figure 1, independent variables of model are 16 planning processes and 17 organizational support processes influence on dependent variables include 4 success dimensions such as cost overrun, schedule overrun, project performance and customer satisfaction. In addition, there are two moderating variables as country and industry.

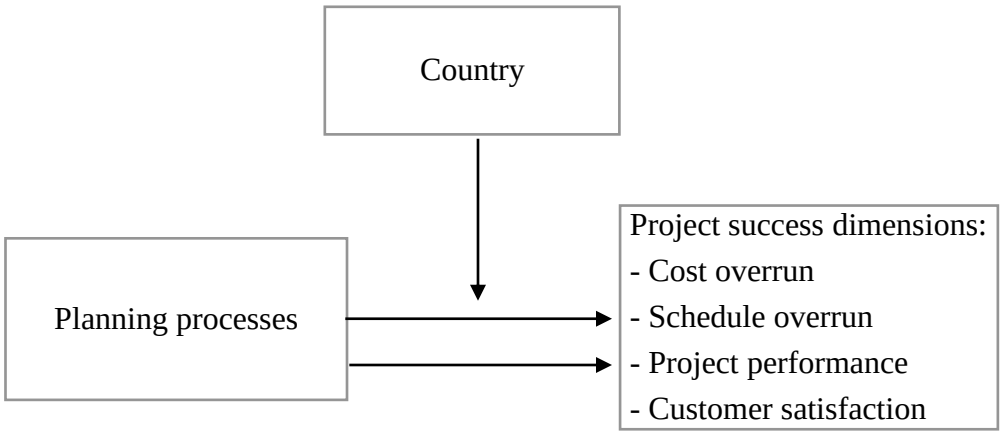

FIGURE 1
RESEARCH MODEL

Sample and Data Collection

The goal of the survey is to build a PMPQ model. Therefore, questionnaire prepared on the base of research model and aimed to collect data regarding planning, organizational support processes and project success (Appendix 1). The original survey created by Zwikael et al. (2005) was used in Israel, China, New Zealand and Japan. This questionnaire translated into Kazakh and Russian. Then it was sent to 19 high-tech entrepreneurs, 9 communication, 17 software, 12 enterprises. In addition, we communicated with Kazakh Association of Project Managers and their clients and members joined to passing a questionnaire.

Project managers joined in survey were asked about use intensity of independent variables (33 planning processes) and dependent variables (17 organizational support processes). Respondents evaluated them through scale ranging from low to high level of using (from 1 to 5 Likert scale). Supervisors of projects asked to evaluate dependent variables as four success dimensions: schedule overrun and cost overrun (measured by percentages from planed index), then customer satisfaction and technical performance, measured by scale ranging from 1 to 10.

Table 1
CHARACTERISTICS OF PROJECTS BY COUNTRIES AND INDUSTRIES

№	Project type	Japan, %	Kazakhstan, %
1	Engineering	18	23
2	Software	70	59
3	Communication	12	18
4	**Total**	**100**	**100**

Table 1 shows a list of main industries which chosen for data analysis. The source of questionnaires are similar, because in both countries projects from engineering industry consist about 20%, software about 60%, communication about 15% of all questionnaires.

Validity of model evaluated by comparing project success dimensions with overall project planning index. Project planning index calculated from average usage of 16 planning and 17 organizational support processes. Overall planning index high correlated with all success dimensions. Regression analysis shows that results are significant (p-values under 0.01). Thus,

we can claim that this model is valid and may be used for measure planning quality and projects` success level.

RESULTS AND DISCUSSION

This part of the study includes data analysis and discussion sections. Firstly, we compared projects` success level in developing and developed countries representatives, then extent of use of planning processes and organizational support level.

Project Success

Project success level for each country measured by average of cost overrun, schedule overrun, technical performance and customer satisfaction. The results of the measurement shown in Figure 2.

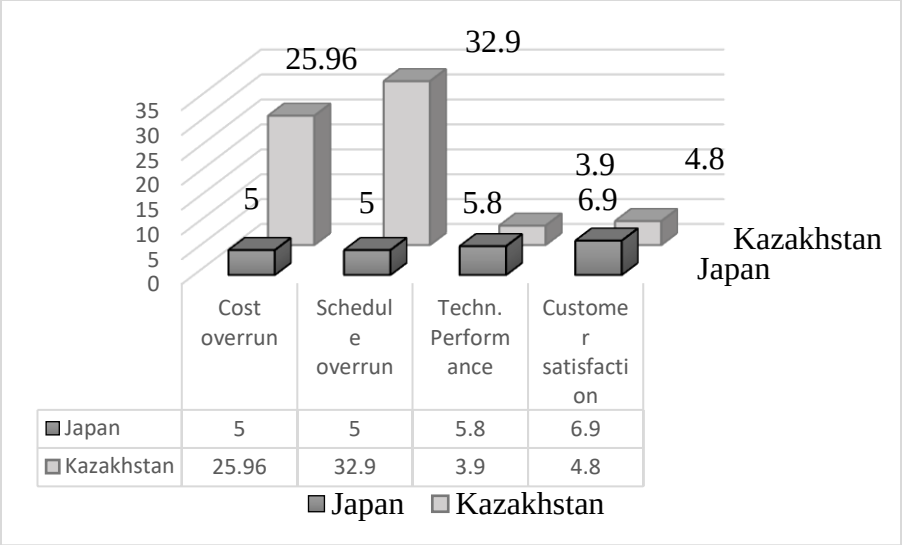

FIGURE 2
PROJECT SUCCESS LEVEL IN JAPAN AND KAZAKHSTAN

As depicted in Figure 2, Japan has the best results in cost overrun and schedule overrun. Japanese projects` cost overrun probably 5 times lower than Kazakhstani. Japanese high-tech projects schedule overrun 6 times lower. It may be influence of specific Japanese culture, where managers pay significant attention to scheduling. Also it may be result of spending more efforts on cost and time planning. Because authors revealed high correlation between performing planning processes and projects` success dimensions. Kazakh managers show bad results on cost budgeting and time management. They spend more money and time for project execution. It may be result of result of lack of experience and professional managers, lack of conditions for high-tech industries development.

As depicted in the Figure 2, Japan show highest level of technical performance and customer satisfaction. Interesting finding is that Kazakhstani results are not so far from Japanese. Managers of representative of developing countries pay more attention on better technical performance of projects through spending more money and time what reflects in cost overrun

and time overrun. Moreover, they focus on customers` needs. This finding help to prove the idea, which assume that developing countries` projects complete with worst success outcome. There are may be several reasons as lack of experience and qualified project managers or spending less effort to perform planning processes and low level of organizational support. Farther study focuses on project managers` planning performance for clarify this question.

Project Managers' Planning Performance

Data gathered from project managers about using intensity of planning processes gives total vision about projects` planning quality in three country. Also data analysis presents which project knowledge areas often performed by each country`s project managers. This information depicted in Table 2.

Table 2
PERFORMING PLANNING PROCESSES IN JAPAN AND KAZAKHSTAN

№	Planning processes	PMPQ index/Japan (n=83)	PMPQ index/Kazakhstan (n=100)	P-values
1	Activity definition	3.7	3.6	0.001**
2	Staff acquisition	3.3	3.3	0.015*
3	Project plan development	3.7	3.6	0.021*
4	Resource planning	3.5	3.2	0.022*
5	Activity duration estimating	4.0	3.8	0.035*
6	Scope planning	3.9	3.6	0.072
7	Procurement planning	2.9	2.9	0.350
8	Organizational planning	3.7	3.3	0.256
9	Risk management planning	2.8	2.5	0.491
10	Quality planning	3.0	2.6	0.450
11	Activity sequencing	3.6	3.3	0.372
12	Schedule development	4.1	3.8	0.312
13	Scope definition	3.8	3.2	0.125
14	Cost budgeting	3.4	3.3	0.198
15	Communication planning	2.9	2.6	0.001**
16	Cost estimating	4.1	3.7	0.001**

Note: *$p \leq 0.05$; **$p \leq 0.01$ (statistically significant).

Table 2 shows differences between two countries in performing planning processes. Project managers from Japan perform cost estimating, cost budgeting, schedule, quality and communication processes intensively than Kazakhstan. These findings explain best results of Japanese projects during measuring two success dimensions as cost and schedule overrun. Japanese managers perform communication and quality planning processes better than Kazakhstani. Japan exceeds Kazakhstan in many points as developed country. But there are few processes which intensively used by developing countries project managers. For example, procurement planning at the same level. Scope management is not so far from Japanese results.

CONCLUSION

Research question of this study asked:

1. What are the level of high-tech project success in developing countries?
2. What are the critical project management knowledge areas that affect to high-tech projects success in developing countries?
3. What are the critical processes performed by local managers affect to project success in developing countries?

Results show that managers from developing and developed countries run similar projects with different planning quality and success level. Moreover, study reveals significant positive relation between extent of using planning processes and project success. Success dimensions of developing countries quite lower than in developed countries. For example, Japanese managers pay significant attention to time and cost scheduling and have better results than Kazakhstani managers. Kazakh managers show worst result in cost overrun (25.96%) and low results in schedule overrun (32.9%), which impacted by low extent of use cost and time planning processes. It may be result of specific national culture, which describe Kazakh managers as don`t focused on time management. Moreover, Kazakhstan is developing country that may be limited by its economy and human resources development. So, Low level of high-tech projects` success in developing countries may be result of lowest level of organizational support, lack of experience and undeveloped infrastructure that may support management of local high-tech projects.

Extent of use planning processes are not much differs between two countries, but has different level in use intensity of specific processes. For example, data analysis reveals that scope, cost and time processes more often performed than communication, risk and quality by two countries` managers. The reason of this may be that scope, cost and time are items of "*golden triangle*" and most common used knowledge areas in project management. Therefore, project managers may often use these processes, because they are well known.

Critical knowledge areas for high-tech project success in developing countries as Kazakhstan are project integration and scope management, communications management, risk and quality management. Japanese managers much exceed Kazakhstani by extent of using communication and quality planning processes. These two knowledge areas often used by Japanese project managers than Kazakhstani, due to the fact that Japanese national culture well-known by its quality management and high focus on teamwork which supposed to good communication skills.

The next critical processes performed by local managers have sufficient influence on high-tech project success: using project management software, existence of project based enterprise, supportive organizational structure, support on planning and using new tools. Performing these processes by project managers ensures high-tech entrepreneurship development. Because successful projects may bring a lot of benefits to entrepreneurs. These benefits may consist high level of profit, good image and new customers.

Results of the study help to conclude that developing countries lag behind developed countries in high-tech project management and project success level. Therefore, such countries should investigate experience of developed countries that achieve a success in high-tech entrepreneurship. In addition, the study reveals major factors that directly affect to success dimensions. They are connected with using modern software tools, risk and quality management

technics. Results of the study show that good project management can be a critical factor for successful entrepreneurship.

Developing countries should try to be open to innovations that ensure development of business in general. The establishment of innovative infrastructure and high qualified human resources may support high-tech entrepreneurship in developing countries.

Limitations are that research focuses only on planning quality and doesn`t cover all phases of project management. Findings may elaborated to future research linked with another project management processes. The study considers analysis of two countries, and may be expanded by adding additional countries in the future.

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