Effect of Real Option Approach Investment in the Information Technology

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Abstract

This article describes the investment in Information Technologies (IT) which will be assessed using real option analysis. The role of Information Technologies has become irreplaceable for run of all companies in any area of industry nowadays. It is almost impossible to run a prosperous company without IT gadgets, such as telephone, computer software and hardware and the like. Whether the investments in ICT were done in the right measure and as economical as possible, with regard to the increasing rate of economic crisis, can be evaluated by several ways. One of the methods is evaluation of investments using real option approach.

Key words: Real option approach, Information Technologies, investment

JEL Classification: G00

1 Introduction

The investment in Information and Communication Technology (ICT) has been the most dynamically increasing investment in late 1990s and early 2000s. With the lasting world-wide economic crisis, investments in ICT became the key factor for the managers to think about other ways how to increase the efficiency of production of the company as well as looking for other ways of promotion of products at the markets using some kinds of ICT.

2 State of the Art in the IT Sector Development

IT sector provides companies with a lot of investment opportunities, either in IT products, services or stock of IT companies. Those opportunities can bring revenues to the company that invested in them or they can ensure technological or IT advantage in comparison to the company's competition. But wrong assessment of investment opportunities can seriously damaged company or it can also totally destroy the company. This is why the present situation in IT sector must be analysed and considered.

Information technologies (IT) have been the driving force of economic changes for more than a decade. IT sectors contribute to technological progress, output and productivity growth. The impacts of the IT sector can be seen in various area of economy such as its contribution to output,

employment or productivity growth, or as a source of technological change affecting other parts of the economy.
The IT sector was in recession during the economic crisis in 2008 and 2009 as well as other sectors of economy. This sector is recovering from this crisis and the outlook for IT production and markets is brighter than in 2008, 2009. IT growth in OECD countries went down by over 6 % in 2009 due to the weak macroeconomic conditions, stagnation of business and consumer assortment. World IT spending fell by 4 % in 2009 but it is expected to grow in the following years (OECD Factbook, 2010).

The IT sector in the OECD countries has had consistent growth over the long term. It represented more than 8 % of OECD business value added and this sector employed almost 16 million people in 2008. OECD IT manufacturing has declined overall with the global restructuring of production, but countries with strong value added in IT manufacturing maintain a comparative advantage and export surpluses in IT goods. In 2008, Korea, Finland, Ireland, Japan, Hungary, Sweden, the Slovak Republic, Germany, the Czech Republic, the USA and Mexico were the OECD countries with the largest shares of IT manufacturing value added in total value added. Out of these, ten had a revealed comparative advantage in IT goods exports and 9 had export surpluses (OECD Factbook, 2010).

Performances in the IT sector differ markedly as IT production and markets moved to non-OECD countries. Since IT manufacturing has moved to lower-cost locations in OECD countries and Asian economies, the OECD -area IT sector has sifted to computer and related services and other IT services. These services account for more than 2/3 of total IT sector value added in most countries. Their share has increased and they have grown more rapidly than total business services. The share of OECD countries on the IT world market was 76 % in 2009 which meant a decrease from 84 % in 2003 (OECD Factbook, 2010).

Worldwide IT trade has returned to growth following the very sharp decline from the last half of 2008 through the first quarter of 2009. Before the economic crisis, global IT trade expanded strongly and contributed to grow through 2008. It approached 4 trillion USD in 2008 (it had tripled since 1996 and it had almost doubled in 2000). The peak of the share of IT trade in total world merchandise trade was at 18 % in 2000 (OECD Factbook, 2010).

It fell to 12.5 % in 2008 due to the slowdown in IT trade, stronger growth of world trade in non-IT products and price effects. The OECD share of total IT trade dropped from 71 % in 1996 to 53 % in 2008. China is by far the largest exporter of IT goods, very largely driven by foreign investment and sourcing arrangements. India is the largest exporter of computer and information services (OECD Factbook, 2010).

IT systems enable more sustainable production and consumption across the economy, ranging from product-specific improvements to entire systems. Following the recession IT policies are helping to foster economic recovery. Most government responses to the economic crisis include measures targeting the IT sector and promoting IT-based innovation, diffusion and use.

2.1 Top 10 IT companies
After the change in classification of two of the largest IT companies, IBM and Fujitsu from “IT equipment and systems” to “IT services”, four out of the top 10 IT services companies (Tab. 1)

rank in the ICT top 50. Revenues of the top 10 IT services specialist companies amounted to 250 billion USD in 2009. These companies employed more than 1.1 million people and earned net profit of more than 15 billion USD (OECD Factbook, 2010).

Among the top 10 services companies, SAIC and Fujitsu, increased their revenue and employment of people in 2009 in comparison to the situation in 2008. Atos origin and Cap Gemini suffered the largest drop in revenues, at around 14 % and 10 %, they are followed by companies such as IBM, Accenture and Tech Data with 8 % per each company (OECD Factbook, 2010).

Tab. 1 Top 10 IT services companies, 2009 (in million USD and number of employed) (OECD Factbook, 2010)

Name of the company	Country	Revenue (2009)	Number of employed people (2009)	R&D (2009)	Net income (2009)
IBM	US	95 759	399 409	5 820	13 425
Fujitsu	Japan	46 337	173 653	2 477	917
Accenture	Ireland	23 171	177 000	-	1 590
Tech Data	US	22 100	8 000	-	180
Computer Sciences Corporation	US	16 004	92 000	-	940
Cap Gemini	France	11 497	90 516	-	244
SAIC	US	10 846	46 100	-	497
Automatic Data Processing	US	8 790	45 000	493	1 655
First Data	US	8 811	26 600	-	-3 764
Atos Origin	France	7 041	49 036	-	44

2.2 IT goods

The IT goods sector started to rebound strongly from early 2009 in exporting Asian countries, led by Korea. In Europe, Canada and the USA declines were relatively less sharp, of the order of -10 % to - 20 % year on year, but the rebound has been sluggish and most of these countries have not yet shown signs of significant improvement. Growth in some is still declining year on year (Fig. 1) (OECD Factbook, 2010).

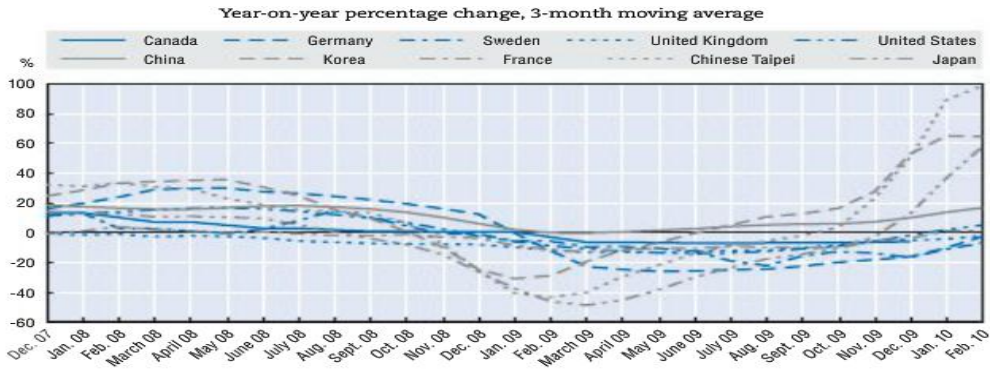

Fig. 1 Growth in monthly output in IT goods, December 2007 - February 2010 (OECD Factbook, 2010)

The IT goods supply side was hit hard at the end of 2008 and in the beginning of 2009, whereas production was collapsing in many countries, mostly in OECD exporters Japan and Korea as well

as Chinese Taipei. IT goods growth dropped below zero in the beginning of 2009 even in China (OECD Factbook, 2010).

Early in the recession the IT goods-producing sector performed better than the car-producing industry. In many countries it performed even better, or at least not worse than manufacturing as a whole, with exception of Korea and Japan (OECD Factbook, 2010).

Japan's IT equipment and electronics goods inventories peaked in early 2009 and then ran down very rapidly as production was cut. However, growth in inventories was positive again in the first quarter of 2010, a sign of weakening markets and supply-side expansion (OECD Factbook, 2010).

Computers equipment is the largest part of OECD IT goods trade, accounting for around 25 % of the total trade. The USA, the Netherlands and Germany are the biggest OECD exporters. Japan, the United Kingdom and the USA have all experienced dropping exports since the middle 1990s. Korea, Ireland, Mexico, the Czech Republic are large exporters. Hungary and the Czech Republic are experiencing very high export growth rates. The Netherlands, Korea, Ireland, the Czech Republic and Hungary had a positive net trade balance in 2008. Korea experienced the largest trade surplus. The United States of America had the largest deficit (Fig. 2) (OECD Factbook, 2010).

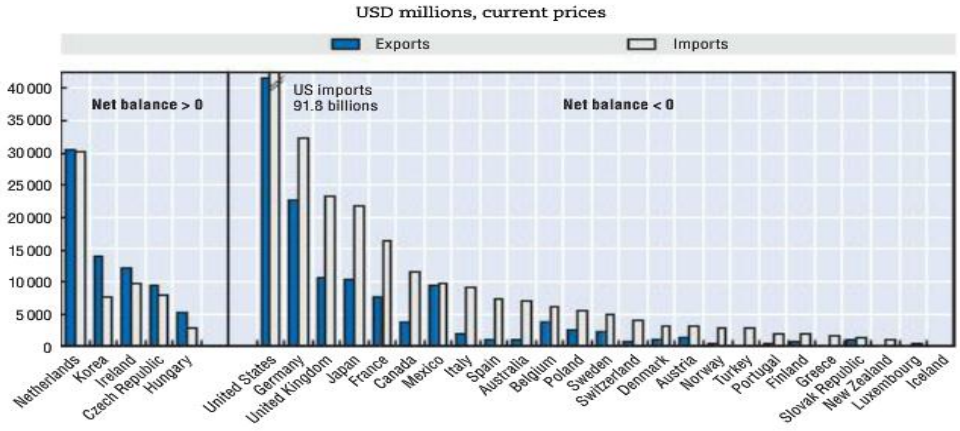

Fig. 2 OECD computer equipment trade, 2008 (OECD Factbook, 2010)

2.3 IT employment

IT sector employment has significant share on the total employment in industry. This sector employed 16 million people in the OECD countries in 2008 or 5.8 % of total OECD business sector employment (Fig.3) (OECD Factbook, 2010). The sector's long-term growth in 1995 and 2008 has been more than 1.2 % per year that was almost a half a percentage higher than total business employment growth.

The largest shares of IT employment in total business employment were in Finland and Sweden (around 8 %). This IT employment in Luxembourg in 2008 doubled in comparison to 1995 whereas employment in Canada, Austria and Ireland in 2008 decreased in comparison to 1995 (OECD Factbook, 2010).

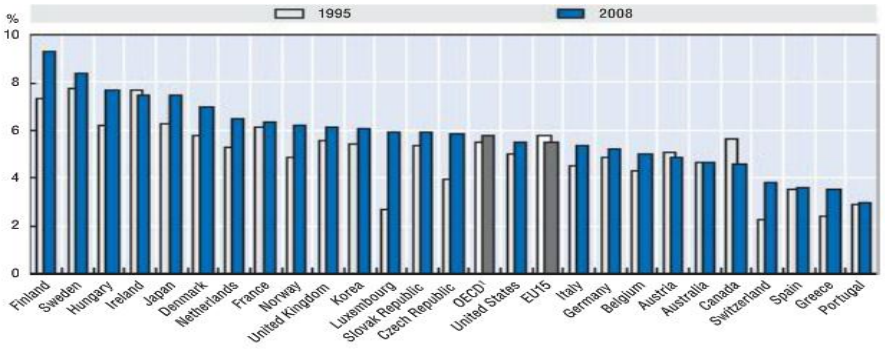

Fig. 3 Share of IT employment in business sector employment, 1995 and 2008 (OECD Factbook, 2010)

In the United States IT sector employment presented more than 30 % of total OECD IT sector employment in 2008, followed by Japan which share was 19 % and Germany 8 % (Fig. 4) (OECD Factbook, 2010).

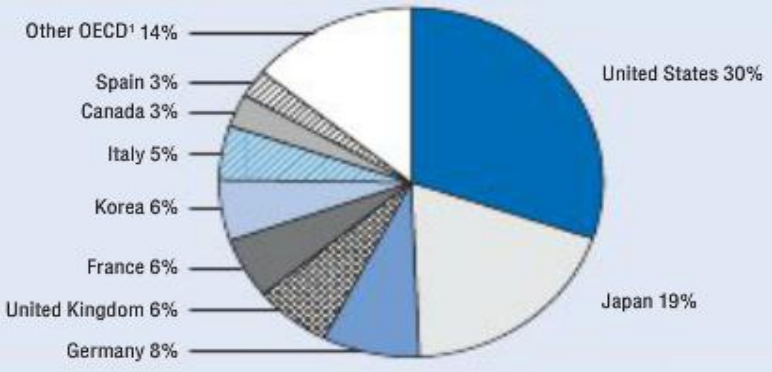

Fig. 4 Share of OECD IT employment by country 2008 (OECD Factbook, 2010)

More than 11 million people are employed in IT services in the OECD countries whereas 5 million people are employed in manufacturing. From 1995 to 2008, employment in computer, computer related and IT services has grown faster than business services as a whole (OECD Factbook, 2010).

In the time period from 1995 to 2008, the IT share in value added has increased in all OECD countries except Austria (-1.3%), Australia and Canada (-0.8% both). In 2010, IT employment (IT specialists) accounted for between 1.7% (Turkey) and 5.4% (Sweden) of total employment of the OECD countries. Over 1995-2010, this share has been rising in most countries, despite the stagnation of employment in the IT sector (OECD Factbook, 2010).

The broader group of IT-using occupations (specialists, advanced and basic users) accounts for over 20% of total employment in most countries, ranging from 10.9% (Turkey) and 35.3% (Luxembourg) (OECD Factbook, 2010).

3 Investments in the Information Technologies

Investment in information technology (IT) was the most dynamic component of investment in the late 1990s and early 2000s. This investment enabled new technologies to enter the production process, to expand and renew the capital stock, and to sustain economic growth. It becomes a very difficult task for the policy makers of an organization to decide about the investments in IT. There can be two possibilities (Götze,U. - Northcott, D. - Schuster, 2008):

1.) Wait for the new advanced version to be launched: This version of IT is at much cheaper price than the present one but by the time a decision is made regarding the investment in IT a further advanced version of IT is about to be released. Thus there is another postponement in the investment. This process goes on and investment in IT never materializes.

2.) The policy makers of the organization decided to implement any available version of IT: The managers in the organization instantly invest in any version of released IT in the market at the huge prevailing cost. But soon they realize that whatever they have bought has become obsolete and has become a liability.

The above-mentioned features that investing in IT must be done after a thorough thinking about the situation and IT devices market by the competent policy makers. It is also unconditionally important for the policy makers of the organization to be either IT literate persons or if they are not, they should discuss the issue with people who are adept at IT area (Götze,U. - Northcott, D. - Schuster, 2008).

3.1 Connection between Technology, Investment & Business

It is impossible or at least rather difficult for companies and organizations to survive at global market without having the latest technology. Technology is the tool through which a business is going to grow. Thus we find that there is direct relation among the three.

1.) Technology
2.) Investment
3.) Business

Technology is the major driving force behind the globalization of production and changes in the patterns of business and investment. Investment is seen as a vector of production, technology and business expertise. Business, on the other hand, is seen both as a cause and consequence of increased investment and technological development. The connection between technology, investment and business is shown in Fig. 5 (Götze,U. - Northcott, D. - Schuster, 2008).

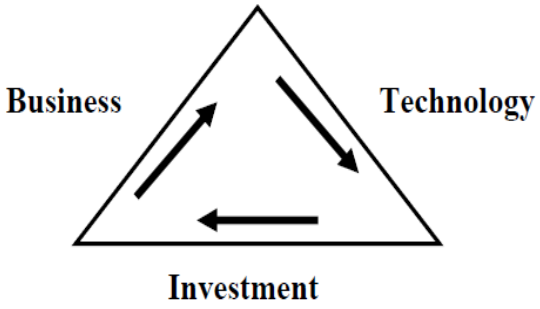

Fig. 5 Connection between technology, investment and business

Based on the past experience, it can be said that out of 500 companies which were there in 1918 only10% of them survived for more than 50 years. Statistics show that 50% of all the new organizations, which are established, go out of business within five years.

When the reasons of the going out of the business are analyzed, the conclusion is that the inability of the companies to adapt to a fast changing environment and the lack of resources causes this fact. Companies have to face the challenge of new technologies, new products, changing tastes of customers and it puts pressure on them (Götze,U. - Northcott, D. - Schuster, 2008).

One of those threatens to companies is technology. Sometimes, technological changes take place so radically as to constitute a „technological discontinuity", a sharp break in industrial practice that either enhances or destroys the competence of firms in an industry.

4 The Real Option Approach and Evaluation of IT Using Real Option Approach

Real options analysis is a valuation and strategic decision paradigm that applies financial option theory to real assets. Stewart Myers (1987) first referred to the term in a discussion about the gap between strategic planning and finance theory. DCF analysis, developed from finance theory, made sense when applied to businesses such as 'cash cows'. However the discontinuities associated with today's business (Götze,U. - Northcott, D. - Schuster, 2008).

Environment is putting limitations on the life of businesses such as these and therefore the DCF techniques used to analyses them. Risk can also be leveraged to create rather than suppress value. Hedges can protect investments from downside risks while an exposure is maintained to any upside potential. Real options offer a framework and the metrics for managing strategy, value and risk in today's business environment.

Organizations will typically invest in projects that generate a return greater than a hurdle rate. Hurdle rates can, however, often be observed at three to four times the cost of capital (Dixit and Pindyck, 1994). One explanation is the implied option value, or opportunity cost associated with a capital investment. Rather than the investment decision being that (discounted) cash inflows must equal or exceed (discounted) cash outflows as per the NPV (Net Present Value) rule, the investment's cash inflows must exceed the cash outflows by the value of keeping open any optionality in the investment (Götze,U. - Northcott, D. - Schuster, 2008).

If a decision is made to proceed with an irreversible investment the opportunity to delay the investment is forfeited, and so the rights to any option implied in the investment are exercised. This opportunity cost should therefore be included in the valuation of an investment.
The NPV rule should therefore be revised by subtracting the opportunity cost of exercising any options, and then invest if the modified NPV is positive. The alternative is to keep the conventional NPV and the option value distinct. The investment framework can therefore include two identified value components, the NPV and the real option value. A strategic NPV can therefore be defined as (Trigeorgis, 1996):

Strategic NPV = standard NPV + option premium The modified NPV rule is now to invest if the strategic NPV is greater than zero.

The approach that has been described for assessing the effects of risk, for the most part, are focused on the negative effects of risk. Put another way, they are all focused on the downside of risk and they miss the opportunity component that provides the upside.
The real options approach is the only one that gives prominence to the upside potential for risk, based on the argument that uncertainty can sometimes be a source of additional value, especially to those who are poised to take advantage of it.

Real options is a comprehensive and integrated solution (using the financial theory, economic analysis, management science, decision sciences, statistics, and econometric modelling) to apply options theory to value real investment projects to improve the decision making process. Dynamic and uncertain business environment requires flexible business decision approaches in order to evaluate business opportunities (Götze,U. - Northcott, D. - Schuster, 2008).

The greater the complexity a project, the more useful the Real Option Approach becomes, with high-level of volatility in incomes and costs and best fits to complicated structures where decision-making processes will take a long period of time.

4.1 The reasons why a company should use the real option approach to evaluate investment in IT technologies

Strategic planning needs flexible and dynamic approaches. Present Value calculations are needed as a check on strategy analysis and vice versa; however, standard discounted cash flow techniques will tend to understate the option value attached to growing profitable lines of business. Decisions about innovation initiatives could require dealing with real options.

This approach is not always necessary, some decisions are not complicated (the investment is either an incredibly valuable one or a total disaster) so real options analysis is not really useful, unless, nothing will change this result (Götze,U. - Northcott, D. - Schuster, 2008).

Traditional tools, as DCF, work well when there are no significant options and/or uncertain is very little. On the other hand, real options analysis could be useful in the following situations:

- **When there is a contingent investment decision. There is no other approach that can correctly value this kind of chance.**
- **When uncertainty is large enough so that it is sensible to wait for more information, this way avoiding regret for irreversible investments.**
- **When the value seems to be captured in possibilities for future growth options rather than current cash flow.**
- **When there will be project updates and mid-course strategy corrections.**

5 Conclusions

This paper deals with the survey of IT technologies, investment in the IT, characteristics of investment projects, the description of real option approach. Investing in real options is a way to preserve flexibility for the future. Options enable learning so that an academic institution can act more quickly later. They provide a way to build capacity now for opportunities that may emerge (or may be bigger) in the future.

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