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School of Industrial Engineering and Management

**Creating risk measurement model to project
portfolio management in construction company**

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ABSTRACT

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This thesis was carried out as a case study of a company YIT in order to clarify the severest risks for the company and to build a method for project portfolio evaluation. The target organization creates new living environment by constructing residential buildings, business premises, infrastructure and entire areas worth for EUR 1.9 billion in the year 2013. Company has noted project portfolio management needs more information about the structure of project portfolio and possible influences of market shock situation. With interviews have been evaluated risks with biggest influence and most appropriate metrics to examine.

The major risks for the company were evaluated by interviewing the executive staff. At the same time, the most appropriate risk metrics were considered. At the moment sales risk was estimated to have biggest impact on company's business. Therefore project portfolio evaluation model was created and three different scenarios for company's future were created in order to identify the scale of possible market shock situation. The created model is tested with public and descriptive figures of YIT in a one-year-long market shock and the impact on different metrics was evaluated. Study was conducted using constructive research methodology. Results indicate that company has notable sales risk in certain sections of business portfolio.

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Tässä työssä tutkittiin case-yritys YIT:n projektiportfolion hallintaan liittyviä riskejä urakointi- ja omaperustaisen rakennustuotannon välillä konstruktiivisella tutkimusotteella. Kohdeyritys toimii rakennusalalla rakentamalla asuntoja, toimitiloja, infrastruktuuria ja kokonaisia alueita 1,9 miljardin liikevaihdon arvosta. Yritys on laittanut merkille tarpeen projektiportfolion rakenteen, siihen liittyvän tiedon sekä markkinoiden muutoksesta aiheutuvan kysyntävaihtelun muutoksen arviointiin.

Haastatteleamalla yrityksen konsernijohdon henkilöitä on arvioitu riskejä, joilla voi olla suurin vaikutus ja pohdittu mittareita, joilla mitata näitä riskejä. Haastattelujen kautta saadun tiedon avulla luodulla analysointimallilla simuloidaan vuoden mittaista markkinashokkia yrityksen liiketoiminnassa ja vaikutusta useisiin yrityksen tunnuslukuihin kolmessa eri skenaariossa käyttäen julkisia ja kuvainnollisia lukuja. Tulokset osoittavat, että yrityksen nykyinen myyntiriski on huomioonotettavan suuruinen tietyissä liiketoimintaportfolion osissa. Tästä syystä arvioidaan tasapainottavan liiketoiminnan tarvetta.

PREFACE

This thesis was made when I was working as a Master's Thesis worker in YIT during spring and summer 2014.

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LIST OF ABBREVIATIONS:

BS	Balance sheet
CEE	Central Eastern Europe
CF	Cash flow
Contr	Contracting business
Dev	Development business
EBIT	Earnings Before Interest and Taxes
ERM	Enterprise Risk Management
FIN	Finland
GDP	Gross Domestic Product
IB-DEBT	Interest Bearing Debt
NPV	Net Present Value
P/L	Profit and loss account
ROI	Return On Investment
RUS	Russia
SVA	Shareholder Value Analysis
YIT	Yleinen Insinööritoimisto
VBM	Value Based Management

1 INTRODUCTION

1.1 Background

This thesis is done in purpose to clarify strategic risks which may occur due to changing business environment in multi-project environment and would affect a construction company's financial position and assess these risks in order to estimate their financial effect. Project portfolio management demands suitable model for risk level assessment. Case company has hundreds of ongoing projects in different phases and stages of completion and success of sales of these projects is crucial to company's financial position. Also almost every product inside residential building projects is unique in some extent. The risk profile of the construction and project development business differs from other industries. Risks and also opportunities lie between those hundreds of projects every year. Comparing to other industries typical factors for construction projects are shorter order backlog, smaller capital tied up, lower fixed cost and lower operating margins. Development projects, in turn, may require remarkable capital investments in search for higher margins. Obviously, construction industry in general includes many operational and project management level risks but this research focuses on project portfolio level. Previous research of project portfolio management mainly focuses on business which includes less variables and portfolio consists of ingredients which can be estimated more easily. For example investment portfolio may consist of invisible securities which can be estimated with normal investment evaluation methods such as the most common net present value method.

1.2 Case Company – YIT

YIT creates more sustainable urban environment by building residential building-, business premises, infrastructure and entire areas. YIT is the largest residential

construction company in Finland and the largest foreign construction company in Russia. YIT is also one of the biggest commercial premises and infrastructure construction companies in Finland. YIT operates in seven countries in three geographic business areas. In 2013, the company's revenue was approximately EUR 1.9 billion. The roots of Yleinen Insinööritoimisto YIT (the General Engineering Company) go back to 1912 when company went into business. At the moment YIT is divided in two business segments which contain two business areas for housing, one business area for business premises and infra construction. Every building project is unique in some way. There are a lot of variations in project methods but two main types for different projects in construction business can be detected: development and contracting. In contracting projects company operates as contractor and therefore takes care of designing and construction is handled with own work force and/or with subcontractors. In development projects company handles also with plot investment and sales and therefore risk level is totally different with contracting projects. Also net cash flow and revenue recognition is different in various project forms. Other contractual forms are possible in construction field but these are the main lines to focus in this research.

1.3 Research problem and objectives

Based on the situation of case company the research problem of this research is defined as follows:

- What strategic risks company is facing and what risks can be measured to assess company's financial performance?
- With which method and metrics these risks can be measured?
- How project portfolio should be evaluated and managed to achieve wanted risk level?

Research focuses on finding the key risks for the company in present business environment in project portfolio management level. Furthermore differences be-

tween development and contracting projects are being evaluated to point out the influence of sales and investment risk. First objective of this research is to find out which strategic risks are essential to YIT's business. Second objective is to create a way to measure and pick up metrics for performance model to evaluate what is their financial effect. With this performance measurement one is able to assess the balance of the project portfolio of YIT.

1.4 Methods and data

Research will be executed as a constructive research based on company's research problem. In the beginning of this research current state of risk management and strategy planning in case corporation will be clarified. This is done by interviewing strategy and financial experts of YIT. With interviews the general knowledge and variance of risk awareness among corporate executives will be examined.

Based on literature review and interviews business assessment model will be created and it will be tested with descriptive data. Since beginning of this research it was held as an objective to keep this study as public and that is the reason why only descriptive and public data is being used. Performance metrics will also be chosen and results will be evaluated. This model can be used in future to estimate the business portfolio of the case company.

Constructive research is often also called a case study. Constructive research refers a research method where research problem is estimated based on predefined criteria and new contribution is being developed. Basis for constructive research can be for example a theory, algorithm or model. (Vom Brocke et al. 2013, p. 61)

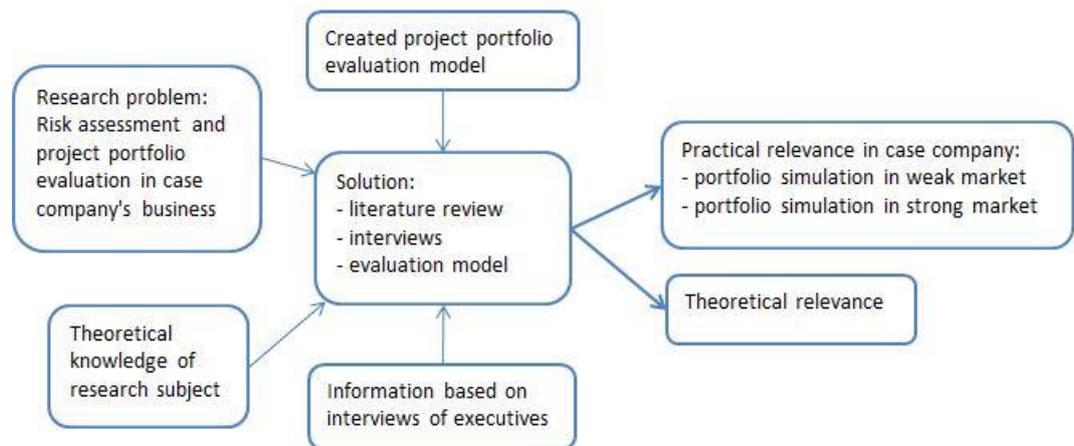


Figure 1: Structure of research

The structure of this research is based on literature review which will be conducted of risks in general and risks in construction field, project methods in construction business, performance measurement and project portfolio management. Furthermore percentage of completion as accounting method will be clarified since it is essential ingredient of the evaluation model created in this research. With interviews in case company the criteria for creation of upcoming evaluation model is being set and also it gives an insight for the present risk environment. Created evaluation model meets the requirements of case company's business such as terms in revenue recognition, sales progress and differences between divisions.

2 RISK MANAGEMENT

2.1 Defining risk

In 20th century first significant studies of risk definition were published. Very first ones were published by Willet (1901) and Leitner (1915) and these studies defined risk as a measurable uncertainty in contrast with non-measurable uncertainty which is not considered as risk, only as ignorance about future events. (Borghezi & Gaudenzi 2013, p. 5)

Traditionally concept of risk is mainly linked to the concept of unfavorable event. According to Sheehan (2010, p. 29) risks are internal and external events that will decrease revenues or increase costs, and hence negatively impact company's financial performance. Pelin (2004, p. 199) defines risk as a negative anomaly from objectives. He also mentions that actualized anomaly is no longer a risk. It is a problem which needs actions. Risk may be a feature that is represented by the consequences that may be losses or gains, depending on the situation. However risk appears to be associated with consequences that involve losses for those who take it. Still risk may lead to a positive influence. We take an example. We assume that in our business an equipment failure will influence 5 % of extra costs. This failure is, of course, an unfavorable event. Now this equipment failure occurred in our production but our costs increased only 2 %. In this scenario our failure was unfavorable event but it also included a favorable element. (Borghezi & Gaudenzi. 2013. p. 3-5)

Every business has an expected return in general. In portfolio theory Markowitz (1952, p. 89) suggests that one should replace the term "risk" with "variance of return" in portfolio management and think what kind of meaning would result. Risk level can also be understood as variance of return in portfolio management.

Different risk factors of construction industry have been listed in a research made by Hlaing et al. (2008, p. 90). There are more than fifty risk factors in total and in table 1 are presented fifteen factors considered to be most serious.

Table 1: Top 15 risk factors in construction industry (Hlaing et al. 2008)

Top 15 risk factors considered by contractors		
Rank	Risk factor	Class
1.	Lack of financial resources of the contractor	B
2.	Financial stability of the client	A
3.	Cost overruns due to delay	B
4.	Financial stability	E
5.	Shortage of resources	E
6.	Poor quality of resources	E
7.	Lack of qualified staff	B
8.	Inaccurate cost estimate	B
9.	Delay due to damaged or late materials	E
10.	Default by subcontractor/supplier	E
11.	Deficiencies in contract document	D
12.	Inaccurate time estimate	B
13.	Cancel or delay project	A
14.	Delay in presenting/addressing problems	B
15.	Fluctuation in material prices	F

Classes:

A	Client-generated risk
B	Contractor-generated risk
C	Project specific risk
D	Procurement specific risk
E	Subcontractor/supplier generated risk
F	External risks

When considering these results, must be remembered that this questionnaire was made in 2005 between construction companies operating in Singapore and applies mainly for contracting companies, although developers face similar risks through their contractors. Almost every risk presented in this table comes up from manu-

facturing process. Such factors as political instability, loss due to war, exchange rate fluctuation and changes in market environment mentioned in this research but are far behind those considered to be the most severe. Actually these business environment related factors are considered to be almost the last ones based on their seriousness. In this research and particularly in this company at the moment these factors are considered to be the ones with the biggest uncertainty. Though this previous report doesn't match with the risk environment in this investigation, it gives a good view of different risks in construction.

2.2 Risk identification

A time used in risk management is always limited. Therefore the first phase of risk management is to focus risk assessment to appropriate areas. When focus has been set to the right area of management it is possible to start identifying risks. (Pelin, 2004, p. 200)

Standard of risk management ISO 31000 states that first part of risk assessment is risk identification. The aim of this step is to generate a comprehensive list of risks based on those events that might create, enhance, prevent, degrade, accelerate, or delay the achievement of objectives. Comprehensive identification is critical, because a risk that is not identified at this stage will not be included in further analysis. (The Institute of Risk Management, 2010)

2.3 Risk classification

Pelin (2004, p. 202) classifies risks by their priority which is based on probability and meaning. From this kind of classification it is easily possible to conduct a matrix model to assess risks.

ISO 31000 does not recommend a specific risk classification system and states that every company must provide their own classification system most appropriate to the range of risks that it faces. (The Institute of Risk Management 2010)

Borghezi & Gaudenzi (2013, p. 21-23) have presented one typical, widely used and very well-known classification in figure 2. This model contains four types of risk and relevant examples of risks in every category. Risks can be divided in strategic, hazard, operational and financial risks. Despite of the classified category, risks may have strategic, operational and financial effects. Furthermore, negative risk realization seems to be a combination between these categories. From this perspective, if the Finance department is managing financial risks, Top Management strategic risks, Middle-Management operational risks and these sections will not communicate, risk management might lose its sight. For example, many types of strategic and business risks may have significant financial impacts.



Figure 2: Typical risk classification (Borghezi & Gaudenzi 2013, p. 21)

Borghezi&Gaudenzi (2013, 8) state that there is no limit for number of classifications. Further classifications are possible if they contribute to more effective risk assessment and treatment process.

According to Borghezi & Gaudenzi (2013, p. 69) key business risks may also be classified based on four macro areas:

1. Sales area
 - a. Clients risk
 - b. Responsibility for products sold
 - c. Risk from competition and export markets
2. Supply area
 - a. Suppliers risk
 - b. Commodity volatility
 - c. Capacity of supplying with the factor of production used
3. Financial source balance
 - a. Financial source balance
 - b. Interest rate trends
 - c. Exchange rate trends
4. Safety area
 - a. Safety at work
 - b. Fire and catastrophic events
 - c. Environmental disasters

2.4 Risk assessment

Risk assessment consists of recognition and ranking of risks. Therefore risks must be identified to evaluate them. Based on their seriousness risks will be classified. (The Institute of Risk Management 2010)

There are many different risk assessment models. Risk assessment model should be simple and straightforward. It should also be easily communicated through organization and it should support strategic thinking and decision making. (Hallikas et al. 2002, p. 46)

According to Hallikas et al. (2002, p. 47) risk assessment can be divided in objective and subjective risk assessment. Objective risk assessment is based on occurrences. Detailed information of these occurrences is possible to get through organization's Enterprise Resource Planning (ERP) systems. Sometimes it is possible to get information by measuring company's processes. In this case based on these observations it is possible to provide data which helps to define the probability of these occurrences. In subjective assessment research is made based on experts' evaluations. Sometimes organization's operational environment contains so much uncertainty that measurements are troublesome or even impossible to make. Therefore subjective risk assessment is based on expert's experience and outlook of organization and its operational environment. (Hallikas et al. 2002, p. 47)

2.5 Risk management perspectives

Traditionally risk management has been identified as a process, which helps company to predict and prevent risks and minimize losses which are inflicted from risks. (Engblom 2003, p 19; Suominen 2003, p. 27) According to Cleland (2004, p. 202) risk management is a technique which is used to control uncertainty. Borghezi & Gaudenzi (2013, p.11) state that despite strategy and strategic risk evaluation are done by top-management, risk management happens in all levels of organization. This derives from risk classification done by top-management: some risks are taken care of in project level. Therefore perspectives of risk management are connected with the method how company classify risks.

As stated in figure 3, risk management can be seen as a frame which includes risk assessment. Risk assessment itself includes risk identification, evaluation and classification. With these actions it is possible to find out which risks need to be managed.



Figure 3: Risk management pattern

According to Borghenzi&Gaudenzi (2013, p. 11-12, the need of risk management in business is based on Value Based Management (VBM). The purpose of VBM is to maximize value which normally is shareholder's value. Managing with a view to creating value begins with the strategy and ends with the financial results. Therefore VBM is an essential contribution for risk management process, whose objective is to protect the business from unfavorable events in order to maximize its value creation capacity. However, according to Engblom, there is no firm and univocal definition for risk management. (2003, p. 19)

Risk management can be conducted as Enterprise Risk Management (ERM). ERM is also known as Business Risk Management, strategic Risk Management and Integrated Risk Management. The major benefits of ERM are:

- Protecting and enhancing organizational value as stated in Value Based Management
- Supporting managers' decision-making processes and focusing their attention to value creation priorities

- Optimizing the cost of capital and the cost of risk
- Protecting corporate image, reputation and relationship with stakeholders

Principles of ERM are clearly stated in ISO 31000. These principles were first published in 2009 and they are now considered as a standard for the definition of risk management principles. (Borghezi & Gaudenzi 2013, p. 31-32)

Cleland (2004, p. 203) states that conducting risk management into a big picture is highly necessary because problems in risk management derive from narrow perspective. Cleland uses engineers in risk management as an example: engineers normally complete most of the job so it feels natural to let them to do the risk management. When this happens, the engineers will focus only on technical risks, forgetting market, scope, supplier and management risks that are more usual sources of business failure. As a result Cleland suggests that company should use a cross-functional team to conduct all parts of risk management. Team should be used especially in the risk identification step.

2.6 Strategic risk

Simons (2000, p. 255) defines strategic risk as an unexpected event or set of conditions that significantly reduces the ability of managers to implement their intended business strategy. In this image, business strategy is at the center point. There are three basic sources of strategic risk:

- Operations risk
- Competitive risk
- Asset impairment

Operations risk derives from the core business of the company such as consequences of a malfunction in manufacturing capability or problems in sales process. Company owns an asset due to generate future cash flow. When asset loses a

significant part of its value it becomes impaired. Therefore asset probably loses also the ability to make future cash flow. Financial impairment derives from a decline in the market value of significant balance sheet asset held for resale. For example, firms holding Russian assets found their assets impaired when the government devalued the currency in 1998. In this case, currency devaluation decreased the expected value of future cash flows. The third source of strategic risk results from changes in the competitive environment. New competitive component at the market can be new entrant or a substitute product. Competitive risk can also be attached to supplier's will to limit availability of components or customer's will to change supplier. (Simons 2000, p.256-258)

3 CONSTRUCTION PORTFOLIO MANAGEMENT

3.1 Portfolio theory

According to Modern Portfolio Theory (MPT) (Markowitz 1952, p. 77) every investor should aim to maximize return and the process of selecting a portfolio aims to maximize portfolios expected return. Since the future is not known, return must be treated as expected return. Furthermore, in portfolio selection risk is also present. Expected return can also be considered by using variance of return. Of course, portfolio with smallest variance is not necessarily the one with maximum expected return. Therefore boundaries for portfolio selection must be set. Risk perspective is also present when Markowitz (1952, p. 89) states that portfolio should be diversified. Investment decision maker can modify the risk level by diversifying portfolio by choosing various assets.

There has been a constant controversy about the concept of risk since the beginning of MPT. In the same time there has been an increasing interest in ways to measure it and numerous demanding quantitative models has been created. In every model the quality of forecasting depends of accuracy of input measures. (Moreno et al. 2005, p. 1267-1268)

In the 1970s, research and development enterprises started to develop different quantitative models to support their project selection decision making. In even more dynamic business environment the need for project portfolio management has increased continuously. (Petit & Hobbs 2010, p.47)

In 2008 Project Management Institute published The Standard for Project Portfolio Management – Second Edition. This standard defines a project portfolio as “a collection of projects or programs and other work that are grouped together to

lead effective management of that work to meet strategic business objectives”. (PMI 2008, p.138)

3.2 Project portfolio assessment in construction industry

Construction portfolio is defined as the combination of two or more construction projects. Construction portfolio management is a way to coordinate multiple resources and activities in order to achieve the specific objectives. Construction company’s project portfolio management is linked to risk management in order to obtain the optimum risk return portfolio. (Khan & Burn 2013, p. 14-18)

Petit & Hobbs (2010) have researched project portfolio management and its uncertainty between few case companies. Their key finding was that in dynamic business environment the biggest uncertainty is in changing scope. They also present that even though companies claim to be dynamic and fast-moving, that is not necessarily true.

There are three main commonalities that project portfolio management studies are based on: project selection criteria, portfolio balancing and strategic alignment. Project selection criteria are defined in strategic alignment. What is more, in portfolio management also portfolio balancing must be considered to create a sustainable portfolio. (Petit & Hobbs 2010, p. 46-47)

According to Khan & Burn (2013, p. 18) project portfolio management at high level demands advance thinking what has to be done and which activities should be used. Zwikael & Globerson (2006, p. 698) stated that construction and engineering organizations maintain the highest quality in project planning, both in the organization level and in project manager level. However, another of their findings is that greatest weakness of these companies is risk management, which may result from a lack of managerial know-how.

Also Pheng et al. (1997, p. 232) state that property developers appear to lack a comprehensive approach towards crisis assessment. In their research they define a crisis to be a negative anomaly influenced from market forces or uncertainties that can even evolve to be fatal. Threats are too often considered only as individual, not as a system of crisis. In that case elements of a crisis are being affected by other elements and their cross effect should be considered.

In figure 4 is represented the optimal risk return. The optimal level is in the middle of this curve. Company may want to increase their risk level in order to achieve higher return but as it stands in the figure, after certain point risk grows faster than presumable return. (Simons 2000, p. 267, 283)

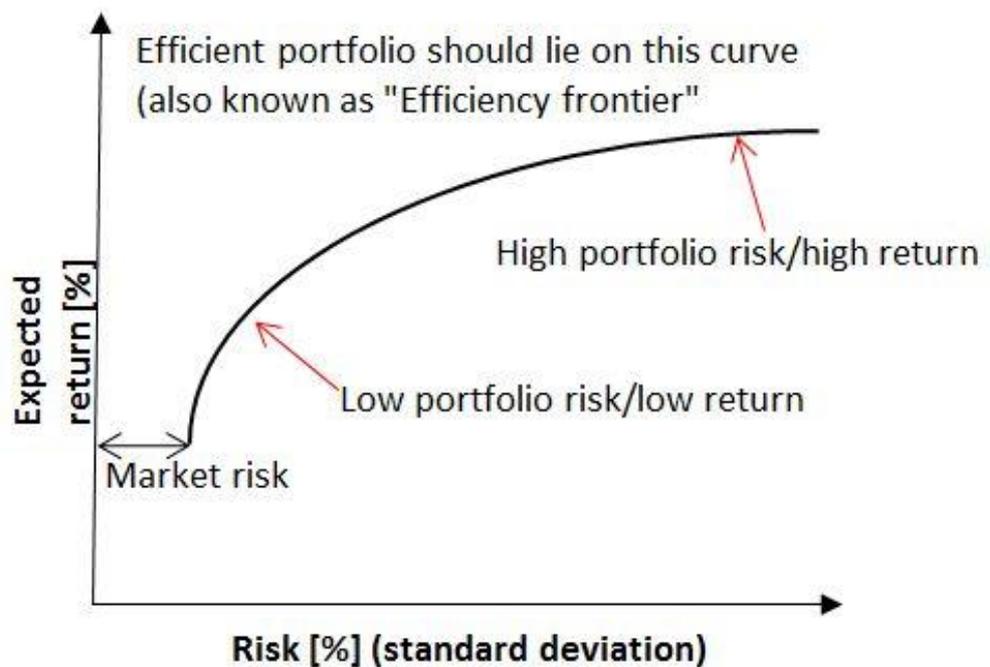


Figure 4: Portfolio risk-return (Modified from Simons 2000, p. 267)

Portfolio management in construction business differs from those in securities and this is important to recognize. For example, construction projects typically are not divisible, whereas securities are. (Khan & Burn 2013, p. 21)

According to Khan & Burn (2013, p. 26) the main aim of the portfolio management is to achieve alignment with company's strategic goals. As strategy, portfolio management is intensively affected by business environment. Therefore it is compulsory to bring changes to construction portfolio in changing business environment. (Khan & Burn 2013, p. 33)

3.3 Late break-even point in construction industry

The breakeven point is that quantity of output sold that at which total revenues equal total costs. Now in this point operating income is 0. Breakeven point is essential to managers because they want to avoid operating losses. (Horngren et al. 2006. p. 65)

According to Pike & Neale (1999, p. 7-9) cash is the lifeblood of business and cash management is the key of a business. If at any point cash fails to flow properly, occurring problem might damage the company or even turn out fatal.

The construction industry is volatile and highly vulnerable during recessions because competition limits price and cost flexibility. Economic cycles are a fact of life in the construction business and that is why companies must assess their performance and sometimes economize. Strischek cites Confucious by saying that he who does not economize will have to agonize. (2010, p. 60)

Strischek (2010, p. 61) writes that difference between revenue and expense is profit and the simplest way to enhance your business is to increase revenue and/or decrease expense. For some this is easier than for others, especially in the construction field. Cyclicity creates difficult situation where generating enough revenue to break even is even harder when sales are not predictable from year to the next.

If 10% increase in sales results in a 25% rise in profits, that is an operating leverage of 2,5x. The same applies with declining sales. Companies operating in industries which are characterized by high operating leverage and volatile sales will be vulnerable to erratic profits. Unfortunately construction industry suffers from both. So recession combined with company operation expansion will probably have unwanted influences. (Strischek 2010, p. 62-65)

3.4 Value Based Management

Value-based management (VBM) provides managers with tools and techniques to support the development and implementation of value-creating strategies. The first modern impression of VBM was published by Alfred Rappaport 1986 and since then numerous consulting firms have developed different value-based measures in order to create value for the company. Essential advantage of value-based metrics is that they also consider the risk outlook. The most important measures to estimate value are the economic value added (EVA), the cash flow return on investment (CFROI) and the return on invested capital (ROIC). (Bausch & Schwenker 2009, p. 15-18)

VBM is mainly used in strategy planning but it is also used in performance measurement. Performance measurement is the key element when management focuses on value creation because measurement offers possibilities for target setting, performance monitoring and responding if expected and actual results vary. (Bausch & Schwenker 2009, p. 27)

3.5 Cash flow and sensitivity analyses

Cash flow analysis is a method for investment appraisal. Same term is normally used for real investments such as buildings and equipment and also financial investments and same principles apply. The most used method of cash flow analysis

is net present value (NPV) method. In NPV method all future cash flows will be discounted to present value with correct discount rate. Many managers also prefer to use non-discounting methods such as the payback period or return on capital. (Pike & Neale 1999, p. 129-133)

NPV method requires that cash flow structure of the whole project needs to be known at the beginning of the project and the discount rate must remain the same over the lifetime of the project. However, many projects do not fulfill these criteria. Real options offer a more comprehensive tool for project assessment. It offers better capabilities in situations where is a contingent investment decision, uncertainty in cash flows and flexibility in project's strategy. Real options include different possibilities to defer, alter, switch or abandon the target. Although the real options theory has been a topic of research for over 25 years it has not been broadly accessible to practitioners in Corporate Finance before mid-1990s. Even later on it has not become very well-known among senior managers accustomed to the traditional NPV method. However, the situation was the same for the new NPV method for decades but now it is widely used. (Schulmerich, p. 23-26)

During past decades many different methods for option valuation has been developed. Option valuation can be analytical or numerical. Numerical methods include partial differential equations and stochastic process. (Schulmerich, p. 27) Vollrath (2001) investigated sample of companies headquartered in Germany and found out that although the real options approach is theoretically superior to traditional capital budgeting tools, it is not widespread in companies. However, same survey found out that flexibility plays a critical role in the decision making process on new investment projects.

The payback period is the period of time needed for the future net cash inflows to match the original expense. Instead of speaking of when project pays back it is also possible to discuss about project's break even. Payback period method doesn't consider the time value of money. (Pike & Neale 1999, p. 137)

Cash flow analysis in construction business was researched by Zayed & Liu (2014, p. 170-190). They present that construction projects include higher risk than traditional ones because they contain high capital outlays and complex site conditions. Construction projects are well-known for complexity and ambiguity. Their research focuses on identifying factors that affect cash flow and cash flow forecasting of a single project.

Sensitivity analysis is a simple technique to locate and evaluate the potential impact of risk on a project's profitability. Sensitivity analysis provides a wide range of "what if" questions for decision makers. For example, what is the sales revenue for a project required to break even or what happens for our profitability if selling price falls five percent? Sensitivity is widely used because of its ability to focus on particular estimates and its simplicity. It can be easily used to evaluate the critical factors that have the extreme impact on a project's profitability. (Pike & Neale 1999, p. 241-242)

Shareholder value analysis (SVA) is based on NPV (Net present value) approach. The key assumption of SVA is that business is worth for the net present value of its future cash flows. Many leading corporations in US and in Europe have adopted SVA because it links management, decisions and strategies to value creation. Strategies, business, investment and financing strategy, should always be evaluated also from shareholders value perspective. (Pike & Neale 1999, p. 112)

4 ACCOUNTING METHODS IN CONSTRUCTION INDUSTRY

4.1 Construction accounting

According to Trotman & Zimmer (1986, p. 137) there are two methods commonly used to record profit from construction contracts. First one is completed contract method which recognizes profit only after all work of the contract is done. Second one is the percentage of completion method. Percentage of completion method recognizes profit step by step when construction project develops.

The accounting law of Finland requires that the revenue of the accounting must be recognized as revenue of the profit and loss account. (Kirjanpitolaki 5:1.1) The accounting law of Finland demands as well that the revenue and expenses of the accounting period are recognized without noticing the dates when their payments were paid (Kirjanpitolaki 3:3.1). Therefore, construction contract must be recognized to the accounting period when the contract was realized in other words contract was delivered to the customer (Kirjanpitolautakunta 2000, p. 2). This revenue recognition method is called completed-contract method. The accounting law of Finland allows an exception, which permits to recognize the revenue of a contract based on contract's completion estimation (Kirjanpitolaki 5:4). This exception is called percentage-of-completion method (Kirjanpitolautakunta 2000, p. 3). The percentage-of-completion method can be used as an alternative revenue recognition method according to Finnish accounting legislation. It can be used for construction contracts instead of completed-contract method. In Finnish literature term construction project is better known as long-term project (Räty & Virkkunen. 2004, p. 229)

Financial statements are used by investors who assess the right value of a company at the present moment. Reports should give balanced and understandable in-

formation of company's current position and potential. An understanding of valuation is essential to understand the effect of investment and financial decisions. (Pike & Neale 1999, p. 17, 116-118) Financial statements are also used by loan officers who assess the ability of corporate loan applicants to repay a proposed loan. (Trotman & Zimmer 1986, p. 136)

4.2 Prerequisites for percentage-of-completion method

Only industries which are allowed to use percentage of completion method generally are construction and shipbuilding industries and manufacturing of machines, which are manufactured over more than one accounting period and the meaning of single contract's revenue recognition, is significant for the company. (Sorsa 1996, p. 231) Although, the guideline of the Finnish Accounting Practice Board (Kirjanpitolautakunta 2000, p. 3-4) does not define any universal minimum limit for the value of construction contract's financial value. Likewise, Finnish Accounting Practice Board does not define exact limit for the duration of the construction contract although typically minimum duration is one year. Prepula (1995, p. 70) argues that six months should be considered as the minimum duration of construction contract. This claim is based on the assumption that on average more than half of the contracts with duration of less than six months will be executed in one accounting period. Divergent opinions can also be found. Sorsa (1996, p. 232) states that minimum limit of six months should not be followed as it stands. A single contract should be compared to total revenue and profit. Hence, revenue recognition method should be considered. If a construction contract with duration of less than six months will be executed on two different accounting periods using completed-contract method, the whole revenue of this contract will be recognized on the second accounting period. Therefore, financial statements of these periods would not give totally fair view of company's financial situation.

As stated before, percentage of completion method can be used only for construction contracts. Finnish Accounting Practice Board has set guidelines for percent-

age of completion method. The construction contract implementation must be based on firm contract. In this contract must be defined sales price of the construction contract. In this case construction project can be a building, road, bridge, ship or a quite large machine unit. (Kirjanpitolautakunta 2000, p. 3)

4.3 Revenue recognition using percentage of completion method

By using percentage-of-completion method the revenue and profit of the company will be divided between several accounting periods more evenly. Without percentage-of-completion method in revenue recognition comparison between several accounting periods would be very difficult. As mentioned earlier, in the accounting law of Finland the percentage-of-completion method is a voluntary method for the revenue recognition of construction contracts and it can be used only if the requirements can be fulfilled. (Kirjanpitolautakunta 2000, p. 3)

If the revenue of the company is recognized using the completed-contract-method, revenue and profit of different accounting periods can fluctuate significantly. Fixed costs of contracts will accumulate similarly in both methods. If percentage-of-completion method is not used in construction contracts the financial situation is not realistic. (Sorsa 1996, p. 231)

One requirement of using percentage-of-completion method is that the stage of completion of construction contracts can be evaluated. This stage of completion defines what amount of contract's revenue should be recognized as revenue in profit and loss account in the end of accounting period. (Kirjanpitolautakunta 2000, p. 8)

4.4 Differences between contracting and development projects

When project planning has succeeded in certain phase, project owner must decide should they execute the construction work with their own work force or should they use one or more construction contractors and designers. (Liuksiala 1986, p. 15)

According to Oberlender (1993, p. 16-17) project initiation in construction industry requires teamwork between the three contracting parties: project owner, designer and contractor. Contracting arrangement between different project models may vary based on project's features. In figure 5 are presented the most used methods for contracting projects. A design/bid/build contract is widely used for projects that don't have unusual features and have a well-defined scope. A design/build contract is usually used in projects to shorten the required time or to provide flexibility to make changes in the project during construction.

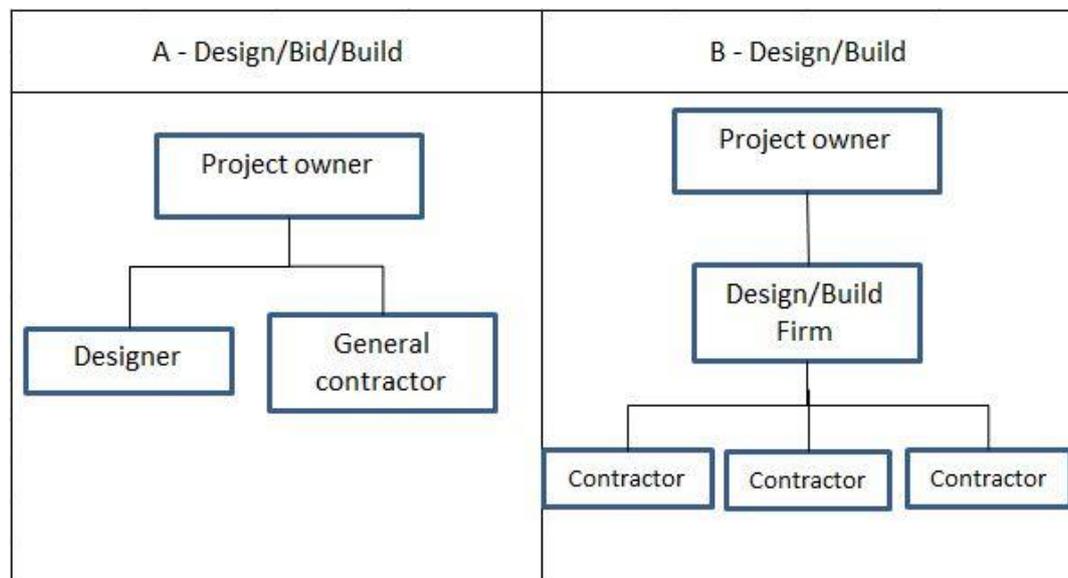


Figure 5: Contracting arrangements (Oberlender 1993, p. 17)

Another possibility instead of more commonly used contracting projects is development projects. In development projects company takes care of almost the whole

project. Developer buys a plot or a property and sets up an organization to manage the project. Legislation of housing companies between different countries may vary but it is mainly uniform. The construction company designs the project and takes care of needed authorization. Developer is also responsible of managing the sales of the end product. (Liuksiala 1986, p. 258)

Usually project cash flows will arrive throughout the year. In practice, cash flows arising during the year are treated as occurring at the year end. Strictly speaking, these cash flows should be identified on a monthly or even daily basis and discounted using appropriate discount factors. (Pike & Neale 1999, p. 131)

In contracting projects revenue recognition is based on completion degree only because this project is already sold when starting the project. There are variable possibilities for payment methods but still contracts already exist. In development projects company still must sell apartments to gain profit. Therefore in development projects revenue recognition is dependent also from sales. (Liuksiala 1986, p. 258)

5 PERFORMANCE MEASUREMENT

5.1 Objectives of measurement

One of the most known definitions for performance measurement has been presented by Neely et al. (1995, p. 1122). They define performance measurement as the process of quantifying the efficiency of action. Herein effectiveness refers to situation how customer expectations are met for example. However, this research is pursuing a wider frame to evaluate corporation's risk level. Marshall et al. (1999, p. 13) offer a wider perspective to performance measurement. They define performance measurement as the development of indicators and collection of data to describe, report on and analyze performance.

Kald and Nilsson (2000, p. 119-120) have examined different dimensions of performance measurement from the perspective of business unit controllers. Their study reveals that there are two purposes of using performance measurement above others. The most important purpose of using performance measurement is to support the decisions at the top-management level, and the next most important one is to support the decisions at the operating level.

Knowledge of performance measurement is a mixture of economics, industrial engineering, organizational theory, psychology and public policy. Of these, economics and organizational theory are the most integrated parts of performance measurement. (Neely 2002, p. 81)

According to Simons (2000, p.6) company creates value by executing business strategy. In business strategy company has defined business goals which usually are financial. Performance measurement systems assist managers in trailing the implementation of strategy by comparing results against strategic objectives.

In the late 1980s the process of deciding what to measure became topical. Keegan et al. (1989, p. 47) presented one of the first practices for the process of deciding what to measure. The most important section is to look at the strategy and define the strategic objectives of the company and to determine how they could be translated into divisional goals and how to embed this system into management thinking.

5.2 Measuring with right metrics

Kaplan and Norton (1992, p. 71) present that managers should not choose between operational and financial measures. They claim that senior executives do not rely on one-sided measures because no single measure can provide a clear performance target of the business. According to Simmons (2000, p.234) financial measures are usually drawn from company's accounting systems. Non-financial measures are quantitative data created outside the formal accounting system.

An alternative for previous approach is presented by Fitzgerald et al. (1991, p. 55). In this study performance measurement is divided in two based on their types. As can be seen in figure 6, there are performance measures related to results and those which concentrate on determinants of results. The key point of this approach is that it highlights the fact that the results obtained today are a function of past business performance.

Results	Financial performance
	Competitiveness
Determinants	Quality
	Flexibility
	Resource utilisation
	Innovation

Figure 6: Results and determinants of performance measurement (Fitzgerald et al. 1991)

Based on his analysis Simons (2000, p. 103) lists the most essential financial measures for any business:

- Sales
- Net income
- Cash flow
- Investment in new assets
- Return on equity
- $\text{Net income} / \text{Sales} = \text{Profitability}$
- $\text{Sales} / \text{Assets} = \text{Asset turnover}$

Pike & Neale (1999, p. 131) present that profit is the most usually used measure to assess performance but they prefer cash flow to be better measure because profit always depends on accounting concepts. According to Arnold (1998, p. 119) different cash flow models are used to assess project's profitability and same techniques can be used to assess the timing of projects. Furthermore, sometimes it might be more profitable to delay a project rather than proceed immediately.

5.3 Risk-adjusted portfolio performance

According to Malkiel (2007, p. 330-331) principle number one is that return is always related to risk. Although one might have heard it away too many times, no lesson is more important in investment management.

Tonchia & Quagini (2010, p. 12-13) claim that before decision making any investment must go through two phases: analysis and evaluation. The investment analysis phase consists of:

- The quantification of incoming and outgoing cash flows
- The variance of such cash flow over time
- The monetary value of such time
- The risk level which is the uncertainty of points above

The evaluation phase consists of:

- Identification, selection and implementation of evaluation criteria
- The defining of acceptance criteria, which are in balance with corporate strategy, objectives and risk exposure

This evaluation has three targets:

- To evaluate the increase in net income
- To evaluate the profitability level of the company
- To evaluate the risk level

Furthermore, investment should be evaluated also after the investment decision.

The most common methods used to evaluate financial performance are:

1. The Net Present Value (NPV) to the evaluation of income.
2. The Actual Rate of Return (ARR) for the evaluation of profitability
3. The Pay-back method to contain risks when calculating cash flow estimates

4. Internal Rate of Return (IRR) for the evaluation of the risk level when estimating discount rates

Olsson (2008) has studied the risk management in a multi-project environment and he has used Bombardier Transportation in Sweden as a case company. Problem behind this study was that risks were managed quite well in project level but higher project portfolio level of risk management is lacking. In this research Olsson studies how to assess project level risks combined. Assessed risks are based on history view of different projects in portfolio. Olsson evaluates risks and combines them as a trend in portfolio level.

Petit (2012) has studied the uncertainty of a portfolio. Petit argues that with appropriate sensing mechanisms company is able to foresee and prepare for impacts of technical and market based uncertainty. In this research author states that market uncertainties maintain the most significant influences for the company. Furthermore, company must still gain a way to measure the effects.

Martinsuo et al. (2014) conducted a research where interviews of executives were used to reveal uncertainties of ten different companies and means to control these uncertainties in portfolio management. Sources of uncertainty were classified to derive from business environment, organizational complexity or single-project based. Strategic management was seen as a best tool to manage uncertainties of a portfolio which were more often seen as threats, not as opportunities. Authors state that managers follow and identify external uncertainties well but those should be taken into account in strategy planning. In addition, value-based dimensions should be created to activate management in portfolio level.

Business portfolio should be forward-leaning and risk-adjusted in dynamic business environment. Based on these prerequisites Cogliandro (2014) has developed NPV method further to respond better for requirements. Cogliandro has reinforced the NPV equation with Benefit factor and Technology readiness level factor. Ben-

efit factor has five degrees based on estimated benefits for business where lowest score indicates only slight improvement and highest score indicates radical change in market dynamics. Technology readiness level has nine factors which indicate in which phase of a lifecycle the certain investment or project is. Author states that this tool helps managers to build a forward-leaning and risk-adjusted future value portfolio in various industries and company types not only in new business investments and products but also existing products, workforce, equipment and technology.

6 PROJECT PORTFOLIO SIMULATION MODEL

6.1 Current state of risk management

Currently the case company evaluates strategic business risks twice a year. In this research we defined to focus in strategic risks so we don't explore risks attached for example to human resources which are evaluated constantly. Strategic risks are evaluated within corporate strategy consideration and budgeting. All risks are collected in risk matrix model based on their probability and impact. Company sees that matrix model evaluation itself is not enough for three reasons. First of all, matrix evaluation is seen as too shallow insight for risk management. Second of all, matrix evaluation is not supported by enough comprehensive calculations. Thirdly, matrix evaluation is usually a subjective assessment.

As stated in literature, it has been researched, that construction companies possess the highest talent and results in project planning and execution, not only in middle-management but also in top-management. Although, it has been stated in the same research that construction companies have the poorest state of risk management. In another research it has been stated that construction companies don't prepare for a crisis comprehensively enough and they lack a comprehensive view of their portfolio. This means that risk management might be in a good level but a comprehensive view of a possible crisis is missing. Based on interviews of case company executives this is at least partially true. In this point it has to be remembered that risk management is usually pursuing negative anomalies, which can be bypassed if only positive options are wanted to be seen.

Among people risk is always considered as a negative occurrence. Most people don't even know that risk is bidirectional. It is true that risk exposes us to potential losses but risk also provides us with opportunities. Therefore, firms try to exploit risk all the time. Why would someone expose his company for risk? Obvi-

ously, because they believe they can exploit risk and generate greater value. This can be seen as emerging a totally new continent or in smaller scale just a new project. Project can be comparatively small size, it can possess vast risk and it can hold a chance of big profit and these factors may vary.

6.2 Regional differences in YIT's business environment

There are differences in YIT's business environment between different product segments, divisions and geographic areas. In this research the most important difference is cash flow formation between housing, commercial and infra projects. All of these differences set a lot of challenges and variables for creating a risk measurement system.

Finland is usually being held very competitive but also stable market. Risk level in Russia is different comparing to Finland because of many reasons. First of all, financing options for customers buying residences are different. Second, political environment can be considered to be more insecure. Third, culture and customer behavior differs from Finnish culture. Fourth, selling price setting in foreign and slightly volatile market is different than in Finland. Naturally, margins are slightly better with higher risk.

6.3 Differences between business models

Cash flow appearance and risk level between contracting and development business are different. In contracting projects the whole project is already sold and cash flow is dependent only from contractual terms of payment validation and completion of project. Therefore in this case incoming cash flow is more predictable, while in development projects cash flow and profit are dependent of sales. If company gains no sales, it becomes more challenging to continue the project with increasing working capital. In case company majority of business consists of de-

velopment projects. Therefore the progress of sales is in key point in revenue recognition. Second key point is, of course, the completion of construction but in this study we mainly trust previously mentioned research and interviews when they state that company knows construction operations very well. Obviously, sales are dependent for several things. Therefore assessment of strategic risks arises.

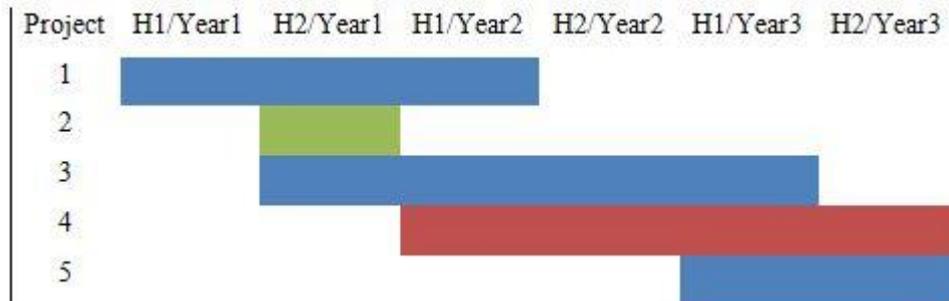


Figure 7: Gantt chart of on-going projects

Company has several on-going projects all the time as presented in figure 7. Every project is unique based on size, location, duration revenue recognition and profitability for example. This very simple and imaginary picture shows how different size projects take place in chronological timeframe. In some time of the year there are no projects starting and some projects take more time than others.

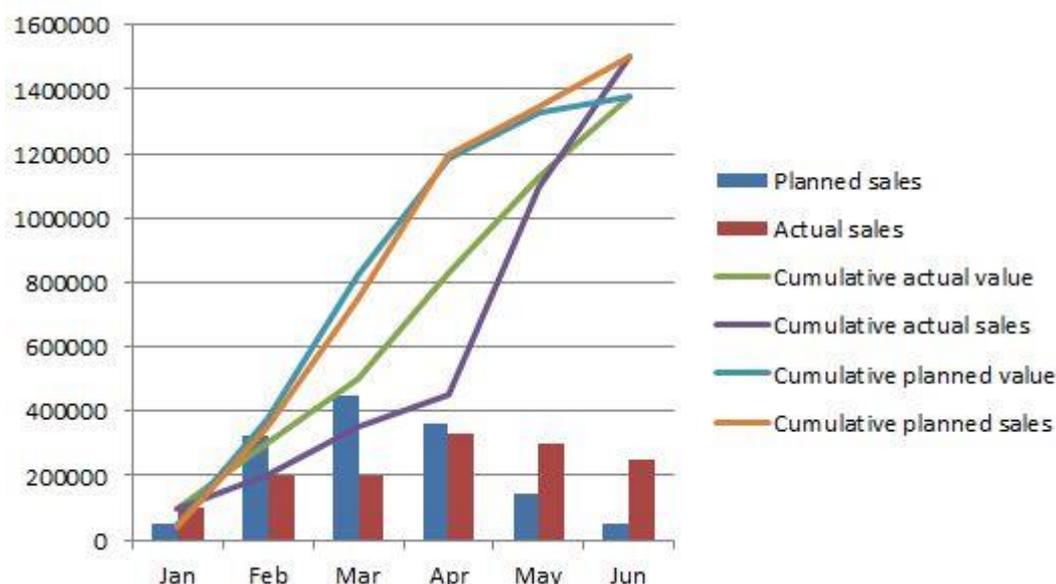


Figure 8: Cash flow and construction project's break-even point

Figure 8 represents a single project income recognition and value formation. Blue and orange lines and blue column are planned values for the project. In this example sales will not improve as planned and therefore break-even point will be reached significantly later. One project itself is not essential but if the same situation multiplies in two hundred projects simultaneously, preparedness and ability to react quickly is crucial.

6.4 Crisis 2009 H1

In September 2008 financial markets started to volatilize also in YIT's business environment. Prices were declining in Baltic countries and Russia as stated in figure 9 and therefore also decelerated both sales and completion of construction. As stated in theoretical part, risk management is attached to Value-Based-Management (VBM). This is true as if risk management is unsuccessful; also VBM is unsuccessful from shareholder's perspective. Operating margin in Q1/09 was -38,7 percent in International construction services causing loss of 23,8 Million euros. This is an example of severe risk realization in portfolio management. One might say it will not occur again in the same seriousness because it demands

so many factors to occur in the same time. However, it can be seen from history that most, if not all, plans and estimates do not achieve the results as originally evaluated. Because it is very likely that global economy will face new economic crises in future, the possibility must be considered.

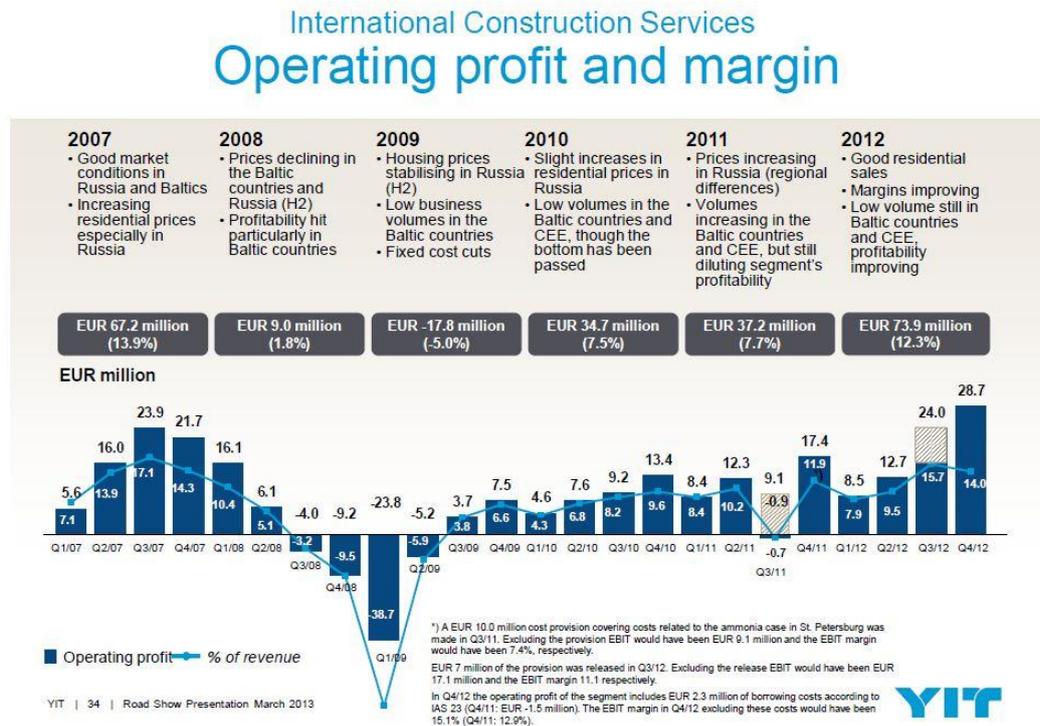


Figure 9: YIT's International services' operating profit (YIT Road Show Presentation March 2013)

Break-even point is essential in construction industry to keep tied up capital as small as possible. If sales stagnates incoming cash flow declines but outgoing cash flow remains the same. Some actions to slow down the outgoing cash flow can be done but still the future of the company is at risk if the market shock reveals to be remarkably longer than expected and the project portfolio is heavily imbalanced.

6.5 Identifying risks with interviews

The strongest and the most severe occurrence of risk for YIT is lack of sufficient funds. This can be seen as a root of different factors such as: weak cash inflow, too high amount of investments comparing to market situation and financing difficulties. These factors are connected between each other.

As stated in literature, one risk factor itself will not probably be remarkably strong. The problem is, today we live in a world where economy is notably more connected between business areas and segments. Therefore we could also discuss about crisis management instead of individual risk management.

Weak cash inflow may occur due to changing business environment and company can't probably make influence to whole environment. Obviously every company does market analysis from their business environment and tries to prepare for changes in demand beforehand but still there is always a possibility that a crisis surprises us. Therefore the structure of company's project portfolio arises in the key point because if a crisis catches us, correct portfolio status may help us to survive through market shock easier. In this case correct portfolio structure means that our portfolio can't either have too big share of simultaneously starting projects or ending projects because it inflicts more imbalanced net cash flow over the quarters of accounting periods. Also differences in cash flow and capital outlay between business segments must be taken into account.

8 corporate executives who work with strategy, profitability and business process development, investment decisions, financials, M&A and internal auditing were interviewed for this research to study the knowledge and risk awareness inside the company. As a start, the definition of strategic risk was presented as it is stated in chapter 2.5 of this research.

Research questions were as follows:

1. What are the strongest threats for our business and where do they derive from? Have we prepared well enough?
2. How strategic risks have been assessed so far and is this method sufficient or lacking?
3. With which metrics strategic risk and its influence should be evaluated?
4. What kind of information decision maker needs for his decision making?
5. How often and with what kind of time frame strategic risks should be evaluated?
6. In which organizational level strategic risks management should be?

Considering the operations risk historically, in near past there are such threats as lack of proper materials or skilled work force. Notably, at the moment nobody even considered that YIT's main risk could be in manufacturing and manufacture process was held as a strong part of the business. Project level risks are considered to be managed well and this also stems with previous research of construction industry's risk profile which is presented earlier. In this interview every one of executives considered management of sales risk as a main challenge at the moment. A few of interviewees also mentioned the risk of Russian business environment. In this environment political decisions cannot be foreseen and especially now in year 2014 when European Union is considering expanding sanctions against Russia the severest counteractions that Russian government could do must be taken into account. The severest action would probably be Russian government taking over companies, their financial and business operations in Russia. Probability of this kind of heavy action can be widely discussed and this discussion would definitely cause opinions from both ends.

According to these interviews, the main risk is sales risk meaning that sales stagnate and this matter was seen commonly between executives. Reasons behind this threat vary but not significantly. Naturally, the main answer for a reason was weakening market but also political decision making in Finland and especially in Russia came up. Weakening market could derive from political or economic crisis which would probably be global in some extent, not local. Thus regional decen-

tralization is not necessarily enough strong cover against market shock. Almost a half of interviewees, who work with finance every day, mentioned that rising interest rates would be negative for YIT's business through customers. They also mentioned that YIT's hedging against rising interest rates is sufficient but still it affects the company indirectly. Seven out of nine interviewees thought preparedness to severe risks should be improved. Reasons for this varied. Three main reasons were mentioned. First of all, YIT's indebtedness is on a high level comparing to the present market situation. Secondly, company should improve the process of evaluating effects and actions for some main risks as these risks have a big impact. Thirdly, YIT should be able to evaluate its business portfolio in a more detailed and analytical manner. To put it briefly, the most important spot to develop is to create a way to evaluate and develop the structure of the business portfolio. Clearly, company cannot increase the sales risk unlimitedly so the revenue growth should come up in a balanced way.

Answers for the second question were quite unified. So far strategic risks have been assessed with risk matrix which is comprehensive but it is not supported by calculations and it is always subjective perspective of present risk environment.

As stated in literature, cash is the lifeline of any business. This came up in the third question when net cash flow was proposed to be one measure. In general, more measures attached to profitability were mentioned instead of looking at Earning Before Interests and Taxes (EBIT), which can be seen too superficial measure especially for this kind of business.

Fourth question was what information decision maker needs to support decision making process. This question was set superficial on purpose. With this big variance in answers attached to different levels of thinking was searched. The core of these answers was three-dimensional. First of all, some interviewees approached the question at its source: what kind of occurrences in market environment could influence an impact and what indicators should be followed to predict these. Sec-

ondly, was presented the possibility to do a sensitivity analysis for our portfolio and assess the scenarios which could derive from fluctuating market environment. The third perspective of this question was that most of all we should give emphasis on assessing actions we are going to proceed if certain scenarios actualize.

Fifth and sixth question was about the organizational level handling strategic risks and how often they should be assessed and what kind of time frame to use. Commonly was expressed that strategic risks should be evaluated by board of directors. Although it was mentioned several times that with clear and correct strategy every lower organizational level should be attached to the process. The big frame for strategy is set once a year by board of directors and this way also strategic risk should be evaluated. The perspective of risk evaluation should be set at least three years. It was widely pointed out that longer perspective is better, naturally, but the question is how far company is able to see? Common guess was that company could be able to see two years progress to some extent, but process must aim for three years because it is also a time frame for our normal strategy. Five of interviewees highlighted that besides company makes a bigger risk and strategy update once a year, one must do a constant evaluation of company's portfolio and if market environment changes, company must change with it. In this manner company needs different scenarios and actions to be prepared.

One of interviewees mentioned that some of the risk realized arise from former plot acquisitions being made several years ago based on too ambitious growth expectations and also simultaneously growing market share before recession but this acquisition and investment assessment process is greatly improved from those days.

Based on interviews it seems that the project and process management is well in place in YIT but the sales risk management should be researched further. This stems with literature where is stated that engineers suffer a lack of comprehensive

perspective for enterprise risk management because they easily focus on their own segment of work and mainly its technical risk.

6.6 Previous research of similar business

Business performance analysis in construction business and real estate business is not a new issue but different business forms set many requirements. As stated before, construction business is very competitive industry in its numerous forms and therefore business performance measurement is widely used in operational level. Usually used method in top-management level is cash flow analysis. YIT's competitor Skanska for example calculates the net present value of their infrastructure projects and publishes it in their annual report (Skanska Annual Report 2013). This research focuses on YIT's business which mainly consists of development projects where the company starts from plot acquisition and also holds the risk of sales. Those projects where cash flow analysis is being used are normally quite much longer than those projects this research investigates and also future cash flows should be quite easily predicted when cash flow analysis is being used.

Risk management in portfolio level has been studied a little. For example Olsson (2008) has studied portfolio risks multi-project environment but his study focuses on risks itself and in this study our main goal is to find out what are the influences and what should our actions be to respond. Olsson's method to compare project risks between projects and summarize them to portfolio level seems to be straightforward and efficient so it might be valuable assessment method also in construction industry but it doesn't fit in this research's objectives.

6.7 Model structure

Based on interviews and risk mapping a simulation model was developed to give perspective into YIT's business divisions. Aim of this model is to simulate a mar-

ket shock of specified size. In this market shock project sales in housing business stagnates and volume decreases. Also possibility of cost elasticity is taken into account. This model studies the results of business performance, not determinants of business performance. Additionally, the model provides a way to analyze how different parameters affect the profitability, cash flow and balance sheet structure of the case company both on business segment and Group level.

Simulation model is based on six sheets of different business segments of YIT. Three of these sheets are the areas where development based projects are executed such as residential development in Russia (RUS), Central Eastern Europe (CEE) and Finland (FIN) and also Commercial premises development. Two others are Infrastructure and Contracting business. Every one of these sheets has two scenarios: normal and weakening market. In every sheet there is also certain details considering revenue recognition and market environment. As mentioned earlier, all the data presented in following tables is only descriptive and prepared for purposes of this research, that is to say it does not reflect the actual performance or financial situation of the case company.

Table 2: Structure of business model sheets

Project progress	Normal market						Weakening market								
	Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	
Quarter	Constr	Constr	Constr	Handov	Compl	Compl	Constr	Constr	Constr	Handov	Compl	Compl	Compl	Compl	
Project status	Constr	Constr	Constr	Handov	Compl	Compl	Constr	Constr	Constr	Handov	Compl	Compl	Compl	Compl	
Parameters															
Gross margin	15 %	of total sales					15 %	of total sales							
Plot investment	25 %	of total project costs					25 %	of total project costs							
Average down payment	15 %	of apartment selling price					15 %	of apartment selling price							
Housing company loan	60 %	of completed apartment selling price					60 %	of completed apartment selling price							
Total sales	100						100								
Total costs	85						85								
Plot costs	21						21								
Construction costs	64						64								
Project margin	15						15								
Sales & costs															
Split of sales (%)	10 %	15 %	20 %	25 %	20 %	10 %	10 %	15 %	20 %	20 %	15 %	10 %	5 %	5 %	
Sales	10	15	20	25	20	10	10	15	20	20	15	10	5	5	
Cumulative sales	10	25	45	70	90	100	10	25	45	65	80	90	95	100	
Split of construction costs (%)	25 %	25 %	25 %	25 %			25 %	25 %	25 %	25 %					
Construction costs	16	16	16	16	0	0	16	16	16	16	0	0	0	0	
Plot costs	21						21								
Costs	37	16	16	16	0	0	37	16	16	16	0	0	0	0	
Cumulative costs	37	53	69	85	85	85	37	53	69	85	85	85	85	85	
Income recognition															
Degree of sales (%)	10 %	25 %	45 %	70 %	90 %	100 %	10 %	25 %	45 %	65 %	80 %	90 %	95 %	100 %	
Degree of completion (%)	44 %	63 %	81 %	100 %	100 %	100 %	44 %	63 %	81 %	100 %	100 %	100 %	100 %	100 %	
Degree of income recognition (%)	4 %	16 %	37 %	70 %	90 %	100 %	4 %	16 %	37 %	65 %	80 %	90 %	95 %	100 %	
Cumulative revenue	4	16	37	70	90	100	4	16	37	65	80	90	95	100	
Cumulative costs	4	13	31	60	77	85	4	13	31	55	68	77	81	85	
Cumulative margin	1	2	5	11	14	15	1	2	5	10	12	14	14	15	
Revenue	4	11	21	33	20	10	4	11	21	28	15	10	5	5	
Costs	4	10	18	28	17	9	4	10	18	24	13	9	4	4	
Margin	1	2	3	5	3	2	1	2	3	4	2	2	1	1	
Cash flow															
Down payment	2	2	3				2	2	3						
Sales price payment				63	8	4				58	6	4	2	2	
Housing company loan				18						21					
Sales cash flow	2	2	3	81	8	4	2	2	3	79	6	4	2	2	
Cumul. sales cash flow	2	4	7	88	96	100	2	4	7	86	92	96	98	100	
Sold receivables	9	13	17	-38			9	13	17	-38					
Sales cash flow incl. proj. financing	10	15	20	43	8	4	10	15	20	41	6	4	2	2	
Cumul. sales cash flow incl. proj. fin.	10	25	45	88	96	100	10	25	45	86	92	96	98	100	
Construction cash flow	16	16	16	16	0	0	16	16	16	16	0	0	0	0	
Cumul. construction cash flow	16	32	48	64	64	64	16	32	48	64	64	64	64	64	
Net cash flow	-14	-14	-13	65	8	4	-14	-14	-13	63	6	4	2	2	
Cumul. net cash flow	-14	-28	-41	24	32	36	-14	-28	-41	22	28	32	34	36	
Net cash flow incl. proj. fin.	-6	-1	4	27	8	4	-6	-1	4	25	6	4	2	2	
Cumul. net cash flow incl. proj. fin.	-6	-7	-3	24	32	36	-6	-7	-3	22	28	32	34	36	
Balance sheet															
Work in progress	33	40	38	26			33	40	38	30					
Shares in completed corp.					9	0					17	9	4	0	
Trade receivables	9	21	38				9	21	38						
Total assets	42	61	76	26	9	0	42	61	76	30	17	9	4	0	
Advances received	2	4	7				2	4	7						
Order book															
Backlog of orders	96	84	63	30	10	0	96	84	63	35	20	10	5	0	

In table 2 the basic idea of the model is presented. This sheet represents development model business in residential building in Finland and simulates one single average project of this market. This sheet has seven main sections marked with blue cells in table 2. On the top is chronological timeframe of one average project of this certain market area. In normal market project building lasts one year and sales are totally completed six months after that. In a weakening market construc-

tion proceeds normally but sales starts to stagnate after certain point. This point can be set by the user as we can see from the line “split of sales”. If weakening and normal market scenarios in table 2 are compared, the slowdown has been set to start in fourth quarter. It must be noted that this weakening scenario is not extremely severe because 65 percent of the project is sold by handover phase and cumulative sales reaches 80 percent within a quarter from handover. Input by user in these sheets only in cells with bolded borders. Notably, net cash flow is negative until the handover of a project when break-even point is reached.

Second part is parameter section. Only data to provide for this sheet can be seen at the upper part of the sheet. User should provide gross margin, plot investment, average down payment, housing company loan and split of sales and split of costs for every quarter. This information can be put into cells with bolded borders.

Third, fourth, fifth sixth and seventh parts represent the financial figures of a project such as sales, costs, income recognition, cash flow and balance sheet. As mentioned before, split of sales can be changed but everything else is provided by the model. Income recognition is based on percentage of completion method. This sheet is the most complicated one with housing company loan and project financing options. These are financial instruments which are used only in Finland at the moment. Project financing in cash flow section means that after down payment the rest of the sales price can be sold to a financing department. Naturally this improves cash flow figures which can be seen if sales cash flow is compared with and without the project financing. Therefore sheets for Russia’s or CEE’s residential development don’t include these options and they are slightly shorter. In table 2 average down payment has been set in 15 percent which is quite usual in Finnish housing market. Differences in financing methods can be easily seen later in results.

In Russia projects are larger by average than in other market areas and therefore project is divided for 6 months longer period than in the other market areas. Otherwise the structure is the same.

Infrastructure and contracting are business models without such sales risk as in YIT's residential development market. In these sections split of sales is always hundred percent and cumulative sales proceeds linearly with costs. This business model is simple and less risky but risk theory applies when lower risks mean lower margins. Because there is no sales risk, these projects are not divided by normal and weakening market but based on their size. There are normal projects and large projects and difference in this manner comes up by their length.

Taking everything into account, these sheets do not consider the size of these projects despite their length. These sheets give only the average situation for every business model and they are based on percentages.

Table 3: Insert of quarterly revenues

Revenue per project	Revenue per project	Revenue per project	Weakening Market	Weakening Market	Weakening Market
	67			64	
75	67		71	64	
32	64	63	30	61	60
74	88	63	70	84	60
22	34	86	21	32	82
53	25	88	50	24	84
	53	42		50	40
	75	32		71	30
	43			41	
	25			24	
Costs	Costs	Costs	Constr.cost	Constr.cost	Constr.cost
	54			35	
60	54		39	35	
26	51	50	17	33	33
59	70	50	38	46	33
18	27	69	11	18	45
42	20	70	28	13	46
	42	34		28	22
	60	26		39	17
	34			22	
	20			13	

In table 3 is presented the input of revenues in start of calculation sheets. Revenues are inserted for every quarter and for every business separately. Model calculates revenues for weakening market and all costs including plot investment and construction costs. Again, input only to cells with bolded borders.

Table 4: Calculation of project revenues in declining market

Year 0				Year 1				Year 2				Year 3			
Q1	Q2	Q3	Q4												
1	2	4	6	4	2										
6	6	14	27	43	26	13									
13	6	4	9	18	24	13	8	4	4	2	5	9	15	9	4
21	13	6	3	7	13	18	10	6	3	3	4	9	17	27	16
13	21	13	6	2	5	9	12	7	4	2	2	3	7	14	22
7	13	21	13	6	4	10	18	25	13	9	4	4	1	4	7
						2	5	9	12	7	4	2	2	2	5
							0	1	2	3	2	1	1	1	3
								0	0	0	0	0	0	0	0
								3	8	15	20	11	7	4	
61	61	62	64	79	73	64	54	52	43	34	36	49	53	62	60

Quarterly project revenues which were previously described in table 3 will be summed in calculation sheet as presented in table 4. In blue cells in every line

there is one ending project and after them in white cells starts new projects. In white cells red color is used as text color starting from third project line to describe that project delays are starting to occur. In yellow cells are also starting new projects. To make it easier to perceive the connection between input and calculation, tables 3 and 4 are unified in appendix I. Revenue input cells under blue color cell affect blue cells in continuous calculation. The same applies with white and yellow cells. For example the first yellow cell from top affects the figurative project starting at Q3/Year 2 and the same applies in the next line.

Starting from first quarter of year one formulas also include a decrease of volume and possibility of cost elasticity. In tables 4 and 5 volume declines 25 percent, cost elasticity is five percent and declining market lasts one year. This model describes the weakening market environment which is the objective of this modeling. As a comparison in table 5 is the normal market without slowing sales and declining volume.

Table 5: Calculation of project revenues in normal market

Normal Scenario	Year 0				Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4												
Revenue	1	2	4	6	4	2										
	6	6	14	27	43	26	13									
	13	6	4	10	18	29	18	9								
	21	13	6	3	8	14	22	13	7							
	13	21	13	6	3	7	13	20	12	6	3	7	14	22	13	7
	7	13	21	13	6	5	14	26	41	24	12	1	4	7	11	6
							3	7	13	20	12	6	2	5	9	15
								1	2	3	5	3	2	3	7	13
									0	0	0	0	0	0	3	7
										3	8	15	25	15	7	3
Revenue total:	61	61	62	65	82	83	82	76	74	57	41	34	45	51	50	51

In table 5 all projects proceed normally without interruptions. Therefore all projects are marked with green text. Table 3, 4 and 5 represent Residential development Finland but other calculation sheets are alike. In Russia’s sheet projects are longer but there is only one “project” starting in each quarter as well. This simulation model calculates costs, cash inflow, cash outflow, net cash flow, work in progress, value of shares in completed corporations, trade receivables, total assets and advances received for normal and weakening market in the same way as presented

for revenue in tables 4 and 5. Model also calculates the plot utilization level for each quarter in both market environments by comparing actualized total costs of a quarter to calculation sheet's percentage of plot costs of a project. With this one is able to estimate the plot reserve in balance sheet to evaluate how much should be invested in new plots to maintain sufficient reserves. This is the basis for calculation in the model.

7 PERFORMANCE MEASUREMENT IN THE MODEL

7.1 Targets in corporation's strategy

According to YIT Corporation's strategy in 2013, YIT aims for well-managed, profitable growth. YIT has set financial targets in its business strategy. Company aims to grow its revenue 5-10 percent annually. Return on investment target is 20 percent. Equity ratio target is 40 percent and operating cash flow after investments should be sufficient for dividend payout and reduction of debt (YIT financial review 2013).

Percentage of revenue coming from Russia in 2013 was 27 percent. (YIT financial review 2013) Latest occurrences in Russian policy in Ukraine and its influence to financial markets have raised discussion about Russia's portion of YIT's revenue.

YIT has set a target to achieve better tolerance for recessions. This target holds a common cause among companies: how to predict and adjust for rapid demand changes? Construction industry is not extremely capital intensive business compared to many others, but development business requires usually significant investments both in plot portfolio and in the first phases of construction. Furthermore, it is very competitive industry and also sensitive for recessions. Therefore, sales are in key point of the economy of the company. If sales stagnate, also production should be converted to present, or more preferably, future demand. This modeling should offer an image of what happens if no adjustments in production capacity are being made.

Used revenues in modeling for different business segments at year 0 are:

- Housing Finland and Central Eastern Europe 800 million euros
- Housing Russia 500 million euros
- Business Premises and Infrastructure 700 million euros

Presented revenues are a rough match of YIT's real revenues between business segments. Due to publicity of this research, revenues are presented in line with YIT's existing reporting structure. However, for the purposes of this research contracting business has been included in Business Premises and Infrastructure segment figures.

7.2 Business units to measure

As stated in theoretical part of this study, there is a strong linkage between strategy, portfolio management and risk. Every one of these factors has an influence on company's return. Main objective of this research is to create information that supports decision making in top management level. Due to this, this study focuses at financial metrics instead of operational metrics. Data used in this study is descriptive, but company can use its reporting data later to support its decision making process.

The cash flows from existing investments reflect the efficiency of the way how they are managed and the quality of these investments. Furthermore, these cash flows also present the consequences of past decisions made by the company on risk position to choose and what kind of risks to avoid especially. If a company is more aware what risks to take and which ones to avoid, it can generate higher cash flows in future. This can also be seen as strength of the company because if company has dealt with similar risk in past it has better ground to survive through crisis.

7.3 Metrics and units

Net present value (NPV) method was considered to use to evaluate projects and estimate variance of return according to Portfolio theory and this way to estimate the risk level in total. During research there occurred some problems such as

compatibility with company's internal environment and needless problematic with methodology when projects are relatively short. This kind of cash flow analysis doesn't fit very well for company's development projects. Furthermore, in YIT people consider that forecasting a single project is handled very well but perceiving the whole picture of a portfolio needs more research. Thus decision makers can figure out should the company be eager to achieve goals by investing more or should they stay hold until temporary market shock is over for example.

Metrics in this research are normal business performance metrics that are also used in previously mentioned cash flow analyzes. The model used in this research can provide many kinds of information and metrics. Obviously if a company would have a lack of information, creating too much information instead is not an improvement in general. Metrics should be carefully rarefied and they should be also appropriate for certain business environment. This question was mapped out with interviews. Three perspectives were presented. Firstly, EBIT is the most used metric in this business but it was seen that it has a lacking view of required capital. Secondly, when this perspective was mentioned, company's CFO underlined that despite a few weaknesses EBIT is still a good measure in this kind of business and describes many corners of business indirectly. Thirdly, almost everybody emphasized that if they should pick only one metric to see, it would be net cash flow. The main reason for this is that net cash flow reveals severe situations most clearly.

In literature part of this study the most used metrics are presented. Combining these, results of interviews and the model built for assessment following metrics have been picked for division level simulation

- Revenue
- EBIT
- Cash flow after investments

7.4 Financial statements of different business units

After basic calculation of the model are the financial statements of each business unit. Again, tables for contracting business differ from developing business' tables. Contracting and infra business tables don't include the balance sheet items because there is nothing very significant in large scale. Equipment is in this case assumed to be on Group level balance sheet, although depreciations and investments are allocated to business unit level. These business units are also very simple in revenue recognition. Table 6 represents the infrastructure building business in scenario one where company does not seek for growth from this kind of business. These scenarios will be examined in next chapter.

Table 6: Financial statements of infrastructure building business

	Financial statements	Year 0	Year 1	Year 2	Year 3	
P/L	Revenue normal projects	150	150	150	150	
	Change (%)		0,0 %	0,0 %	0,0 %	
	Revenue large projects	150	150	150	150	
	Change (%)		0,0 %	0,0 %	0,0 %	
	Revenue, total	300	300	300	300	
	Gross margin	33	33	33	33	
	% of revenue	11 %	11 %	11 %	11 %	
	Fixed costs (% of revenue)	5 %	5 %	5 %	5 %	
	FC €	15	15	15	15	
	Depreciation	6	6	6	6	
	EBIT	12	12	12	12	
	% of revenue	4,0 %	4,0 %	4,0 %	4,0 %	
	Financial items	0	0	0	0	
	CF	Cash flow from operations	18	18	18	18
		Net financial items	0	0	0	0
Cash flow after financial items		18	18	18	18	
Equipment Investments		6	6	6	6	
Plot investments		0	0	0	0	
Cash flow after investments		12	12	12	12	

As can be seen from table 6, revenue in every year is 300 million euros and EBIT by percentage is 4 which is ordinary in this kind of business in competitive market environment. Financial items such as interests are assumed to be zero in this simu-

lation. Also plot investments are assumed to be zero. Equipment investments are about 6 million euros per year and the same amount will be depreciated every year.

Table 7: Residential development Russia's financial statements in normal scenario

		Normal scenario					
	Financial statements	Year 0	Year 1	Year 2	Year 3		
P/L	Revenue	502	548	598	653		
	Change (%)		9 %	9 %	9 %		
	Gross margin	85	93	102	111		
	% of revenue	17 %	17 %	17 %	17 %		
	Fixed costs	5,0 %	5,0 %	5,0 %	5,0 %		
	FC €	25	27	30	33		
	Depreceations	0	0	0	0		
	EBIT	60	66	72	78		
	% of revenue	12,0 %	12,0 %	12,0 %	12,0 %		
	Financial items	17	15	12	11	6,0 %	Interest level
	BS	Plots & development	200	211	224	236	200
Work in progress		224	243	270	285		
Shares in compl corp		5	5	6	7		
Trade receivables		102	112	124	132		
Total assets		331	361	400	424		
Advances received		102	112	124	132		
Trade payables		83	91	99	108	20 %	Percentage of costs
Allocated IB-debt		289,0	244,0	203,5	187,3	34 %	Percentage of group level
CF	Cash flow from operations	190	212	225	265		
	Net financial items	17,3	14,6	12,2	11,2		
	Cash flow after financial items	172	197	213	254		
	Equipment investments	0	0	0	0		
	Plot investments	115	135	148	151		
	Cash flow after investments	57	62	65	103		

In table 7 are Residential development Russia's financial statements. In these sheets which represent development business have also the balance sheet (BS) section. Allocated interest bearing debt comes from Group level simulation but it stands also in these sheets to affect the profit and loss statement with financial items. Allocation of IB-debt can be set by the user. In this example allocation is set based on development business total revenue divided by revenue of each business areas. Russia is the second biggest unit and therefore it holds the second biggest share of 34 percent of IB-debt. The level of trade payables has been set to twenty percent in each segment. With this input trade payables match quite well

with the amount of trade payables in YIT's financial review 2013. A big part of balance sheet consists of plots. The plot reserve was estimated to be 600 million euros in group level and it was divided to development divisions based on their revenues. The starting level of plots in group level was estimated and based on that, revenue shares between development segments, plot utilization and revenue growth model calculates the amount of plot investments as in table 7. This amount should cover the plot utilization and exceed it with the same amount as revenue grows. If revenue will not grow at all, plot investment level will remain the same. In this simulation there will be no equipment investments in development segments because they are not notably big. 4 million euros for contracting business and 6 million euros for infra construction for every year have been set.

Table 8: Input parameters

Input parameters	Business Premises & Infrastructure			Housing Russia	Housing Finland & CEE	
Revenue at year 0	700			500	800	
In financial statements						
for each business division:	Contracting	Infra	Com Dev FIN CEE	Res Dev RUS	Res Dev FIN	Res Dev CEE
Revenue growth scenario 1	0 %	0 %	5 %	9 %	5 %	9 %
Revenue growth scenario 2	17 %	17 %	0 %	0 %	0 %	0 %
Plot investment of project costs	x	x	25 %	25 %	25 %	25 %
Average down payment	x	x	x	50 %	15 %	15 %
Cost elasticity in weakening market	0 %	0 %	5 %	5 %	5 %	5 %
Volume decline in weakening market	0 %	0 %	25 %	25 %	25 %	25 %
Fixed costs by percentage	5 %	5 %	5 %	5 %	5 %	5 %
Equipment investments	4	6	0	0	0	0
Interest rate	x	x	4 %	6 %	4 %	4 %
Trade payables percentage of costs	20 %	20 %	20 %	20 %	20 %	20 %

From table 8 can be seen every input parameter which is inserted to the model except the previously mentioned split of sales. As mentioned earlier, business unit revenues are combined to match organization's public reporting structure due to publicity reasons even though this simulation is executed with imaginary figures. Upper part of the table 8 matches the public structure of target organization. Additionally, lower part matches the structure of this simulation. There is no plot investments assumed to occur in contracting and infrastructure divisions. In weakening market these scenarios' cost elasticity and volume decline was assumed to

be the same in every development division. Percentage of group level IB-debt was calculated based on different divisions' share of revenues to give the right image of balance sheet in division level. In contracting business and infra construction their balance sheets are very slim. Interest rate for group level is four percent and for every division it is four except Russia where it is six percent.

8 TESTING AND EVALUATING IN GROUP LEVEL

8.1 Two different scenarios to analyze sales risk

As presented in table 8, two different scenarios to demonstrate the influences of sales risk were created. In both scenarios the revenue growth in group level has been targeted to be around five percent which is the lower boundary at the moment according to YIT's financial targets. First scenario simulates a situation where company seeks for growth from development business and contracting business including infra construction remains stable. Second scenario is totally opposite where company seeks for growth from contracting business and development business stays still. Differences in profits, balance sheets, cash flows and in Return on Investment (ROI) between these models will be estimated. In this example all other variables remain the same except annual revenues.

8.2 Modeling the group level financial statements

In table 9 are financial statements of group level. This table represents normal market environment in scenario number one. Financial items are counted with interest rate of four percent. That is a little above the current level in corporate credit market but it gives truthful image of financial items and one percent in interest rate in this kind of business will not significantly swing this simulation to one way or another. Tax rate is 20 percent and the number of Group's shares (including treasury shares) is 127,2 million. For cash flow simulation dividend is set as 50 percent of previous year's net profit. Equity, IB-debt, non-current assets and other non-current assets are estimated based on YIT's balance sheet in the end of 2013. Non-current assets and cash reserves in balance sheet are estimated to remain in same level despite the growth.

Table 9: Financial statements of group level

Normal market						
Financial statements		Year 0	Year 1	Year 2	Year 3	
	Revenue	2003	2109	2219	2337	
	Change (%)		5,3 %	5,2 %	5,3 %	
	Gross margin	290	307	325	344	
	% of revenue	14,5 %	14,6 %	14,6 %	14,7 %	
	Activated interests	17,0	13,3	9,7	5,6	
	Fixed costs MI	100	105	111	117	
	% of revenue	5,0 %	5,0 %	5,0 %	5,0 %	
P/L	EBIT	180	192	204	217	
	% of revenue	9,0 %	9,1 %	9,2 %	9,3 %	
	Financial items	17,0	13,3	9,7	5,6	4,0 %
	Taxes	36	38	41	43	20,0 %
	Net profit	127	140	153	168	
	EPS	1,00	1,10	1,21	1,32	127,2
BS						
	Non-current assets	123	123	123	123	
	Plots & development	600	626	652	679	
	Work in progress	515	559	538	636	
	Shares in compl corp	22	23	25	26	
	Trade receivables	390	420	445	473	
	Other current assets	200	200	200	200	
	Cash	150	150	150	150	
	Total assets	2 000	2 101	2 192	2 287	
	Equity	700	767	844	927	
	Interest-bearing debt	850	664	483	278	
	Advances received	126	138	151	161	
	Trade payables	253	271	290	310	
	Other non-IB debt	70	259	424	612	
CF						
	Cash flow from operations	660	705	751	877	
	Net financial items	34	27	19	11	
	Cash flow after financial items	626	678	731	866	
	Equipment investments	10	10	10	10	
	Plot investments	334	385	405	420	
	Investments total	344	395	415	430	
	Cash flow after investments	282	283	317	435	
	Taxes	36	38	41	43	
	Dividend	60	64	70	77	50 %
	Net cash flow	186	181	206	315	
	Invested capital		1491	1379	1266	
	Net debt	700	514	333	128	

This model gives a lot of business information but the most essential lines which were focused in this research are revenue, revenue growth, EBIT percentage, Earnings Per Share (EPS), total assets, cash flow after investments, gearing and ROI. These metrics are chosen because for most of these can be found ready target values from case company's financial review. Table 9 describes a situation where company seeks for moderate five percent growth rate and it is done by growing development business which is more profitable than contracting but it al-

so requires more assets and investments. It also must be noted this table describes a normal market situation when business runs fine. Next is evaluated the weakening market scenario.

Table 10: Metrics of scenario 1 and 2

	Scenario 1							
	Normal market				Weakening market			
	Year 0	Year 1	Year 2	Year 3	Year 0	Year 1	Year 2	Year 3
Revenue	2003	2109	2219	2337	1959	1755	1855	2437
Growth %		5,3 %	5,2 %	5,3 %		-10,4 %	5,7 %	31,4 %
EBIT %	9,0 %	9,1 %	9,2 %	9,3 %	8,0 %	6,7 %	7,1 %	7,9 %
EPS	1,00	1,10	1,20	1,32	0,85	0,63	0,73	1,13
Total assets	1853	1954	2045	2140	1820	1689	1932	2324
Cash flow after investments	182	174	199	308	132	119	48	258
ROI		12,7 %	13,0 %	13,2 %		8,4 %	8,9 %	11,3 %
Gearing %		74,4 %	47,2 %	21,4 %		81,9 %	62,8 %	53,6 %
	Scenario 2							
	Normal market				Weakening market			
	Year 0	Year 1	Year 2	Year 3	Year 0	Year 1	Year 2	Year 3
Revenue	2000	2086	2186	2302	1957	1762	1879	2422
Growth %		4,3 %	4,8 %	5,3 %		-10,0 %	6,7 %	28,9 %
EBIT %	9,0 %	8,9 %	8,7 %	8,6 %	8,0 %	6,6 %	6,9 %	7,6 %
EPS	1,00	1,06	1,14	1,22	0,85	0,62	0,73	1,10
Total assets	1837	1837	1837	1838	1805	1606	1750	2005
Cash flow after investments	214	234	257	324	165	174	130	314
ROI		12,7 %	13,1 %	13,6 %		8,5 %	9,3 %	12,0 %
Gearing %		70,3 %	36,4 %	5,1 %		77,6 %	51,7 %	33,4 %

For table 10 was selected eight metrics from group level simulation. Based on company targets was chosen to look into revenue and its growth, EBIT, EPS, total assets in balance sheet, cash flow after investments, ROI and gearing level of the company. Scenario one is for growing development business and scenario two is for growing contracting. Group level revenue is 2 billion euros at start and it grows around five percent every year in both scenarios. If the possibility of risk is considered, cash flow is essential. Growing contracting business generates stronger cash flow in scenario 1 because there is less need for new investments. On the other hand profitability of contracting business is lower. Therefore EBIT by percentage of revenue starts to decline in scenario number 2 in normal market environment despite the strong cash flow. ROI seems to develop better towards YIT's 20 percent target in scenario 2 but this is partially misleading because leeway in contracting and infrastructure construction market is not very big. In the other

words, seeking 17 percent growth yearly from contracting business in competitive Finnish market, means automatically declining margins. Another misleading part of this simulation is that in weakening market company would probably adapt their production capacity to prevalent market environment. In table 10 company operates without adaptation in production capacity despite the weakening market environment. Therefore delayed projects generate revenue rapidly after a market shock and total assets in balance sheet grow significantly in declining market. To provide clear and comparable information of sales risk comparison between business models, adaptation was left undone in this scenario. It seems that only positive points in the scenario number two are stronger cash flow after investments, improving ROI due to lack of new investments and rapidly improving gearing percentage.

If figure 4 in literature part of this study is considered, these scenarios are probably the extremities of risk level and company should aim for the optimal risk level and profit. Based on these previously mentioned reasons a third scenario was created which is more comparable to real world.

8.3 Third scenario

Two previous scenarios were mainly explorational to point out the influence of sales risk. Because these scenarios image very strict black and white view of business, which is not applicable in real world, a third scenario was created to estimate financial figures of YIT in future. This scenario number 3 is similar with previous ones with a few exceptions. Firstly, revenue growths between divisions are slightly different compared to scenario one in table 8. In scenario 3 development business growth is one percent lower in each four divisions and contracting business growth percentage changes from zero to three percent. Secondly, company starts to make an adaptation of 10 percent in production capacity beginning from first quarter of year 1. Thirdly, after this company will not grow the amount of new projects quarterly in next two years. Revenue growth comes from previously

started projects with delayed sales. Notably, even with decreased amount of production, revenue leaps 26 percent in year 3 when all delayed projects come to an end and simultaneously new projects with normal income recognition profile start. Fourth of all, in scenario 3 contracting and infrastructure businesses suffer a one percent gross margin decline in weakening market due to increasing competition.

Table 6: Metrics of scenario 3

	Scenario 3							
	Normal market				Weakening market			
	Year 0	Year 1	Year 2	Year 3	Year 0	Year 1	Year 2	Year 3
Revenue	1997	2102	2212	2328	1953	1717	1726	2183
Growth %		5,2 %	5,3 %	5,2 %		-12,1 %	0,5 %	26,5 %
EBIT %	9,0 %	9,1 %	9,1 %	9,2 %	8,0 %	6,6 %	6,9 %	7,8 %
EPS	1,00	1,09	1,19	1,3	0,85	0,61	0,67	1,00
Total assets	1847	1932	2010	2091	1817	1648	1779	2036
Cash flow after investments	184	182	203	308	141	177	115	271
ROI		12,7 %	13,0 %	13,3 %		8,2 %	8,5 %	11,0 %
Gearing %		74,1 %	46,0 %	19,8 %		80,8 %	54,5 %	38,0 %

What is more, in this scenario even with lower production capacity, company creates higher profits in good market environment but still maintains strong enough cash flow in poor market environment. In every scenario ROI is alike with others when difference is less than 0,5 percent. This influences only from plot investment level which inflicts from sales price decline. If this would not be done, ROI would go a lot deeper with development business' plot investments. All results of this last scenario are presented in table 11.

8.4 Sensitivity analysis based on few variables

Previous scenario analysis was done with 25 percent drop of volume and 5 percent of fixed costs in every division. Analysis of this third scenario in weakening market with some variables was seen necessary to assess how different variables affect to different business measures. Gross margin, fixed costs, volume decline and sales price decline in development businesses were used as parameters in sensitivity analysis. This sensitivity analysis table is in appendix II. From figures for

sales price decline can be calculated the operating leverage which is 11 in year 1 when comparing company's normal sales to poor market with ten percent sales price decline. In this sensitivity analysis also contracting and infrastructure businesses have a gross margin decline of 1 percent during year one and two. This simulates a situation where competition presumably grows in contracting business which inflicts weaker gross margins.

From these variables, gross margin levels have the strongest influence on earnings. Gaining only two percent higher gross margin influences 25 percent better earnings. On the other hand, losing gross margin levels leads to strongest decline in earnings.

During interviews also possibility of rising interest rates was noted. Interest rates were seen mainly as a threat through our customers but with modeling the effect of rising interest rates were tested. Based on modeling, rising interest from 4 to 7 percent in general would cause around 20 million euros bigger interest expenses which would lower earnings for 10 percent. That is an expense which can be handled in corporate level but unsure is what it would do to customer demand especially in residential building business.

In this model the level of plot investments was tied in plot utilization and revenue growth. This means that in the model plot investments are made only in that amount which is defined by estimated revenue growth (or decline) without any additional assumptions. Plot investments are the biggest and most crucial entry for cash flow and as stated in literature cash flow is the most crucial entry for company's survival through weak market. If plot investments are made with too ambitious and unrealistic assumptions, risk related to sufficiency of financing and liquidity increases. Non-utilized plots tie a lot of capital in balance sheet and weaken key performance metrics like ROI. On top of that, plot development and construction requires additional capital which further increases the cash outflow.

Considering cash flows in scenario three between divisions arises a few key points. In this scenario plot investments and dividends are in very low level because the model calculates them as a percentage based on revenue growth and net profit. Now there is 115 million euros of free cash flow in year 2 but dividends would need at least 20 million euros to maintain “normal” level to keep investors satisfied and meanwhile plot investments would need 100 million euros to have a growth seeking perspective. In this situation, if for example interest expenses rise 20 million euros and currency exchange fluctuation causes 10 million euros, company must finance some of this growth with heavier debt load.

Residential building business in Russia seems to be solid and attractive business in good market but for bad market environment need for balancing business increases within the group. Value of shares in completed corporations grows four times bigger in bad market which partially creates pressure for declining sales prices. Though this is hypothetical and simplified modeling it gives perspective for the possible impacts. This raises one possible action in portfolio management which is threshold values for the value of unsold shares in completed projects.

Obviously, even last scenario number three is hypothetical in some manner. It is hard to see a situation where company would not seek for lower fixed costs and better margins after one poor year or even shorter time.

9 DISCUSSION

9.1 Conclusions

Research questions and findings will be presented here one by one. The first research question was:

- What are the main risks in YIT's business at the moment?

Interviews of managers were used in previous research of portfolio management level risks by Martinsuo et al. (2014) in order to clarify the severity of different risks in prevailing market environment. This research focused mainly on strategic risks. The definition which was used includes a perspective for strategic risk based on manufacturing, sales, competitive and asset impairment views (Simmons 2000). Based on interviews competitive risk is not very big because YIT operates in an industry which develops technologically quite slowly and operating margins are low. Obviously situation could be totally different in some other industry. Of course, competitive risk is always present and should also be noted. Barriers to entry in existing market are high especially in development business due to remarkable investment needs which lowers the possibility of new entrants. Also possibility of new product is relatively small. Reasons for this are low margins, competitive market and quite settled way to build housing. Obviously, this does not mean company will not have to follow customers' expectations and possibilities. Previously mentioned definition for competitive risk includes a possibility of disappointed customers which encourages them to change their provider. Especially in competitive market this requires constant attention.

- How to measure these risks?

One assumption before interviews was that there would be a little more variance in answers about risk awareness based on every person's different position, educational background, work tasks and perspective in general. Surprisingly, answers

were quite unified. Sales risk was commonly seen as a main risk of the moment in this business and it could realize in market shock situation which could derive from political or economic crisis which would probably be global. Thus, regional decentralization is not necessarily enough strong cover against a market shock. Based on this advance information simulation model was created in order to evaluate the whole business portfolio which consists of different business ideas. In this research simulation model was tested with public and partially descriptive figures. Based on previous research of this subject various NPV methods and real options were considered to use to estimate investment decisions and the project portfolio in general. It was decided not to use these methods because they were seen too complicated comparing to needs of the case company. Case company does investment decisions constantly every year and through the interviews investment process was seen very efficient and appropriate. In order to perceive a better image of project portfolio in general and the impact of possible market shock situation, new model was created.

- How project portfolio should be managed based on measurement results?

Some actions during market shock in housing market can be used to provide better sales and cash flow. Such actions are discounts of apartment prices, increasing number of investor projects, reducing investments, renegotiation of purchases and salaries, adjustments to production capacity including organizational adjustments and adjusting the amount of new start-ups. Obviously even with these actions it might be challenging to avoid losses in bad market environment due to high operating leverage in construction industry. Therefore the structure of portfolio should be balanced and it should face the requirements of present market environment.

One conclusion from this research and simulation study is that through any industry problems in risk management derive from narrow perspective in risk evaluation despite the nature of a risk. It does not matter whether the risk is safety risk at construction site or market risk if observer has too narrow perspective when assessing the probability and consequences of the risk. This research focused on cer-

tain case company but certain generalizations can be made. For example risk management principles are quite general between industries and presented project methods are commonly used in construction industry. On the other hand, methods and tools, such as the model created in this research cannot be easily used in other industries. Percentage of completion method is essential ingredient of this evaluation model. This revenue recognition method is used only in shipbuilding and construction industries and in some extent in machinery industry. Though must be remembered these industries mainly build ships and large machine units for certain buyer. As described earlier, in housing development business products are at least partially unsold in construction phase. The key finding of this research, which also took the most of the work, was the created model because it can be used to estimate company's project portfolio in future. Created scenarios and analyses give also an interesting image of different variables' effect to different metrics.

Primary area in strategic risk is in customers' affordability and that problem has two sections. Firstly, increasing taxation would probably reduce the purchasing power of a middle-class customer. Secondly, getting credit from creditors as a private buyer can be regulated by authorities and rising market interests automatically restrain borrowers. Relatively expensive housing is usually bought with credit though. One might say even though interest rate is always categorized in financial risk, in this business it comes through customers in sales risk even stronger.

Based on previous literature review, risk management has been seen to be very poor level in construction industry in managerial level in general. A related research presumed that this influences partially from engineers' narrow perspective in risk evaluation. Among these options, one reason for this through any industry is that investors do not seek answers for how managers are assessing risks and avoiding making losses. Investors mainly read annual reports to learn how managers are planning get more revenue and profit and possibly skips the risk man-

agement section. Unwittingly investor focuses on gaining profits, especially in good market. Unfortunately truth is risk realization usually happens very fast.

The subject of this thesis was challenging for three reasons. Firstly, such research has not been made in construction industry and portfolio management studies in financing and securities industry are considerably different. Second reason was that construction industry in general is not very uniform with various contractual methods. Various contracts also lead to different cash flow profiles and income recognition. Thirdly, creating a way to measure such business where almost every product is unique in some extent is a challenge. In the other words creating such system for an industry where every product is identical is slightly easier.

As a conclusion the reason behind company's main threat in main market area in Finland is increasing taxation, decreasing Gross Domestic Product (GDP) and therefore customers' decreasing purchasing power. This lack of sufficient funds affects two segments of YIT's business: first of all residential building, naturally, but secondly decreasing purchasing power of individuals affects the demand of commercial business premises because of suffering retail business. When increasing taxation causes decreasing purchasing power and economic situation in Europe, and this year also in Russia, remains unstable, customers become more cautious. This event, economic situation in Europe, was more widely taken into account in interviews, but this was discussed mainly from customer awareness perspective.

9.2 Further research

Based on these interviewing and modeling results it is possible to define boundary terms for portfolio management and to estimate their financial effect and applicability in real business. Such terms to define in portfolio management could be for example a limit for the unsold shares in completed corporations. Previously pre-

sented analyses were created to estimate the sales risk of development business and to provide one possible future scenario. The model which was created also allows creating almost endlessly more sensitivity and scenario analysis depending on variables and the nature of the market environment to simulate. Analyses in this research were made with public and descriptive figures. Thus company is probably willing to do analyses with real numbers leaning into future.

Literature suggested that every large company should have cross-functional team to assess all risks and their financial effect. This team should include people with different kinds of work tasks and educational back grounds. From these proposals and results can be conducted a wide perspective for crisis management. Naturally, assets to put in risk management must be smaller than possible gains.

BIBLIOGRAPHY

Books:

Bausch, A. & Schwenker B. 2009. Handbook Utility Management. Springer-Verlag Berlin Heidelberg. 808 p. ISBN 978-3-540-79348-9.

Fitzgerald, L., Johnston, R., Brignall, S., Silvestro, R. and Voss, C. (1991), Performance Measurement in Service Business, CIMA, London. ISBN 978-0948036781.

Hallikas, J., Karvonen, I., Lehtinen, E., Ojala, M., Pulkkinen, U., Tuominen, M., Uusi-Rauva, E. & Virolainen V. 2002. Riskienhallinta yhteistyöverkostossa. Metalliteollisuuden keskusliitto. Vantaa: Tummavuoren Kirjapaino Oy. 93 p. ISBN 951-817-762-7.

Horngren, C. T., Datar S. M. & Foster G. 2006. Cost Accounting – A managerial emphasis. Twelfth edition. 868 p. ISBN 0-13-149538-0.

Leitner F. 1915. Die Unternehmensrisiken. Berlino.

Liuksiala A. 1986. Rakennusalan sopimustekniikka. Jyväskylä: Gummerus oy. ISBN 951-682-123-5.

Neely A. 2002. Business Performance Measurement. University Press, Cambridge. ISBN 0-521-80342 X hardback.

Oberlender G. D. 1993. Project management for engineering and construction. McGraw-Hill Inc. ISBN 0-07-048150-4.

Pike R. & Neale B. 1999. Corporate finance and investment: Decisions and strategies. Prentice Hall Europe. ISBN 0-13-081270-6. 765 p.

Räty, P & Virkkunen, V. 2004. Kansainvälinen tilinpäätöskäytäntö – IFRS raportointi. 2nd edition, Porvoo, WSOY, 558p.

Suomen Standardisoimis-liitto 2011. SFS-ISO 31000. Riskienhallinta: Periaatteet ja ohjeet. Helsinki.

Schulmerich, M. 2010. Real Options Valuation – The Importance of Interest Rate Modelling in Theory and Practice. Springer – Verlag Berlin Heidelberg. 400 p. ISBN 978-3-642-12661-1.

Simons Robert 2000. Contributors: Dávila A. & Kaplan R. S. Performance Measurement & Control Systems for Implementing Strategy. Prentice Hall. Upper Saddle River, New Jersey 07458. 348p. ISBN 013-021945-2.

Suominen, A. 2003. Riskienhallinta. 3.uudistettu painos. Vantaa: WSOY. 221 p. ISBN 951-0-26878-X.

Tonchia S. & Quagini L. 2010. Performance Measurement – Linking Balanced Scorecard to Business Intelligence. Springer – Verlag Berlin Heidelberg. 841 p. ISBN 978-3-642-13234-6.

Vom Brocke, J., Hekkala, R., Ram, S. & Rossi M. Design Science at the Intersection of Physical and Virtual Design. Springer Heidelberg. 541 p. ISBN 978-3-642-38826-2.

Willet A. 1901. The economic theory of risk and insurance. Philadelphia University Press, Philadelphia.

Articles:

Cogliandro, J. Adding dimensions to portfolio management. *Industrial Engineer* Vol. 46, Issue 7, July 2014. Pp. 28-33.

Cleland, D. 2004. *Field guide to project management*. 2nd edition. New Jersey: John Wiley & Sons Inc. ISBN 0-471-46212-8.

Hlaing N.N., Singh D., Tiong R.L.K. & Ehrlich M. Perceptions of Singapore construction contractors on construction risk identification. *Journal of Financial Management of Property and Construction* Vol 13 No. 2 2008. Pp. 85-95. Emerald Group Publishing Limited. ISSN 1366-4387.

Kald, M. & Nilsson, F. (2000). Performance measurement at Nordic Companies. *European Management Journal*, Vol. 18, No. 1, pp. 113–127.

Keegan, D. P., Eiler, R. G. and Jones, C. R. 1989. Are your performance measurement obsolete?. *Management Accounting*, Vol. 70, No. 12, pp. 45–50.

Markowitz H. 1952. Portfolio selection. *Journal of Finance*, Vol. 7, Issue 1, pp. 77-91.

Marshall, M., Wray, L., Epstein, P. and Grifel, S. (1999). 21st Century community focus: better results by linking citizens, government, and performance measurement. *Public Management*, Vol. 81, No. 10, pp. 12–18.

Martinsuo, M., Korhonen, T. & Laine T. Identifying, framing and managing uncertainties in project portfolios. *International Journal of Project Management* No. 32, 2014. Pp. 732-746.

Moreno, D., Marco, P. & Olmeda, 2005. I. Risk forecasting models and optimal portfolio selection. *Applied Economics* Vol. 37 Issue 11, pp. 1267-1281.

Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. and Kennerley, M. (2000) 'Performance measurement system design: developing and testing a process-based approach', *International Journal of Operations and Production Management*, Vol. 20, No. 10, pp.1119–1145.

Olsson R. Risk management in a multi-project environment – An approach to manage portfolio risks. *International Journal of Quality & Reliability Management* Vol. 25 No. 1, 2008. Pp. 60-71. Emerald Group Publishing Limited. 0265-671X.

Petit, Y. & Hobbs, B. Project Portfolios in Dynamic Environments: Sources of Uncertainty and Sensing Mechanicms. *Project Management Journal* Vol. 41 No. 4, 2010. Pp. 46-58. Wiley Online Library.

Petit, Y. Project portfolios in dynamic environments: Organizing for uncertainty. *International Journal of Project Management* Vol. 30, 2012. Pp. 539-563.

Pheng L. S., Ho D. K. H. and Ann Y. S. Crisis management: a survey of property development firms. *Property Management* Vol. 17 No. 3, 1999. Pp. 231-251. MCB University Press. 0263-7472.

Sheehan N. T. A risk-based approach to strategy execution. *Journal of business strategy* Vol. 31, No. 5, 2010. Pp. 25-37. Emerald Group Publishing Limited. ISSN 0275-6668.

Strischek D. Operating Leverage and Break-even Analysis for Contractors. *Dev. RMA Journal* Jul/Aug2010, Vol. 92 Issue 10, p60-65.

Vollrath, R. 2001. Die Berücksichtigung von Handlungsflexibilität bei Investitionsentscheidungen – Eine Empirische Untersuchung. Realoptionen in der Unternehmenspraxis, pp. 45-77. Springer.

Zayed T. & Liu Y. Cash flow modeling for construction projects. Engineering Construction and Architectural Management Vol. 21, No. 2, 2014. Pp. 170-189. Emerald Group Publishing Limited. 0969-9988.

Zwikael O. & Globerson S. Benchmarking of project planning and success in selected industries. Benchmarking: An International Journal Vol. 13 No. 6, 2006. p. 698. Emerald Group Publishing Limited. 1463-5771. DOI 10.1108/14635770610709059

Other:

Engblom, J. 2003. Liikeriskit – Luonne, lajit ja riskikentän mallintaminen. Turun kauppakorkeakoulun julkaisuja. Sarja A-2:2003. 158 p. ISBN 951-564-132-2.

Harti, Jan. YIT Oyj. 2014. Vice President, Group Accounting. Interview. 8.5.2014.

Karvonen, Markku. 2014. Director, Mergers & Acquisitions. YIT Oyj. Interview. 29.4.2014.

Kauniskangas, Kari. 2014. Chief Executive Officer. YIT Oyj. Interview. 16.5.2014.

Kemppinen, Jouko. 2014. Senior Vice President, Investments. YIT Oyj. Interview. 30.4.2014.

Khan A. & Burn S 2013. Project Portfolio Management in Construction Industry. Booktango 1663 Liberty Drive Bloomington, IN 47403. 52 p. ISBN: 978-1-4689-3127-3.

Kirjanpitolaki 31.12.1997/1336.

Kirjanpitolautakunta. 2000. Yleisohje tulon kirjaamisesta tuotoksi valmiusasteen perusteella. Helsinki. Kauppa- ja teollisuusministeriö. 12 p.

Kiviniemi, Tero. 2014. Executive Vice President. YIT Oyj. Interview. 5.5.2014.

Ladvelin, Ari. 2014. Group Internal Audit Director. YIT Oyj. Interview. 23.4.2014.

Lehtinen, Timo. 2014. Chief Financial Officer. YIT Oyj. Interview. 8.5.2014.

Nummi, Juhani. 2014. Senior Vice President, Business Development. YIT Oyj. Interview. 23.4.2014.

Skanska Annual Report 2013. [Skanska web-pages]. [Retrieved July 18, 2014]. Available: <http://www.group.skanska.com/cdn-1cf69e733b12d56/Global/Investors/Reports/2013/Annual-Review-2013-EUR.pdf>

The Institute of Risk Management 2010. A structured approach to Enterprise Risk Management (ERM) and the requirements of ISO 31000. [E-document]. [Retrieved July 18, 2014]. Available: <http://www.e-finanse.com/RaportyCIMA/6.pdf>

YIT Financial Review 2013. [YIT web-pages]. [Retrieved July 18, 2014]. Available: <http://vuosikertomus2013.yit.fi/en/financial-review>

YIT Road Show Presentation, Frankfurt, March 6, 2013. [YIT web-pages]. Retrieved July 18, 2014]. Available: http://www.yitgroup.com/YIT_GROUP/Investors/Reports-and-presentations/presentations

APPENDIX

Appendix I

Revenue per project	Revenue per project	Revenue per project	Weakening Market	Weakening Market	Weakening Market	Year 0				Year 1				Year 2				Year 3				
						Q1	Q2	Q3	Q4													
67	67	67	71	64	64	3	8	14	22	13	7	8	5	3	2	2	3	7	13	21	13	6
75	67	63	30	61	60	7	3	8	16	25	15	9	8	3	2	4	4	3	7	13	21	13
32	64	63	70	84	60	13	6	1	3	6	9	5	3	2	4	4	4	3	7	13	21	13
74	88	63	21	32	82	29	18	9	3	8	15	20	3	4	2	2	1	1	4	10	18	29
22	34	86	50	24	84	7	11	7	3	1	2	3	4	2	6	4	4	2	2	4	10	18
53	25	88				3	5	8	5	3	2	4	4	2	8	6	6	4	2	2	2	5
	53	42										2	4	4	8	11	6	4	4	2	2	3
	75	32											2	2	6	11	15	8	5	3	3	1
	43													2	2	5	9	12	8	6	4	2
	25														1	5	3	5	7	4	2	2
						62	51	48	53	56	48	41	33	37	40	43	41	46	60	70	75	1

Appendix II

Sensitivity analysis for weakening market scenario																
		EBIT %			EPS			Cash flow after investments			ROI %			Gearing %		
		Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Gross margin (development)	-3 % Base case	2,6 %	2,9 %	3,7 %	0,15	0,19	0,38	75	2	158	3,2 %	3,5 %	5,1 %	96 %	84 %	82 %
	+2 %	4,8 %	5,1 %	6,1 %	0,39	0,45	0,74	132	72	239	5,9 %	6,3 %	8,6 %	85 %	65 %	54 %
	+2 %	6,3 %	6,6 %	7,7 %	0,56	0,63	0,98	168	117	292	7,7 %	8,2 %	10,9 %	78 %	54 %	37 %
Fixed costs (all)	+2 % Base case	2,8 %	3,2 %	4,2 %	0,19	0,25	0,49	154	95	269	3,5 %	3,9 %	5,9 %	84 %	62 %	48 %
	-1 %	4,8 %	5,1 %	6,1 %	0,39	0,45	0,74	132	72	239	5,9 %	6,3 %	8,6 %	85 %	65 %	54 %
	-1 %	5,8 %	6,1 %	7,1 %	0,50	0,56	0,87	121	60	224	7,1 %	7,5 %	9,9 %	86 %	67 %	57 %
Volume decline (development)	-50 % Base case	4,7 %	4,7 %	6,0 %	0,36	0,35	0,71	195	2	100	5,5 %	5,7 %	8,6 %	85 %	57 %	55 %
	0 %	4,8 %	5,1 %	6,1 %	0,39	0,45	0,74	132	72	239	5,9 %	6,3 %	8,6 %	85 %	65 %	54 %
	0 %	5,0 %	5,4 %	6,0 %	0,43	0,56	0,78	69	144	348	6,1 %	7,0 %	8,5 %	85 %	73 %	52 %
Sales price decline (development)	-10 % Base case	2,8 %	2,0 %	4,9 %	0,12	0,18	0,58	161	111	248	3,4 %	2,5 %	6,9 %	85 %	62 %	47 %
	0 %	4,8 %	5,1 %	6,1 %	0,39	0,45	0,74	132	72	239	5,9 %	6,3 %	8,6 %	85 %	65 %	54 %
	0 %	6,7 %	7,0 %	8,0 %	0,61	0,79	0,91	103	33	229	8,3 %	9,9 %	10,2 %	85 %	68 %	60 %