Business value of IT in competitiveness of Kazakhstan's energy sector: the role of international oil and gas companies in sustainable development of the local industry

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INTRODUCTION

Countries place great emphasis on industrial competitiveness, due to its importance in creating jobs and growth, and therefore pivotal for the prosperity of a country and its citizens. Industrial competitiveness refers to "a country's specific industry's ability to be able to provide the need to meet product demand to the international market and gain profits continuously, by its more advanced capacity and production efficiency compared with other countries in the free trade international market" (Zhao and Wen (2004) in Zhang and London, 2013). Industrial competitiveness also indicates the capacity of the country to support the development of businesses, and is especially important for small and medium-sized companies (SMEs), the backbone of each economy.

Nowadays, as the oil and gas (O&G) industry faces the prospect of a long-term low-price environment, management teams within their organisations are looking beyond short-term tactics and taking more proactive and strategic approach. In addition, new technologies in fields such as robotics, the Internet of Things (IoT) and Everything (IoE), 3-D printing, material science, autonomous vehicles emerge, disrupt the existing industry value chains and entirely change the way in which companies operate in many industries, including oil and gas. Harnessing new technologies is essential in enhancing operational excellence of the companies in the new O&G market dynamics, as these companies now have the opportunity to achieve further efficiencies through adopting new technologies. This is especially important for the energy sector in Kazakhstan in connection with Kazakhstan's accession to WTO as it will put more pressure on the local energy sector through increasing competition with global players.

Information technology has been acknowledged as a strategic resource and potential for competitive advantage for the organisations by many researchers (Barney, 1991; Clemons and Row, 1991). From this stream of works has emerged the widely accepted conclusion that IT

can be used to create a competitive advantage by increasing organisations' bargaining power and through efficiency improvements (Bakos and Treacy, 1986; King and Gover, 1991). Judged by a topic search of articles published in major journals, research on IT in most transition countries are sparse (Roztocki and Weistroffer, 2008). In particular, limited research is available on the contribution of IT technologies in the competitiveness of Kazakh energy sector and especially on the role which international oil and gas companies can play in creating spillovers into the IT industry.

We have found one case study (Gartner, 2011) on ICT in the IOC in Kazakhstan. This study refers to the establishment and operation of a shared IT service for an international consortium operated by the North Caspian Operating Company formed in 2009 to exploit a huge new Kashagan oil field. The consortium was formed between seven independent IOC (see Figure 1 below). The consortium operating new model assumed that each entity would implement its own processes and systems in order to maximise performance. Parent companies planned to establish their IT systems in Kazakhstan and find ways to share the information between members of the consortium. This would have meant effectively having several independent IT systems. An additional challenge was to build the culture of cooperation and trust between members of the ICT teams from different entities who continued to be competitors for other projects. At the same time, there was a clear business need to set up the IT system in the shortest time. As a result of discussions with stakeholders, a shared-service model was proposed as a solution for ICT organisations design. To the best of our knowledge there is no research on the level of ICT adoption in the O&G industry in Kazakhstan. In order to evaluate business value of IT in competitiveness of Kazakhstan energy sector additional research needs to be conducted.

Insert Figure 1 about here

This paper has aim to fill this gap. The theoretical contribution of this research will be first, development and adaptation of a model of private-public collaboration in the oil and gas cluster; second, in addition to the theoretical framework presented, we will draw an empirical evidence from Kazakhstan's current energy sector's level of ICT adoption and develop recommendation to the policy-makers how IOC can create technological spillovers into ICT industry.

LITERATURE REVIEW

Business value of IT, competitiveness and local content development

Strategic management focuses on the understanding sources of organisation's sustainable competitive advantages. According to Porter (1985), competitive advantage is characterised by low cost, differentiation and sustainability. European Commission (2016) defines industrial competitiveness as on one side "the ability of companies to compete in domestic and global markets" and on the other side the capacity of countries to support the development of the business and is a key determinant for growth and jobs and especially very important for small and medium-sized companies.

The most influential theory of the business strategy that can be applied to the circumstances of the oil and gas industry is the theory of clusters developed by Porter (1998) as a microeconomic basis of the theory of the local competitiveness put in a global economy. This theory explains that oil and gas companies tends to develop in the industry clusters. This term has been introduced in the management literature by Porter (1990, 1998) as key to industrial competitiveness and emphasized the importance of firm links with its supply chain and research. He originally defined clusters as "a geographical group of interconnected companies and associated institutions in a particular field, linked by similarities and complementarities" (Porter, 1998). More recent definition of clusters given by Möhring (2005, p.29) consider cluster as "an agglomeration of vertically and/or horizontally linked firms operating in the same line of business in conjunction with supporting institutions". Porter suggests that cluster is a new way of organisation of national, state and local economies and assume new roles of business, government and other institution to enhance competitiveness (Porter, 2000).

Advantages of clusters are based on external economies or interactions between businesses, industries and other institutions, where the formal and informal organisational mechanisms and cultural standards often play their role in operation and development of clusters (Alexandros and Metaxas, 2016). This is because clusters are actually combination of competition and cooperation between companies. Repeated interactions and informal contacts within the clusters that comes from work and life in one geographic area, promote trust and

communications, while decrease the cost of disruption and recombination of relations of markets (Delgado, Porter & Stern, 2011).

In each market, there is an initial supply split between domestic and foreign producers, depending on the relative import competitiveness of the domestic producers. The competitiveness of the local information technology industry can be improved if the oil and gas sector invest in this industry. At some certain stage of the domestic industry development it only can be done by enacting a regulatory policy. Local content policies is an industrial tool that can enable domestic producers to expand their activities, at least partially with domestic inputs, and gain access to international technological and managerial expertise… [in order to] enhance their competitiveness" (Kalyuzhnova et al, 2016). Industrial policy can be defined as strategic efforts of a government to encourage structural changes and development leading to fostering competitiveness via grows in manufacturing and related services sector (Aiginger, 2007).

Kazakhstan has intensively used local content policies since 2010 until the agreement on WTO accession has been signed in 2015. One of the conditions for WTO accession is abandoning performance measurements, including local content requirements. Kazakhstan will be able to use local content requirements for existing contract until 2021 and after this only some local content requirements in employment and procurement, particularly for services, but not for goods. Therefore rise the question, how Kazakhstan can in future stimulate international exchange in technology in order to enhance the competitiveness of the local economy?

Let's consider first how ICT technologies in general can help companies to generate competitiveness and increase local content. Generation and sustaining competitive advantages resides in the set of strategic resources and capabilities available to the organisation. Information and knowledge resources are particularly significant and arguably the most important among these (Drucker, 1993). Alignment between strategy and IT is a key factor in realising value from IT investments. This concept was formulated by Henderson and Venkatraman (1999) with the development of a strategic alignment model. The model is based on two assumptions: first, that economic performance is directly related to the ability of management to build a strategic fit between the strategic position of the organisation and an appropriate administrative structure; second, that strategic alignment is not static, but a process of continuous change. The Strategic Alignment Model specifies integration between business

and IT at strategic and operational levels (Figure 2 below). IT-Business alignment model describe process of inter-company alignment between IT and organisational strategy.

Insert Figure 2 about here

What actually is the business value of IT? Although many journal papers, conference papers and books have been published on the subject of IT evaluation, only a relatively small set of these publications have been concerned with the core issue of what precisely is meant by the term "value" (Nicolian et all, 2015). Business value of information technologies refers to the connection between IT investment and performance. Studies at the firm level have demonstrated that the impact of IT investment on firm performance is significant and positive (Kohli and Devaraj 2003; Melville et al. 2007). In one of the most-cited papers on this topic, Melville et al. (2004) define the business value of IT as "the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts" (p. 287). They also reveal the existence of two formulations of performance, i.e. efficiency and effectiveness, where efficiency includes internal performance metrics, and effectiveness includes organisational objectives toward improvement of a firm's external environment. Kohli and Grover (2008) have defined the business value of IT as the ability to improve access to information and therefore the ability to improve quality of information in order to generate value from it.

The challenge in defining IT business value is the difficulty in measuring the multiplicity of different factors. That is why also quality dimensions has been added to measure the impact of the IT function on an organisation. Later, authors such as Melville et al (2004), Marshall et al (2005), Ashurst et al (2008) and Ward and Daniel (2012) have developed theoretical models that explain the interconnections between IT and business value (see Table 1 below). In recent times, companies also share resources and make IT investments together. In this case IT is used as an instrument of business value co-creation (Kohli and Grover, 2008).

Insert Table 1 about here

What is the interconnection between IT and local content development? According to the "Local content management framework" (2004) – an Agip Kazakhstan North Caspian Operating Company NV, or Agip KCO (since January 2009 - North Caspian Operating Company BV, or NCOC) an internal document – managers of the company see a number of potential barriers related to local content development. First of all weak domestic skills and/or supplier base - low domestic capacity levels, which are insufficient to meet business needs, in particular:

- Lack of appropriate technical skills base in labour force
- Inadequate or outdated equipment
- Weak technology base, i.e. limited IT infrastructure
- Lack of understanding international tender processes
- Insufficient awareness or poor practice on HSE
- Inadequate knowledge of international commercial practices on HSE
- Inadequate knowledge of international commercial practices e.g. financing etc.
- Imports law

ICT sector in Kazakhstan is currently undeveloped in comparison with some other transition economies (see Table 2 below). As a result, demand for ICT goods and services is mostly covered by imports. The share of local content is especially low for IT equipment and amounted only 3% in 2010. For IT services, which often considered to be more local, the share of local content is only 30% (Government of Kazakhstan, 2010). In the Programme, the Government has set ambitious aims to achieve a share of local content to 10% in equipment and 80% in services by 2014. Reaching these targets requires developing infrastructure, as well as a number of policy changes, including improving business environment and skills development.

Insert Table 2 about here

Recent researches on local content demonstrate that local content policy has positive effect on local economy and, for instance, strongly associates to firm competitiveness and decision on export and LCP also may foster firm competitiveness under a set of conditions (Azhgaliyeva et al, 2016). This demonstrate us that ICT can play role of barrier not only in local content development, but also in competitiveness of Kazakhstan's oil and gas companies and the whole energy sector. Therefore, raise the question, how the level of ICT adoption in the energy sector can be effectively measured?

RESEARCH SETTINGS AND METHOD

Energy value network in Kazakhstan

Energy sector plays extremely important role in the Kazakhstan's economy as it has significant oil and gas reserves and abundant on its natural resources. The petroleum and mining industries accounted 33% of GDP in 2010 and 82% of exports. Kazakhstan has more than 200 oil and gas fields around the Caspian Sea with total production in 2013 at 81.8 million tons. The biggest exploration fields are Tengiz, Kashagan and Karachaganak with approximately 86% of Kazakhstan's oil production (see Table 3 below). There are also there major oil refineries (Karatayev and Clarke, 2016).

Insert Table 3 about here

The empirical study and methodology

The empirical research in our paper will use the conceptual model of IT business value based on the Strategic Alignment Model between business and IT, developed by Henderson & Venkatraman (1993) and Melville at al. (2004) and adopted by the authors to the circumstances of the oil and gas industry in the form of evaluation model and 5-levels model of ICT adoption for measuring business value of IT, both developed by the authors as a theoretical framework for testing in the circumstances of Kazakhstan.

The research questions in our paper are as follows:

- to what extent ICT is adopted in the energy sector of Kazakhstan and how it is used
- to what extent ICT is adopted in energy value network: within each company and between companies and sectors
- what are possible spillovers between O&G and IT sectors and potentials for companies to improve competitiveness by creating inter-industrial clusters

Our hypothesis is that the level of ICT adoption in Kazakhstan O&G sector is between level 2 and 3 for big consortiums and between level 1 and 2 for the rest of the sector and that competitiveness of the O&G industry in Kazakhstan can be significantly improved by further ICT adoption in local oil and gas SMEs sector.

Research methodology combines interviews and secondary data collection (review of policies and data on ICT expenditures). The purpose of the empirical study is to describe the level of ICT adoption in the oil and gas sector in Kazakhstan. We conducted 10 semi-structured interviews with the top-managers from the O&G sector: 3 interviews with large companies and 7 interviews with companies from different parts of the O&G value network (oilfield service companies, refineries, drilling, manufacturing, and transportation). Interviews were conducted in 2016 in Kazakhstan.

The empirical data in this paper was collected from the 60-minutes interviews with IT top-managers and industry experts of the organisations from Kazakhstan's oil and gas value chain (see Table 4 below). The interviews were conducting with a mixture of top management personnel within different types of the oil and gas organisations, such as chief information officer of the oil and gas company, number of managers and engineers, managing director of the oil services industry SME, dean of the information technology department of the leading oil and gas University, director of IT consulting department of the major international consulting company and managers of the National oil and gas research institute. These selection of interviewees represent top-level experts from the energy sector and we believe that with our sample size we have achieved theoretical saturation, which is according to Guest et al. (2006) occurs at the point in data collection and analysis when new information produces little of no change to the data (Guest et al, 2006). According to recommendations given by

qualitative methodologists, the number of interviews for phenomenological studies ranges from six to 10, whereas for case studies at least three to six sources of evidence are recommended (Marshall et al. 2015). Based on the review of published articles, Marshall et al (2015) have proposed a number of fifteen to thirty interviews for single case studies in information system. We stopped our interviews at tenth person as no new themes emerged anymore and we believe that theoretical saturation has been achieved. This can be explained by the fact that all out interviewees are top experts in oil and gas information technologies and can share exclusively rich information about the industry.

The interview format was semi-structured and used open-ended questions, questions which were developed from the literature. The interviews provide primary data on the level of ICT adoption in Kazakhstan O&G sector.

Insert Table 4 about here

Procurement data supplied by NOC KMG was collected from the website www.kmg.kz/en/kaz_content/. These data were analysed by 30-digit nomenclature code ("ENS TRU") developed for public procurement purposes by public institutions of the Republic of Kazakhstan for planning, accounting and analysis of purchasing processes available from www.entsu.kz.

We analysed IT goods and services procurement of the NOC KMG using the first two digits of a nomenclature code – 26 "Computers, electronic and optic goods", second two digits of a nomenclature code – 20 "Computers and equipment" and services first two digits of a nomenclature code – 62 "Information technologies services, computer systems and networks". Since 2015 nomenclature code 3299 – Licences for IT programmes.

DATA ANALYSIS AND RESULTS

Interviews shows that that level of ICT adoption in Kazakhstan's energy sector depends on the size and type of company.

Business value of IT for SMEs (early stage of ICT adoption)

Our findings shows that ICT is relatively undeveloped in Kazakhstan and especially in small and medium enterprises (SMEs) the level of adoption is very low (level one). The main gaps are lack of financial resources for investments in ICT equipment and services, which leads to lack of modern technologies, as well as skills gaps. The reason why SMEs cannot get financial resources is inability to provide an evidence of long-term financial stability and ability to pay the loan back.

For example, one of the interviewees was recently working as a managing director for the national machinery building plant which has been producing equipment for the oil and gas industry in Kazakhstan for more than 20 years. The company is one of the ten leading machinery plants in Kazakhstan, and currently employs about 200 peoples but there is no one responsible for IT. The main initiative in the company is regulatory compliance, namely product certification according to international standards. The organization has no informal or formal ICT or digitization strategy. ICT is not used to increase efficiency, reliability, or keeps costs low (no ERP). Nor is it used in customer services or product innovation (no CRM system). The only ICT technologies available are hardware (computers with installed applications such as operative system and office solutions (company sometimes use illegal copies of programmes) and basic accounting programme. There are no plans to implement new technologies, nor any strategic plans. New technologies such as cloud and mobile are not available. The reason is that there is limited availability of such services even from major national telecom companies, namely Kazakhtelecom. The overall level of ICT adoption in the organisation corresponds to level 1 in the five-level ICT adoption model, as activities and processes are not even defined by individual managers, but one person who has personal pace to ICT and management procedures, and controls are not established. This corresponds to the definition of the level 1 of ICT adoption is 5-levels model: „efficiency of processes is chosen by individual managers who do just anything to get the job done, without systematic methods of selection".

Developing of oil and gas SMEs would benefit the economy of Kazakhstan directly through new job creation and also indirectly through productivity growth and foreign direct investments attraction. Adoption of ICT by local oil and gas SMEs in Kazakhstan would also affect the economy in an indirect way through increasing labour productivity, capital investments in ICT infrastructure and equipment and overall competitiveness of the oil and gas sector.

Business value of IT for national oil and gas company (middle stage of ICT adoption)

On the other hand, national oil and gas company (KazMunayGas or KMG), and research institutes, have a higher level of ICT adoption (level two) with international oil and gas companies adopting ICT at level three.

Kazakhstan's NOC KMG is owned by the National Welfare Fund "Samruk-Kazyna" (which is actually is a group of state owned companies), a sovereign wealth fund and joint stock company in Kazakhstan. "Samruk-Kazyna" also owns, either in whole or in part, many major companies in the country, including the national rail and postal service, the telecommunication company Kazakhtelecom, the state uranium company Kazatomprom, Air Astana, as well as numerous financial groups. The state is the sole shareholder of the fund. The IT services for KMG are provided by NWF "Samruk-Kazyna". In 2015, "Samruk-Kazyna" started a project on business and IT transformation. The main idea behind is to redesign business processes and to align the ICT strategy with business strategy and to transform the ICT function if the organisation from service provider to the partner for the business. At the moment, the level of ICT technologies does not allow a business to develop its full potential, i.e. not only just to save costs but also to generate income and develop new businesses. The reason is that managers view ICT technologies as a cost-generating service. Management still does not pay enough attention to ICT, innovation or digitalisation. For example, until recent times there was no position of Chief Information Offices in the C-teams of group companies (apart from Kazakhtelecom and Air Astana), i.e. there was no CIO position in KMG (he was appointed in March 2014 only). If there is no representative of the ICT department at C-level it is very difficult for ICT to become a business partner. There was an IT director position before, responsible for IT operations. In a contrast, in organisations CIO is responsible for ICT as a strategy: innovations, digitalization and how ICT as a driver of a business.

The IT Transformation Team (TT) in "Samruk-Kazyna" includes the following departments: Business processes, IT, Change Management and Project Management. In KMG it accounts for more than 100 people and is built from the best representatives of the operational departments in order to transform business from the inside. Since their appointment, members of TT work only on transformation and not on operational tasks. In "Samruk-Kazyna" there was no IT architect job before, now in the transformation teams a minimum of five architect jobs has been created: application architect, data architect, infrastructure and security architect, processes architect and head of IT as chief architect. The problem here is that there are no

specialists in Kazakhstan in the areas such as data governance or master data management. “Samruk-Kazyna” has hired specialists from Russia, who transfer knowledge from previous project, such as Lukoil and Gazprom in Russian oil and gas industry. “Samruk-Kazyna” has also established an IT academy where IT specialists can fill gaps in knowledge in the area of IT processes, corporate governance in IT, project management, data management and business architecture management. Unfortunately, an IT academy cannot solve all problems. The main challenge here is that universities is Kazakhstan educate IT specialists with no focus on business needs. According to our interviewee, ICT specialist who is currently working for a major international oil and gas company and made an internship at her future employer but “the internship was too short, only one month and in this period of time she could not get sufficient practical information but only general knowledge about her potential working place”. She suggested that such internship should be a minimum of 6 months in order to get more professionally-focused knowledge. “Samruk-Kazyna” has contacted major Kazakhstani universities with proposals on how to adjust their educational programmes to business needs. Thirty students have made 3-month summer practice in six transformations teams in “Samruk-Kazyna” in 2015. In 2016, more summer internships are expected. Professional development standards have been developed in order to describe a career pass for IT specialists, i.e. how the IT staff can progress in their career and which training and certification have to be undertaken and on which career stage. The transformation team in “Samruk-Kazyna” also organises workshops on business and IT strategy alignment and IT courses in the IT Academy at corporate University at “Samruk-Kazyna”.

On the other hand, if we analyse IT expenses (see Tables 5 and 6 below), we can see that it looks more like ICT in KMG create expenses than drive value, because company procures mostly hardware and less is spent on the implementation of ERP, CRM and BI systems which have existed as technology already for decades and on new technologies such as cloud, mobile and big data which can really have impact on business. The problem is that KMG still don’t understand how these newer technologies can be integrated in to their business-models and therefore effects which it gives. From our point of view the described above situations corresponds to the level 2 on the 5-level model of ICT adoption: “Basic management processes and controls are established in order to track progress, and the necessary discipline is in place to repeat early success. As businesses become more mature they begin to conceptualise processes and seek to organise and repeat business processes and measure results”.

Insert Table 5 about here

Insert Table 6 about here

Business value of IT for international oil and gas company (highest level of ICT adoption)

International oil and gas companies operating in Kazakhstan have the most developed level of IT in the whole oil and gas value network in Kazakhstan. For example, Richfit Information Technology Company Limited (Richfit) is the wholly-owned subsidiary of the China National Petroleum Corporation (CNPC), number 4 in the global top 50 oil companies, and number 5 on the Fortune 500 list, which provides IT services mainly for CNPC International. These includes 12 companies in Kazakhstan: PetroKazakhstan, CNPC-AktobeMunaiGas, MangystauMunaiGas etc. as well as for some other Chinese companies such as for example Sinopec Corporation (9 companies in Kazakhstan) and Sinooil (down-stream operations) mostly in Kazakhstan and Central Asia. Richfit also participates in some IT projects in Africa, Venezuela and Russia but Kazakhstan is the one of priority markets for SNPC: it is the closest geographically, and where the highest number of foreign entities are owned.

Richfit supplies information construction plans, information technology consulting, information technology support and technical service business for the petroleum industry and large enterprises and public institutions. The total number of employees in the headquarters in China is 3000 and Richfit International in Kazakhstan accounts for about 50 employees. The company has carried out its business activities in Kazakhstan for three years. Business activities include outsourcing and implementation of ERP systems, outsourcing of IT services, infrastructure outsourcing, and implementation of IT solutions developed by the headquarters in China (office automation systems, digital control systems, production of own temperature and pressure sensors for these systems).

According to the managing director of Redcliff, their customers have different levels of IT adoption. This level depends on the historical pass of these organisations. There are advanced companies from the IT development standpoint, and there are also other companies where IT does not exists, and where it is only possible to speak about basic technologies. Often customers even do not know what IT services do they have and so they do not have any ideas about what and how to implement further. In the more advanced companies from Kazakhstani perspective, the focus is on ERP, but even ERPs does not exist in all these companies. There is also interest in rigs maintenance, and repair automation as well as rigs industrial automatization, and timely data transmission. The aim is real-time data transmission but if there is no automatization of this process companies transmit data manually, often on a daily basis, but sometimes in extreme cases on a weekly basis.

According to the expert's opinion about 30 percent of oil and gas companies in Kazakhstan have a relatively high level of ICT adoption and 60 percent low and 10 percent – very low and in the top segment (upper 30 percent). Oil and gas companies in Kazakhstan spend only 1.5 percent of their revenue on IT, and since the oil price downturn - not more than 1 percent. In most companies ICT function report to CFO, so that still there is no CIO position at the C-level. In CNPC about 20 percent of the IT budget is spent on innovations and 80 percent on maintenance.

When taking decisions on budget, in most of cases IT departments act as drivers of innovations. Technologies such as Internet of Things and Cloud Computing are being adopted by the company. For example, CNPC has recently built the largest single-enterprise ("private") cloud data centre in Asia. The reason for this was that the operating environment with hundreds of IT applications became too complex and lacked the ability to perform its critical functions and it was necessary to integrate the architectures so that company could centrally manage services. Richfit also can use the cloud facilities from China and they already have customers in Kazakhstan who use CNPC's cloud.

According to our expert, only 10 percent of energy companies in Kazakhstan use new IT technologies such as cloud and internet of things. Richfit can offer to customers from Kazakhstan its cloud facilities in China and Dubai, but the constraints on use modern technologies is general low level of IT adoption in Kazakhstan and also the legislation restricting on personal and some other data to keep outside of Kazakhstan. The Chinese National Petroleum Corporation as many other private and government organisations is paying

close attention to cyber security and therefore decided not to use vendor solutions for its cloud services but to build own one.

The level of ICT adoption in international oil and gas companies from our point of view corresponds to the level 3 of 5-levels model: "The processes are documented, standardised, and integrated within an organisation-wide methodology. While processes are documented and standardised, managers' targets are only loosely linked to process outputs".

DISCUSSION

Optimising business value of IT for competitiveness of Kazakhstan's energy sector: a conceptual framework for creating business value from IT in the oil and gas sector

According to our empirical data, the level of ICT adoption in Kazakhstan's energy sector varies depending on the type of the organisation (SME, national companies an international oil and gas companies which can be qualified as multinational-national organisations) with the very low level of adoption by SMEs, medium level by national companies and highest level of adoption by multinational companies operating in the Kazakhstani energy sector. This is a predictable result taking into consideration technology transfer within MNEs from technologically advanced countries such as US, China and the UK. The Russian MNEs are also more technologically developed than local Kazakhstani oil and gas companies due to the historical origin of the Kazakhstani energy sector as a part of the former soviet oil and gas industry, with a centre of competences in the territory of the Russian Federation. NOC KMG has recently started an ambitious IT and business processes transformation project which is financed by the Kazakhstan's state, although the local content in the IT products and services procured by NOC KMG remains very low, so that it does not use the full potential which can be created by the energy sector for the IT sectors of the economy. But SMEs didn't get enough attention or resources from the state and policymakers to be able to develop their level of ICT technologies. Where can these companies seek knowledge and resources in order to develop their ICT adoption? How can policy makers use the potential of MNEs in order to strength the domestic SME sector?

Contemporary view on the value-creation process propose that it is created when actors apply resources and integrate with other actors. Value-creation process involve different stakeholders

who form network in which resources are integrated and applied through interaction (Gummeson and Mele, 2010, Vagro and Lusch, 2011, Jaakkola and Hakanen, 2013). Therefore, our policy advice to the government is to engage the international oil and gas companies in the development of local oil and gas industry and incentivise them to undertake such activities. According to Porter (2005), economic development is a collaborative process involving governments at multiple levels, companies, teaching and research institutions, and institution on collaboration. This aim can be achieved by seeding industrial clusters – "geographic concentrations of interconnected companies and institutions in a particular field" (Porter, 1998). Rugman and Verbeke (2003) have extended Porter's framework to include the role of MNEs in the process of knowledge generation within localised clusters.

The most well-known oil and gas clusters are two regions in the North Sea oil and gas province: the Stavanger region in Norway and the Aberdeen in Scotland, as well as Houston cluster in the USA. Such agglomerations can include not only drilling, exploration and service companies, but also transport, including maritime, catering, information technology providers and other services. The development of local technological and industrial capabilities can follow different paths in the different locations and are characterised by very different local innovation system. But the available evidence suggests that outcomes have been similar along significant dimensions of industry performance so that they do not appear to have led to significantly different levels of international competitiveness (Hatakenaka et al, 2011). Clusters should include not only international and national oil and gas companies and SMEs, but also governmental and other institutions – such as universities, think tanks, agencies and associations which provide supportive functions – such as training, education, research and information.

According to Cumbers (2000), Aberdeen became an important centre of expertise and knowledge within the international oil and gas industry where the products, services and processes were first developed and tested in the North Sea before they have found new markets overseas. This also resulted in spin-off effects through new firm start-ups. However, while there is some evidence of indigenous firms being involved in niche areas of offshore technology developments. The connections between foreign oil companies and local economy remains limited. No major oil company or contractor made Aberdeen its head-office and in the new growing projects such as Brazil, UK local forms are unable to translate it into global advantage. The mission of the cluster is therefore to provide a link between industry, universities and government with the latter as a facilitator of the business environment where

business can develop and increase its competitiveness. One of the aims of the cluster is to support GDP growth both organically and through new investments.

Scandinavian countries such as Norway have succeeded in developing specific know-how linked to their natural resources, and have become a producers of machinery, technology and consulting services related to the different stages of the oil and gas value chain (Meller, 2008). To achieve this they created links between the private sector, universities and public bodies to develop knowledge clusters (De Ferranti, 2002). However, it is important to foster a more collaborative culture in such clusters, as research shows that extent of collaboration between SMEs can be low. Their activity should be not only embedded within local context but also plugged into more global knowledge pipelines and networks. The most dynamic firms are able to capitalise on the local support environment, but also to access non-local sources of information and knowledge about new developments and processes in their markets (Marchese and Potter, 2011).

According to UNCTAD (2010) the business linkage represent one of the best ways for SMEs to enhance their competitiveness and acquire critical assets such as access to international markets, finance, technology, management skills and specialised knowledge. We propose that policymakers in Kazakhstan consider the possibility of seeding an inter-industrial oil and gas-information technology cluster which will focus the activity on the transfer of technological expertise from international oil and gas companies to the local industry and also foster information technology education and products development. Initial endowments can be given by international oil and gas companies operating in Kazakhstan. In order to incentivise oil and gas companies the government may choose to consider a tax incentive for endowments to the cluster. Location can be a critical success-factor for a cluster location and so it should provide easy access to the qualified personnel, as information technology is a knowledge-intensive industry. This type of collaboration includes relationships between ICT provider, NOC, IOC and SME, as well as government as an initiator of new technology implementation and bank as a guarantor of funding. Process of IT-business alignment between oil and gas companies and IT provider can be represented as follows:

The empirical findings above form the basis for the conceptual framework (Figure 3 below), showing the public-private partnership in the oil and gas cluster:

1 – Government impose local content policies as it has aim to develop local industry. It also may provide guarantees to SME or ICT provider (Marchese and Potter, 2011). Government

define tax legislation. Our empirical data confirm inability of SMEs to proof their long-term financial stability and ability to pay a loan (Authors).

2 and 8 – Lack of financial resources for investments in ICT equipment and services (Authors). Bank provides financial support to ICT provider for infrastructure investment and operational needs (Marchese and Potter, 2011).

3 – Government provides special tax regime for ICT provider. In order to set-up knowledge clusters, appropriate incentives would have to be coordinated, financed and provided (Meller, 2008).

4, 5 and 6 – ICT provider delivers services to different companies of the oil and gas cluster: SMEs, IOC and NOC. Value of ICT to users may rise due to network externalities from a community of users. Thus, one firm's ICT investment could increase the productivity of others, this means a classical spillover effect (Lee and Guo, 2004, August).

7 – Government participates in NOC. State participation in the oil and gas sector via NOC provides the government with better control along the value chain. Presence of NOC benefits overall efficiency levels in the industry and thus improve value creation (Tordo et al., 2011).

9 – IOC set-up ICT provider and transfer knowledge and know-how. Acquiring ICT technologies through foreign investments is another opportunity to develop technology (Meller, 2008).

The framework extends the knowledge about how organisations can cooperate in order to create value from ICT in the oil and gas industry. Such cooperation is only feasible if government participate in this collaboration. This relationships can be interpreted in terms of improvement of competitiveness of the organisations participating in it by reducing some of the administrative costs and transferring of technologies and know how. This supposed to results in the local industry development. The conceptual framework provides better understanding of the mechanisms for maximising private and public benefits of sustainability by creating value from IT. This study contributes to previous theory by application of the business-IT alignment framework, theory of competitiveness, cooperation and knowledge transfer in clusters to the development of the local oil and gas industry.

Insert Figure 3 about here

FUTURE RESEARCH AND LIMITATIONS

Or study helped to understand how information technologies can create value in the oil and gas industry. However this study is not without limitations. The study is confined to one industry in one country. In order to improve generalisability of our findings we are going to test our framework in the setting of the other oil and gas rich country. These case studies will be the scope of the upcoming research in Kuwait oil and gas industry.

CONCLUSIONS

With the digital revolution, the ICT industry has started to play a crucial role in the economies of all countries. The advantage of cloud computing technologies is that they allow implementation of standard services in the number of companies in a short period of time, and timely to react on business strategy changes. For example, if we want to implement a human resource solution in 100 separate companies it could take years, however, with cloud solution it can be done in months.

In emerging resource-rich countries it is important to use the wealth created by the energy sector to boost the domestic ICT industry. The key challenge here is that many developing countries have no financial resources of their own to invest in the domestic oil and gas industry, and so they have to attract foreign direct investments in order to develop their oil and gas reserves. Because international oil and gas companies tend to use global procurement opportunities, also in relation to ICT procurement, these expenditures create low knowledge spillovers in the national economy, and therefore create inequalities in the distribution of oil and gas wealth between host and home countries. That is why effort from state are necessary in order to develop local industry.

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APPENDICES

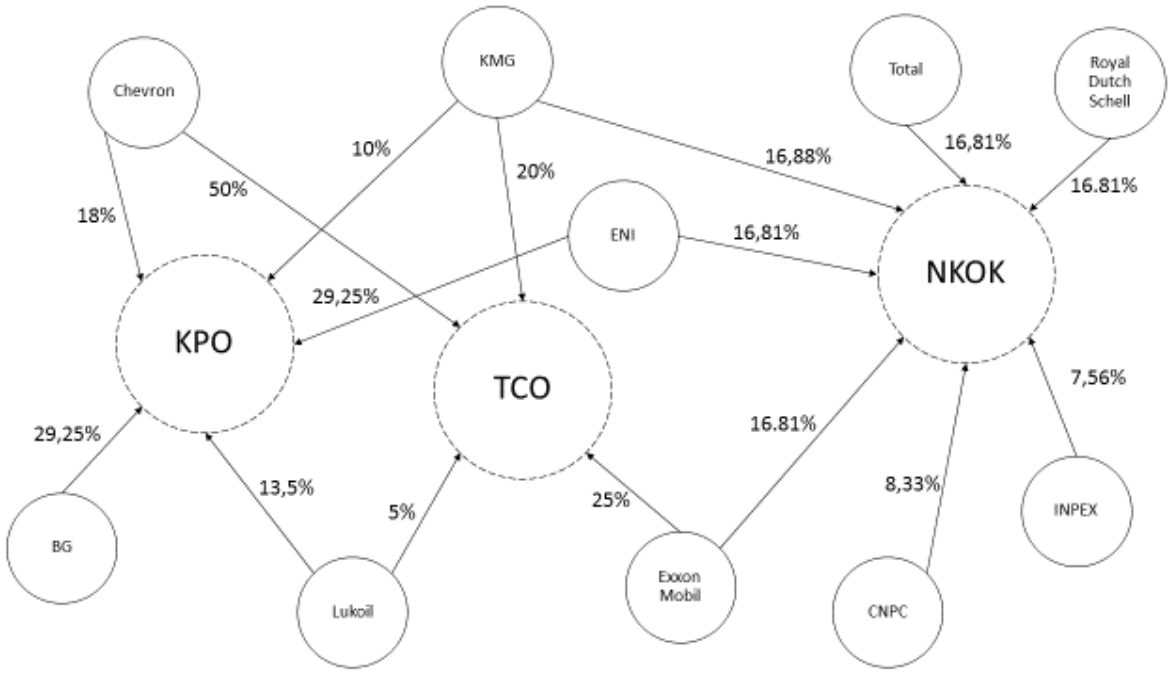

Figure 1. Network of IOCs and NOC KMG in major projects in Kazakhstan[1]. Percentage reflects the share of the individual company in each project. Source: Authors.

[1] Note: Abbreviation of consortiums: KPO - Karachaganak Petroleum Operating BV, TCO – Tengizchevroil, NCOC - North Caspian Operating Company. Abbreviations of O&G companies: KMG – KazMunaiGas, BG – British Gas.

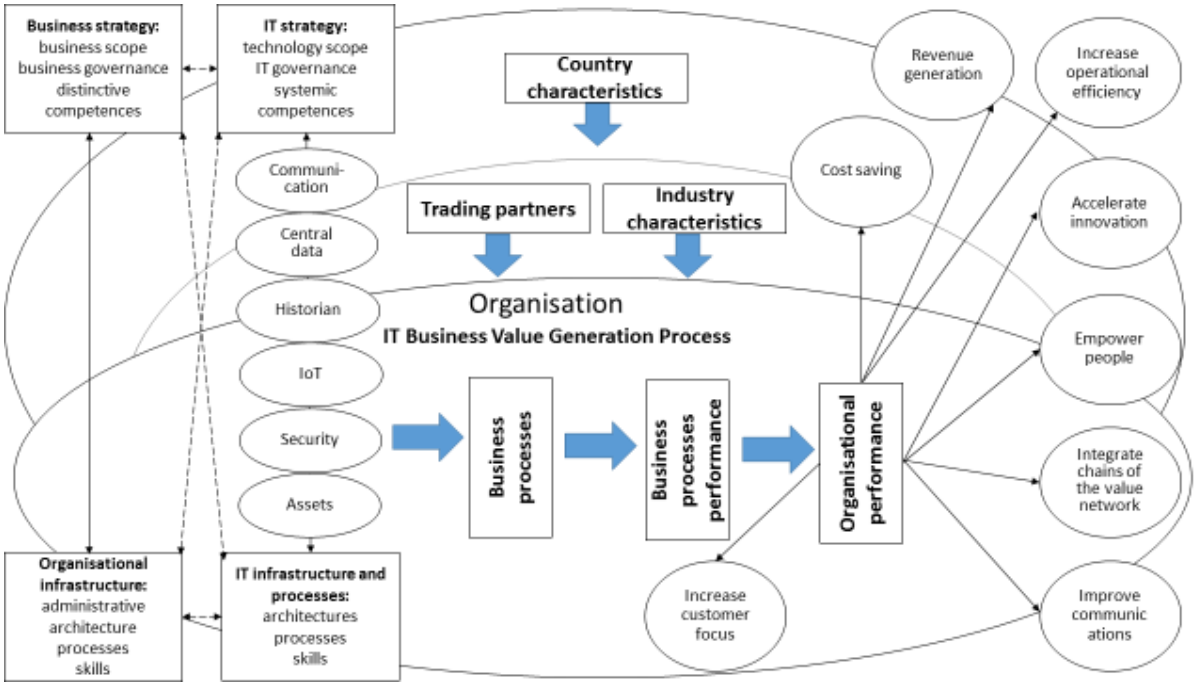

Figure 2. Business-IT valuation model (BIV-model) for oil and gas industry based on Strategic Alignment Model and Resource-Based View on the organisation adopted to the circumstances of the oil and gas industry. Source: Authors, based on Henderson & Venkatraman (1993) and Melville at al. (2004).

Table 1. Theoretical models tracing the pass from IT investments to business value.

Approach	Hypothesis	Indicative literature
Process view, provide an explanation for how IT create business value	IT value is delivered in increments, and each phase of the IT value proposition creates an intermediate outcome. IT value creation comprises of three major processes: IT conversion, IT use and competitive forces.	Markus and Soh (1995)
	Revision of the previous model by adding the IT-business strategy alignment process at the beginning of the IT value creation cycle. IT expenditures need to be liked back to the	Marshall et all (2007)

	business strategy and business requirements in order to generate business benefits.	
	Process-driven model comprising of five major steps: identifying the objectives for investment, planning the realisation, execution, reviewing and evaluating the results, establishing the potential for further benefits.	Ward and Daniel (2006) Ward and Daniel (2012)
Variance view, Explain why IT business value occurs and what variables moderate that outcome	Measurement of the effectiveness of organisational information use, comprising of three dimensions: information technology practices, information management practices and information behaviours and values which are linked to the organisational performance through information orientation.	Marchand and et al (2000)
Hybrid models, Combine both process and variance view	Extent and dimensions of business value of IT depends on external and internal factors, including complimentary organisational resources of the firm and its trading partners, as well as the competitive and macro environment. The model comprises three domains: focus firm, competitive environment and macro environment.	Melville et al (2004)

Source: Compiled from Nicolian et al (2015).

Table 2. Share of ICT goods as percentage of total merchandise trade, annual 2010-2014.

Country/Year	2010	2011	2012	2013	2014
Czech Republic	15	15	14	13	14
Hungary	25	21	17	15	12
Kazakhstan	0.05	0.14	0.44	0.33	0.84
Russian Federation	0.22	0.24	0.31	0.42	0.80
Ukraine	1.07	0.89	1.10	0.93	0.96

Source: Author, adapted from UNCTADstat.
http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx

Table 3. Kazakhstan major upstream projects running by consortiums of O&G companies.

Project	Developers	Participants
Karachaganak	Karachaganak Petroleum Operating BV (KPO)	BG Group 29.25% Eni 29.25% Chevron 18% Lukoil 13.5% KazMunaiGas (KMG) 10%
Tengiz	Tengizchevroil (TCO)	Chevron (50%) Lukoil (5%) ExxonMobil (25%) KMG (20%)
Kashagan	North Caspian Operating Company (NCOC)	China National Petroleum Corporation (CNPC) 8.33% KazMunaiGas (KMG) 16.88% Eni 16.81% Royal Dutch Shell (RDC) 16.81% ExxonMobil (EM) 16.81% Total 16.81% INPEX Corporation 7.56%

Source: Author, adopted from BMI Research (2015).

Table 4. List of interviews.

N	Interviewee's role	Company's type	Interviewee's type
1	Manager	National Oil and Gas research institute	Industry expert
2	Dean of the Faculty of Information Technologies	National Oil and Gas university	Industry expert
3	Managing director	Local O&G services SME	O&G local
4	Director	International IT company	Industry expert
5	Managing Director	International consortium	O&G International
6	Director, IT Consulting	International company	Industry expert
7	ICT Engineer	International consortium	O&G International
8	ICT Director Kazakhstan	International consortium	O&G International
9	Manager	National Oil and Gas research institute	Industry expert
1o	Chief Information Officer	National Oil and Gas research institute	Industry expert

Source: Authors.

Table 5. Plan of IT procurement of NOC KMG.

Year	Goods, Thousands Tenge	Local content, %	Services*, Thousands Tenge	Local content, %	IT programmes, Thousands Tenge	Local content, %
2015	309,906	1	1,581,034	96	117,354	0
2014	2,189,805	0	1,904,774	93	575,960	0
2013	157,314	0	963,468	84	314,730	0

2012	103,679	1	1,668,169	83	2,260,453	12

Source: Authors, compilation from www.kmg.kz/procurement

* Prices are not available for all positions

Table 6. IT procurement of NOC KMG by type of goods.

Type of goods	2012	2013	2014	2015
Notebooks	381		32,844	32,254
Admission system			63,123	
Server	1,568		855,811	3,826
Computer	6,639		10,394	22,273
Workstation		49,383	271,834	34,760
Printer		11,952	93,956	
Keyboard			134	
Printer	672		93,956	77,223
Scanner			14,515	6,362
Plotter				22,294
Monitor				4,888
Cartridge	3,146		0	1,391
Mouse			90	
Projector			1,351	76
Fax			46	129
Printer and copy machine			94,095	
Hard-disk			1,449	332
Disk-set		68,638	742,982	
Hard-disk external			504	
USB	3,904	880	2,323	1,610
Proximity card			220	157
Driver			92	
Shredder	157		120	810

Uninterruptible power supply	85,913	532,224	2,425	97,220
Module of printing and copy machine			179	
Proxy RFID		248	1,313	328
Information leakage protection device	880			
Interactive whiteboard				3,640
Robotic tape libraries		25,681		
Total:	103,679	157,314	2,178,857	309,906

Source: Authors.

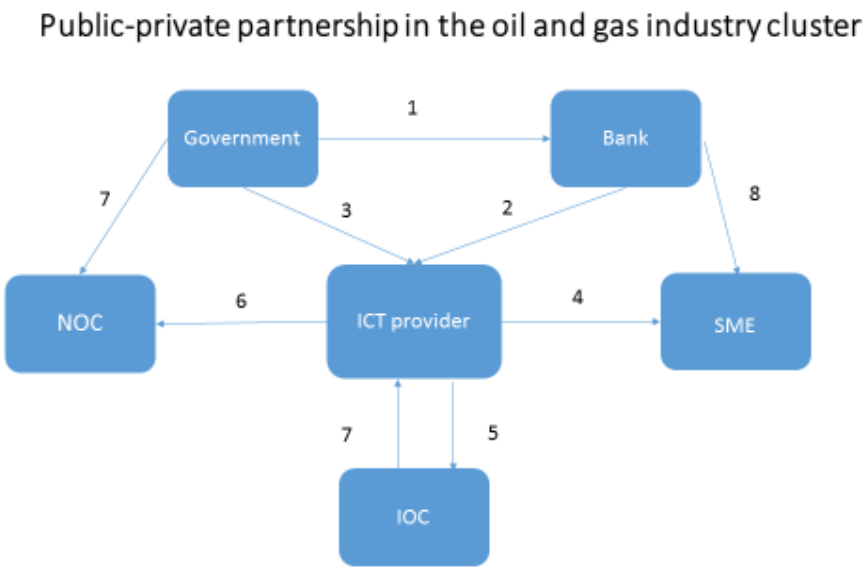

Figure 3. IT collaboration in the oil and gas industry cluster.