

Internationalization plan for software company

Heikki Närhi



Author(s) Heikki Närhi.	
Degree programme in International Business	
Report/thesis title Internationalization plan for software company	Number of pages and appendix pages 76 + 24
<p>Construction business has not traditionally been in the forefront of innovation. Most of project management work is made in traditional way using computer, pen and paper and working from the office instead of the field conditions using mobile devices. Modern way to work is to use mobile project management software to ease the work load of project management, site management and control.</p> <p>During the recent couple years many software companies have risen in Finland and abroad to tackle the mobile project management in construction. The benefits of mobile project management are: improved quality, safety, productivity, documentation and communication.</p> <p>This product oriented thesis is commissioned work for Consight Ltd, Finnish construction project management software company. The primary goal of this thesis to produce roadmap for internationalization for Consight Ltd. to be used in later expansion to international markets.</p> <p>Second objective of this thesis is to a look into the future of project management software development and building information modelling (BIM).</p>	
Keywords Internationalization, project management, construction software company, BIM	

Table of contents

1	Introduction	1
1.1	Background	1
1.2	Purpose of the study	2
1.3	Terminology ICT, Internationalization, PM and BIM	4
2	Construction industry overview in Finland	6
2.1.1	Construction as a part of economy.....	6
2.1.2	Building Construction	7
2.1.3	Infrastructure	8
2.1.4	Construction product industry.....	9
2.1.5	Real Estate.....	9
2.2	Finnish software industry overview	10
2.3	Construction industry overview Global perspective.....	10
2.4	State of project management Global construction survey by KPMG	11
2.5	Project management in construction	13
2.6	Stages of construction project Finnish model.....	14
2.7	Project management parameters	15
2.8	Construction project management software	16
2.9	General concept in pm software and construction	17
3	Functional framework	19
3.1	Project management software and standards	19
3.2	Conventional vs. mobile construction management.....	19
3.2.1	History from CAD to mobile.....	19
3.2.2	Mobile tablets enter the scene	20
3.2.3	Mobile project management proves itself.....	21
3.3	Benefits of mobile construction software.....	23
4	Theoretical framework Internationalization	24
4.1	Introduction.....	24
4.2	Globalization and Internationalization defined.....	24
4.3	Concept of life cycle	25
4.4	Theories of Internationalization	27
4.4.1	Born Global, Organic and Collaborative models	27
4.4.2	Uppsala model of internationalization	28
4.4.3	Innovation Based Internationalization model.....	32
4.4.4	The network approach model.....	33
4.5	Strategy and internationalization	34

4.6	Strategy work and Internationalization planning.....	36
4.6.1	Basic readiness to internationalize.....	38
4.6.2	Marketing considerations	38
4.6.3	Analysing tools	39
4.6.4	Market surveys	39
5	Empirical part: Internationalization plan /road map.....	41
5.1	Internationalization Road Map.....	41
5.2	Product Internationalization Road Map	44
6	BIM	48
6.1	Foreword	48
6.2	What is BIM Building Information Modelling?.....	48
6.2.1	BIM Classification.....	49
6.2.2	Finlands BIM initiative	51
6.2.3	Successful BIM implementation	52
6.3	Where is BIM utilized?.....	56
6.4	BIM challenges and future trends.....	58
6.5	BIM impact Finland.....	60
6.6	BIM and Collaboration considerations.....	60
6.7	BIM and Consight.....	61
7	Discussion	63
7.1	Consideration of results.....	63
7.2	Trustworthiness of the research and Ethical viewpoint	64
7.3	Conclusion and suggestions for development.....	65
7.4	Self-Reflection	65
8	References	67
	APPENDIX 1	76

1 Introduction

1.1 Background

This thesis is a commissioned work for ConSight Ltd, producer of mobile project management software for construction and property management. ConSights mobile software is used in digitising building construction control (valvonta), inspections (tarkastukset), site inspection record cards (tarkastusasiakirja), defect remarks (virhehavainto), construction safety measurements and task design in co-operation with all construction project parties and stakeholders. The overall idea of the mobile software is to help the daily functions of construction site manager, clerk of works or project representative (valvoja), increase their efficiency, produce and store data for quality control and required official municipality documentation.

Internationalization is part of Consights business strategy. I was commissioned to make road map for internationalization for Consight Ltd and encompass in the process pilot project of market automation using Mautic. Marketing has been in transition during the previous decade. New possibilities and challenges have emerged in realm of marketing. Some Finnish software companies have succeeded well in using digital distribution channels, experimental business models, digital marketing and production automation (FSIS, 2015). Mautic was excluded from thesis due to program development delays and could not be done within the projected timeframe. The realigned idea was to look and evaluate opportunities of internationalization in software business.

It is estimated that year 2015 in Uusimaa county large and midsize companies have around 350 big projects on going that would benefit from mobile construction site management (Kemppainen, interview 23.4.2016) Direct cost benefits using mobile construction management software can be traced to saving cost of poor quality; by inspections, documentation and communication.

Another area of cost savings can be achieved by tracking and documenting subcontractor disorderliness (JPL) after or during their work. Work area has to be kept in order for safety reasons. It is commonplace that contracts stipulate that the subcontractor has to clean up the working area. For larger companies that have multiple projects subcontractor failure to meet the requirements of contract might cost annually several hundreds of thousands of euros (Sipiläinen, 2014, 14).

I'm a student of construction site management in Metropolia University of Applied Sciences and I got acquainted with mobile project management software during my studies. Previously I was working as site manager in construction service company. We were dreaming of system that would make our job easier and faster on the site and that could be portable. Consight has produced this kind of system. The aim of Consight is to develop construction sector that has been stagnant in mobile project management. I'm eager to bring my contribution to specific internationalization related issues in developing Consights business.

Many established international construction companies have already taken steps to mobile project management and developed their operations in house or using the existing software. There is still plenty room for growth in the digitalization of construction. The overall efficiency in construction site management is improved significantly by using mobile software with easier communication and documentation between the construction site parties.

1.2 Purpose of the study

Purpose of the study is to produce internationalization road map to construction management software company Consight Ltd. The thesis offers review on both construction and software arena and links this to internationalization of a company. This review was needed to give more comprehensive understanding to the outlining factors of internationalization for specific company operating in the conjunction of IT and construction. This was also needed for the author to clarify and gain understanding in not so familiar area of software business.

This study is needed because the company Consight is engineer led company and has limited proficiency and understanding about the process off internationalization and risks of it. Consights potential in Finland is substantial but internationalization would give the company global potential to become start up success. Aspects of start-up success are dealt more in the internationalization Road Map part of this thesis. The company was in its early stages of development with new software version for IOS and Android coming out during fall 2016.

There is great buzz in the mobile construction PM software market and many other companies around the world are developing similar programs. Some of them have gained considerable market share in their area of operations. The “Buzz” is related to bigger picture of digitalization of construction industry. This digitalization includes BIM, IoT, Big Data, VDC (Virtual Design in Construction), AR (augmented reality) The future of mobile construction project management is taking place and usage of it will increase significantly. Finnish competitor Congrid Ltd will launch their efforts to international markets as they have secured foothold in Finland.

Construction is a bastion of old fashioned thinking and methodology but new technological innovations that offer productivity and quality are paving the way for future. Consight is in the forefront of this new thinking along with its competitors.

Internationalization plays major role in Consights business. This research can help Consights management to the path of internationalization, secure future funding for it and give the management decision making tools for the process. To be left outside internationalization is not an option, construction is global business and the only way to secure place in the future is to grow and conquer business abroad. There is no turning back in rethinking construction management without modern way of using mobile IT.

The benefits of this research for the commissioning company are that they are more knowledgeable on their options of internationalization. They have theoretical framework for internationalization and they can make plans for the future internationalization of their company. The management of company can more easily evaluate the costs, benefits and risks of internationalization.

BIM, Building Information Modelling, part of this thesis is trying to answer to future product development that is taking place in construction and is also affecting mobile construction project management. More and more planning is made using BIM and it is important that PM software could at some point use IFC and contribute to BIM environment. The BIM part of this thesis aims to answer BIM market penetration and future related questions.

1.3 Terminology ICT, Internationalization, PM and BIM

ADCT = Automated Data Collection Technology, collecting data and entering that data directly into computer systems (i.e. without human involvement). ADCT include bar codes, Quick Response (QR) Codes, radio frequency identification(RFID), magnetic stripes and voice recognition.

AGC = Association of General Contractors

Android = operating system

API = application programming interface

AR = Augmented Reality

BAM = Building Assembly Model (MacLeamy)

BFC = Building Collaboration Model

BIM = Building Information Model (Rakennuksen tietomalli)

BOOM = Building Operation Optimization Model (MacLeamy)

Born Global = A term describing accelerated international often global growth path almost from inception (2-3 years).

CDE = Common Data Environment, way to organize and share data in building project.

Cloud = IT service provided for customer using service provider's servers.

Cobie = The Construction Operations Building Information Exchange standard, does not include geometric data, review of 12 standards, BIM is one information source to Cobie.

DOI = Degree of Internationalization

FOM = Foreign Operation Mode. Foreign operation modes can be defined as the institutional or organizational arrangements that are used in order to conduct an international business activity (Welch et al 2007,18)

Global = company is Global when over 50% of its sales comes from outside its home country and it has global presence in Asia, Europe and N. America.

Global niche = specialized market which is spread across countries globally.

ICT = Information and Communication Technology

IFC = Industry Foundation Classes, is standard used to represent building and construction industry data

Internationalization Pathway = Process of internationalization measured by different variables e.g. presence in foreign countries, sales, employees, owners and international staff. Pathway includes four stages: 1. Pre-start, 2. Start, 3. Growth, 4. Consolidation and maturity. Three distinct pathways 1. Organic, 2. Collaborative and 3. Born Global differ in time that is used for the three firsts stages.

IOS = operating system for Apple phones

JPL = Finnish term describing disorderliness caused by construction subcontractor or other party in construction site (Järjestyksenpuutelistista)

MEP = Mechanical, Electric and Plumbing.

IoT = Internet of Things, products, items or services connected to web produce intelligent ecosystems for differing needs.

IT ecosystem = IT system comprising of elements that create functional environment e.g. Apple or Android ecosystems.

LandXML = BIM standard for Infra

PLC = Product Life Cycle

Punch List = a contract document used in the U.S. building industry by the architecture and building trades to organize the completion of a construction project. (UK term Snagging)

REST = Representational State transfer is mobile application architecture format.

SaaS = Software as a Service

SCB = Superior Customer Benefit / competitive advantage

VC = Venture Capital

VDC = Virtual Design in Construction

Internationalization parts partly Adopted from (Äijö et al. 2005, xv-xvi)

2 Construction industry overview in Finland

This section will provide a short overview about construction and Real Estate as a business area in Finland. Then it is easier for the reader to follow on the main text without prior knowledge of construction business. Enlightened readers might move to section 1.9 p.10 Finnish software industry overview.

2.1.1 Construction as a part of economy

The built environment with infrastructure is basis for wellbeing and competitiveness in Finland. Approximately 60 -70% of the national wealth of Finland is tied to buildings, infrastructure, and built land areas. (Rakli, 2013; RT, 2012) Real Estate and Construction Cluster provides work directly or indirectly for every fifth Finn. Housing is the single largest liquid asset for households and for the whole nation of Finland. Construction related investments comprised 66% of all investments made in Finland year 2011. Construction and Real Estate cluster employed over 520 000 people year 2011 and 1-million-euro investment in construction employs on average 15 persons for a year in construction site, product industry and services. (RT, 2011.)

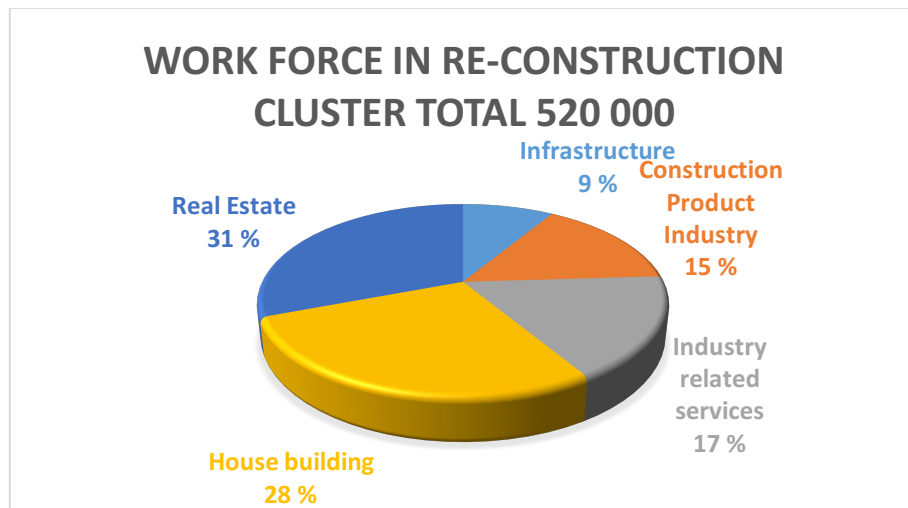


Figure 1. Building Industry Social influence (Rakentamisen yhteiskunnalliset vaikutukset, 2012)

Construction market in Finland is divided in three parts: 1. Infrastructure 8 Billion €, 2. Building Renovation 10,3 Billion € and 3. New buildings 11,2 Billion €. The total amount of construction market was 29,5 Billion euros in 2011. The aging housing stock is raising the share of Building renovation of the total amount of construction market to exceed new built share of the market. (RT, 2011.)

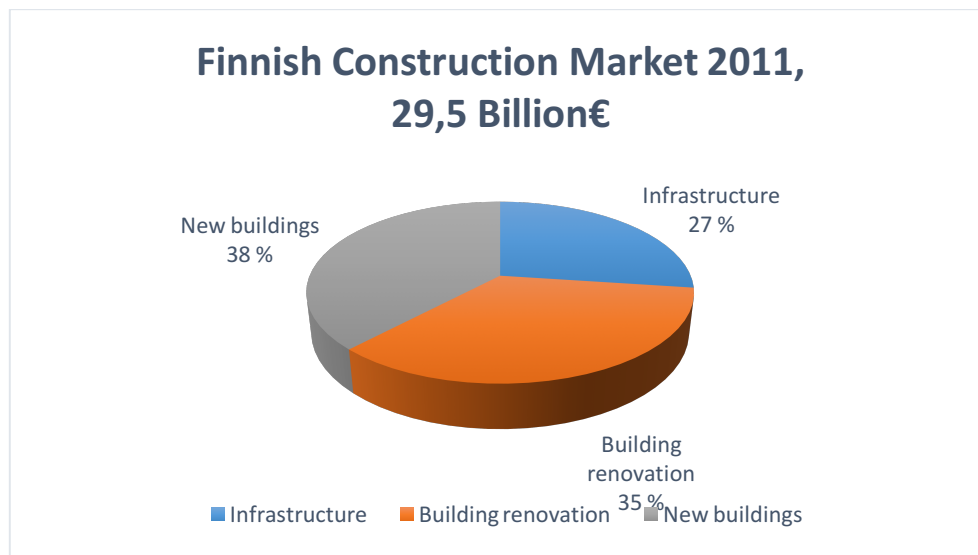


Figure 2. Finnish Construction Market (RT 2011)

2.1.2 Building Construction

Households are the biggest clients in building construction 53% in total including residential housing companies. Companies represent 33% of the total clients and 12% of the clients are municipalities and government. In any occasion even though government would subsidise the sector with investments in infrastructure in downturn the influence is relative small to the total market. Market is driven by household consumption. (RT, 2011.)

The amount of housing renovation is growing in relation to new built. In 2011 the figures were equal but now renovation is slightly higher in value. Total number of residential apartments built per year 2011 was 31 500 (11 000 detached buildings and 20 500 row houses and block of flats). The number of apartments built has been in decline for 4 consecutive years from 2011. Year 2016 the total number of apartments built is anticipated to be around 29 000 units. (RT, 2016.)

Business premises built in Finland are in three equal size segments: 1. Business and office buildings, 2. Public buildings (schools, hospitals) and 3. Industry and warehouse buildings (RT, 2011). The following table shows the biggest construction companies in Finland year 2015 measured in euros. They all have strong presence in the Nordic countries.

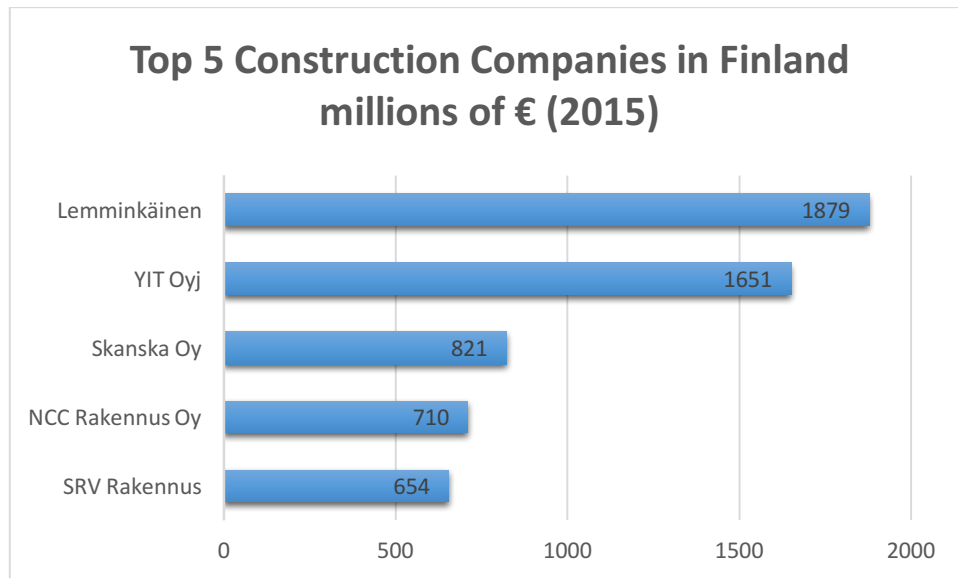


Figure 3. Top 5 Construction Companies in Finland (Rakennuslehti 13.5.2016)

Investments in building construction employ around 16 persons per 1 million € investment on regular work schedule. The money invested in construction is spend 55% in materials, 35% on construction site an 10% in services (design, trade, logistics, financing and insurance). Around 20% of the construction investments is spend on imports. (RT, 2011.)

2.1.3 Infrastructure

Infrastructure comprises of all necessary technical structures for daily living: streets, roads, tunnels, bridges and also harbours airports, technical networks (water, electric, sewage, heating, IT) underneath the earth. Also recreational green zones like parks are part of infrastructure. Infra builders build and maintain the infrastructures and with big earth moving machines they make the foundational work for housing construction. Over 25% of the total volume of construction is infrastructure. 8 Billion euros is spent annually on building, repairing and caring for infrastructure. The main customers in infrastructure are government, municipalities, and in foundation work and in mining the private sector.

One-million-euro investment in infrastructure employs 15 persons for a year. In total 45 000 people work in infrastructure. (Infra ry, 2015.)

2.1.4 Construction product industry

Construction product industry is divided according to Finnish Construction Product Industry Association (RTT) in four categories: 1. Concrete, 2. Small residential building industry, 3. Building materials and 4. Steel (RTT, 2015). The total value of construction product industry in housing construction in Finland was 14,75 Billion € in 2011. The value of product industry in infrastructure is 35% of the total value of 8 billion €, but 20% of it is bitumen for pavements and fuel for the infra machines. Thus the total value of construction product industry including building construction and infra is 15,95 Billion € year 2011. (RT, 2011.)

Concrete in construction product industry comprises of around 50 companies and the total annual turnover of concrete construction product industry is around 1 billion euros. The small residential building product industry comprises of small wood, log and concrete houses. Building materials sector comprises of vast variety of product categories such as 1. Ceramic tiles, 2. Light weight concrete products, 3. Light Weight Clay Aggregate products, 4. Gypsum products, 5. Stone aggregates, 6. Fibre Cement products, 7. Mortars, 8. Insulation products (mineral wool, eps, xps), 9. Water membranes, 10. Fireplaces and pipes, 10. Scaffolding, 11. Cement, 12. Sandwich panels, 13. Engineered panels and Engineered lumber products and 14. Construction elements. (RTT, 2015.)

2.1.5 Real Estate

In 2015, the total value of all Real Estate housing transactions in Finland exceeded 17.3 billion Euros. The number of deals on existing and new housing units reached 100,000, which means an increase of 3.7% from previous year. Total amount of housing transactions has been low during recent years compared to time before 2008. (KVKL 2015). There are around 4600 licenced real estate brokers operating in around 1500 real estate companies (Ammattinetti, 2014).

2.2 Finnish software industry overview

Consight produces software for construction and is part of Finnish software industry. Finnish software industry has grown 2014 20,6%. Software industry in Finland has been growing since 2009 over 4.9% annually. This is due to game firms and smaller firms contributing most of the growth. Bigger companies have had mixed results and overall Finnish software industry growth during 2010 - 2014 was over 10% exceeding the global growth of the industry (FSIS, 2015).

Some of the software companies have been able to utilize modern e-commerce delivery and marketing channels. Helsinki Stock exchange listed IT-service companies have gone through tough times and their revenues have decreased in overall 2,2% from 2013. Industry has two main service oriented business models:

1. *“Standard applications over the Internet:*

- *For sprinters: Reacting quickly to changes in customer needs.*
- *Software firms make use of platforms / ecosystems.*

2. *Integrated solutions:*

- *Full service: Consultancy, Implementation, Operating*
- *For marathoners: Long-term, mutual relationships with customer*

Both types are service-oriented and represent the third step after customer-specific software and software products.” (FSIS, 2015.)

According to Finnish software industry there is a paradigm shift taking place when big projects are changing into cloud based services, scalable products and digital services. It is anticipated that service providers should apply experimental business development using digital marketing and product automation in new ways. (Ohjelmisto yrittäjät, 2016, Finnish software industry survey 2015.)

2.3 Construction industry overview Global perspective

Global construction is 9,5 trillion-dollar business. According to Global Economics forecast for construction industry 2030 (Oxford Economics, 2015), construction output will rise by 85% towards 2030. Oxford economics consulting firm has researched 48 countries and

made estimate that the growth of Global construction will be 8 trillion USD reaching total of 17,5 trillion USD by year 2030. This is due to economics of China, India and US. Main drivers for Global construction growth will be China, India and United States. China is already the world's biggest construction market, urbanization being the driving force in China. US is fastest growing developed country with estimated annual 5.0% growth in construction to year 2030. (Oxford Economics, 2015.)

According the Oxford Economics report there are going to be top 8 construction markets that will account 70% of the growth in construction by 2030. They are: China, US, India, Indonesia, UK, Mexico, Canada and Nigeria. Strongest European construction markets are Germany and UK. UK is predicted to overtake Germany's position as biggest European construction market by year 2025 due to higher average growth of 2,9%. UK will have long and medium term megaprojects and also China is investing heavily in UK infrastructure. (Oxford Economics, 2015.) Trends in global construction business should be taken into consideration when planning internationalization and country selection.

2.4 State of project management Global construction survey by KPMG

KPMG Global LTD interviewed over 100 senior executives from global construction companies sizing from few million USD to well over 5 Billion USD (PKMG, 2015,2). According to KPMG Global construction survey 2015, 64% of construction companies say that their management procedures are optimized or controlled, and 55% of them were satisfied with their investment in project management. However, 51% of the companies experienced one or more underperforming projects. In Energy and natural resources, the subsequent number of underperforming projects was 71% and in public sector the number of underperforming projects was 90%. Only 31% of all projects came within 10% of budgeted in 3 years' time span and just 25% of projects came within 10% of the time frame allocated for the project. In other words, 69% of all projects were not in budgeted and 75% of the project exceeded the time reserved for the project (PKMG, 2015,7).

This points out that there is significant amount of work that can be done in-order to improve timelines and budgeted control of construction projects. Projects can be divided in 4 section: Idea, planning, execution and usage. And most of the cost structure is defined and fixed in the idea and planning phases. Still there lies a rich area for improvement in construction project management.

According to survey 82% of the CEO's expressed need for greater owners vs. contractor collaboration. *"Only 32% of the CEO's had high level of trust in their contractors and 69% of the CEO's said that poor contractor performance was the single biggest reason for project underperformance".* (PKMG, 2015,6.)

Survey stated that 50% of the interviewed companies were using Project Management Information System (PMIS) and 42% of the remaining had plans to commit using such system in the coming 2 years' time. 32% of the ones using PMIS did not have it integrated to accounting and procurement software (PKMG, 2015,6)

Short analysis of PKMG survey

What this means to software company that is specialized in project management?

There is a definitive need for more effective project management and control. Over 2/3 of Global projects are underperforming both financially in in timewise. Even though better construction project management in the production phase does not solve the problems or challenges created in idea and planning phase, there is a significant contribution to better time and cost control during the project. For individual contractor this better management of resources may be question of life or destruction as profit margins are under heavy competition. There might be complacency in companies that they already have what they need in project management in spite of the poor results, resulting also in change resistance to adopt new management tools.

The good news is that many company owners or CEO's are planning to invest in project management information systems. Integration to existing systems is deemed to be important. The benefits of communication and control by mobile software prove to be valuable as 82% of the CEO's want more collaboration and communication between the parties; controlling and documenting is need because of distrust between contractors and subcontractors. Benefits of mobile project management software help especially in tracking the defect remarks and their repair path, thus improving the quality and efficiency of management. This vital information could be leveraged by start-up companies working in the field of Mobile Construction Project management to acquire capital and to reason and attract Venture Capitalists (VC's) to invest in this high market potential.

2.5 Project management in construction

Short overlook is taken into Project Management definition in order to give the reader better understanding of the concept and scope of this pm software and the international pm environment. The questions regarding different modes of project management execution in different target countries is vital information in the internationalization process.

The Chartered Institute of Building (CIOB) UK based, according to their own description, “*world's largest and most influential professional body for construction management and leadership*” (CIOB, 2016) defines project management in construction as follows:

“Project management in construction is the overall planning, co-ordination and control of a project from inception to completion aimed at meeting a client's requirements in order to produce a functionally and financially viable project that will be completed safely, on time, within authorised cost and to the required quality standards” (CIOB, 2011, 4)

Construction projects are time consuming undertakings. Project normally consist of several phases that demand multitude of participants undertaking in the process. These professionals are from financial organizations, engineers, architects, lawyers, insurance companies, governmental agencies, contractors, material and equipment manufacturers, suppliers, and construction craft professionals. (Sears, S. Keoki, Sears, Glenn A., 2015, 6.)

Even a small construction project deals with multitude of skills, diverse materials, and hundreds of different construction tasks. Every construction project has unique features. Each project is tailored to suit the environment according to constructability and reflect the desires and needs of the developer and end customers. Construction is subject to many variables and unpredictable changing environmental factors. Construction team tends to change from project to another. Variety of site conditions such as subsoil, topographical dimension, climate, transportation, material supply, utilities and services, cost of construction, labour conditions, and technical knowledge— are changing from project to project in construction. (Sears et al, 2015,6.)

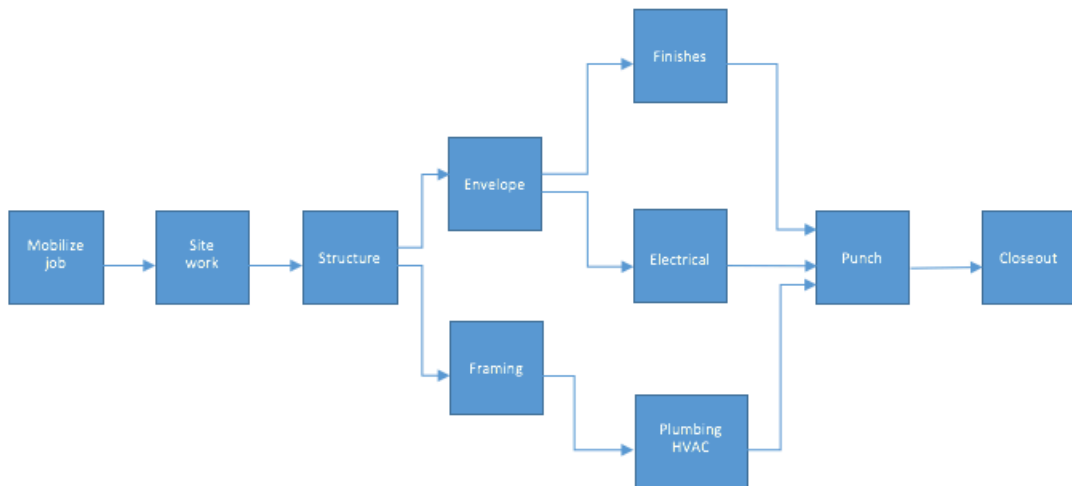


Figure 4. Simplified example of project flow adopted from (Sears et al, 2015,33)

Mobile construction project management software is able to enhance communication between contractors, designers, developer and subcontractors. It is especially used in documentation and in sorting punch list items during construction phase.

2.6 Stages of construction project Finnish model

The main stages in Construction project are: 1. Idea stage, 2. Planning stage, 3. Execution stage and 4. Occupation stage (RT 10- 10387).



Figure 5. Main stages of Construction project (RT 10-10387)

In depth work flow of Finnish Construction Project describes the complexity of different stages and stakeholders involved. The Finnish Construction Project is very similar to CIOB extensive construction project lifecycle (CIOB, 2011, XX) or RIBA Plan of Work 2013 chart. Evaluating these charts helps the reader to have understanding of the similarities and differences between basic project workflows and stakeholders in couple of different countries. This helps the company to position their product offering in right setting in

the construction area, even though finding out PM differences in different countries is just a starting point for in the process of internationalization. It is important to have basic understanding in the common project forms in the target country. More construction specific information and sources especially regarding Nordic countries and Baltic is provided in the Internationalization Road Map for Software company.

2.7 Project management parameters

Construction projects are very complex processes that involve both technical proficiency, adherence to official requirements, good command of economics and operations and smart contractual usage. In international environment understanding of the project modes and terms is very important.

Aspiring start-up company needs to get hold of this information in order to be able to offer their products in the international construction landscape. Different project management formats vary from country to country. The Finnish way of working is described in newly published (15.6.2016) in document Project Management Flow and contractual terms RT 10-11223.

It may be wise to contact renown host country Universities or affiliates like Civil engineer or architect associations in order to find out Project management modes of the target country.

In Finland the different forms are 1. Single Contract (pääurakka), 2. Split contract (jaettu urakka), 3. Design and Build (SR or KVR), 4. Project management contractual modes: A. Management contract (projektinjohtourakka) B. Contract Management for fee with Site Management (projektinjohtopalvelusopimus), C. Construction Management CM (Projektinjohtorakentaminen) 5. Project Partnering (Hankekumppanuus), 6. Project Alliance (Projektialianssi), 7. Public-Private Partnership (Elinkaariurakka, PPP-hanke), 8. Integrated Project Delivery, IDP (Integroitu Projektitoimitus) and 9. Hybrid models (Hybridimallit) using parts from Alliance and IDP project delivery models. (RT 10-11223).

For the purposes of this written work different contractual forms are not dealt with. It is important that the reader can find the source and becomes convinced that it is important to know and understand the host country contractual forms. Very little information is found

straight considering the forms of contractual arrangements in construction projects in different countries. Even though generic construction project work flows with stakeholders can be found. In the turn of century Aalto university made some research on contractual forms in Great Britain and USA (Rakennustieto RK040201).

2.8 Construction project management software

Sections 2.8 and 2.9 illustrate the business landscape of construction project management software in general, to give overview of the complex software environment and where Mobile construction PM software has to fit in. In its life cycle mobile construction project management is coming to early main street (See 4.3 Concept of life cycle).

The software product market fit needs to be perfect to suit the growing market and already established procedures. Different disciplines in the construction arena have their well-established own software products. Mobile PM Software need to bring its added value to the established market. It would be ideal that the PM software could use the data from existing sources and provide data to the existing program e.g. in CRM or other business or construction disciplines, even though the already existing features of mobile PM software bring considerable benefits in construction.

Software Advice Inc., Gartner based company makes extensive research on construction management software and customer buying behaviour on yearly basis. Software Advice Inc. has consulted over 397 000 companies in different business areas in software selection. According to survey made (2013 and) 2015 among their construction company clients, the results were as follows:

1. *“Fifty-two percent of prospective software buyers in construction use pen and paper to conduct estimating, take off, bid management and other processes.*
2. *One-third of prospective buyers say that improving the accuracy of estimates is their top reason for seeking new construction software.*
3. *On average, prospective buyers are willing to spend \$7,766 for the purchase of new construction software.” (Software Advice, 2015.)*

According to Software Advice (2015) Ecosystem thinking has come to play significant role in IT purchases. The desired functional base of features required is: “bidding, estimating, take-offs, accounting and overall project management “.

In their earlier survey 2014 Software Advice Inc. studied the Impact of Job Roles on Construction Software Purchasing Decisions. Construction market is great in diversity comprising from micro companies to global players. Their adaptability of IT-solutions to their business varies greatly. This survey was based on thousands of companies in construction which have contacted Software Advice for consulting on buying IT for their construction company.

Key finding of this buyer behaviour survey in construction were:

- 1 Business owners value improving accuracy and organization but regard company growth (24%) as their number one reason for new software purchases.
- 2 Project managers valued integrated programs that have most desired features “all-in-one” application or high integration between the best applications available. (35%).

In other words, Software Advice buyer behaviour survey shows that companies are searching for improvements in their organizational efficiency, accuracy and growth and they want the top tier of solutions that resolves multiple problems or has high interoperability with previous solutions. Marketing wise these results are important to consider when going forwards with international aspirations, even though results may differ to a degree in different target markets.

2.9 General concept in pm software and construction

Project management software in construction can be divided in different categories. As company sizes differ from micro companies to billion dollar Global players, the needs are different. In broad categories software features are 1. Planning software, 2. Site management software and 3. Economic software. Software can form ecosystems that incorporate different kind of software spheres.

Some technology companies like Trimble, that is operating in construction, has acquired several other companies to develop and provide IT ecosystems for construction. Trimble has acquired Tekla BIM planning company and Vicosoft schedule planner company (Trimble, 2011; 2012). The software solutions of Trimble are highly developed but according to

VDC specialists in Aalto university BIM course (2016) they still lack full integration and reliability e.g using BIM in quantity take offs. Trimble with its orientation to integrated ecosystems follows the desires of target customers for all in one suite (Software Advice 2014;2015). There is was no direct research data that could be found on usage of software in construction in Finland. Some of the most common construction software used in Finland are as follows:

1. Planning software: Tekla Structures, ArchiCAD, AutoDesk product family Revit, MagiCAD, CADS, Riuska (Simulations).
2. Site management: Solibri Modelchecker, BIM360, TeklaBimSight, Dalux, Congrid,
3. Economic software: Evry Jydacon, ECOM, LVISnet, Tocoman TCM Planner /Pro, Klaranet, Vico Control / Schelule Planner, JCAD.
4. Multi software: Vico Office, Haahtela

Many products of the bigger software houses are in global use in construction e.g Tekla product family, ArchiCAD and AutoDesk. There is a definite need for programs to become more mobile. REST and API interfaces are used to get software to function in mobile devices.

American service provider Capterra Inc. and Software Advice Inc. both operate in the same business area to help customers in different business fields to get software that is best suitable for the customer. Capterra divides software for construction business in Accounting, CRM, Estimating and Construction Management software. Both websites list e.g. over 150 programs used in construction management. Both websites provide valuable service to customers searching construction software and also act as reference list to evaluate international competitors in software for Consight. (Capterra, Software Advice, 2016)

3 Functional framework

3.1 Project management software and standards

Projects are becoming inherently more complex and more collaboration is needed between the stakeholder in order to deliver product (building) that serves the customer throughout the life cycle of the building. Efficiency not only in construction is needed but also because of the lifecycle costs of operating the facilities. New regulations and fear of climate change are forcing planning and execution to become more energy efficient. Different kind of project management software enables co-operation and smoother work-flow between the different disciplines of construction from design, to MEP, to construction and Facilities Management (FM).

In order to be able to communicate between different disciplines software standards are needed. There are several standards used and also under development. Important software standards in construction are IFC, COBie, BFC and LandXML.

IFC *Industry Foundation Classes* data model is used to represent building and construction industry data (BuildingSmart, 2016). **COBie** is data format related to Building Information Model containing building information but not geometric data. COBie helps to capture and record important project data. COBie has been merged into software for: “planning, design, construction, commissioning, operations, maintenance and asset management.”.(buildingSmart, 2016.) **BFC** is collaboration format that allows to transfer intelligent messages between various design programs like Tekla Structures, Solibri Model Checker, Cads Planner and DDS Architecture. **LandXML** is used in Infrastructure information modelling as a standard. (buildingSmart, 2016.)

3.2 Conventional vs. mobile construction management

3.2.1 History from CAD to mobile

The paradigm shift that has been taking place in the construction industry has its roots in development of CAD Design from 1960s to 1970s (Törmä, 2016). By the time of 1990s CAD Design started to be quite widespread in the industry, but the problem was that there

was no communication or interoperability between the software and little collaboration between the construction parties (MacLeamy, 2012). Private Alliance was created year 1995 between companies related to design and construction. They saw that internationally recognized open standard for interoperability has to be created. International Alliance for Interoperability (IAI) was established in London year 1996 with representing parties from North America, Europe and Asia. IAI changed its name to buildingSmart year 2008 to reflect better its values and aspirations. BuildingSmart is aiming to develop global digital standards for the built environment and it has presence in major Western countries. BuildingSmart standards like IFC have ISO accreditation. (buildingSmart, 2016.)

3.2.2 Mobile tablets enter the scene

Some early and crude versions of tablet mobile devices entered the market in the mid 1990s and the market offering was increased during the first decade of 2000. The Apple released its first iPad 2010 with overwhelming success and made the tablets mainstream. At the same time Samsung launched their first Android OS based tablet. By the early 2010s the calculation power of processors, memory capacity, wireless connections and camera capabilities had advanced significantly and application development had increased tremendously. (Wikipedia, 2016)

The earliest conceptualizations and case study researches using mobile construction project management were made by Löffgren (2006). The research project started in Royal Institute of Technology in Stockholm with Skanska year 2004. The overall aim was to research how to improve ineffective communication in design and production and enhance collaboration in construction (Löffgren, 2006,I-II).

Skanska continued collaboration with research institutes throughout the decade. They started to implement mobile devices extensively year 2012 rolling out 1000 iPads around US business units in few years' time. The aim was to make construction crews more efficient through the use of mobility. (WSJ, 2012)

3.2.3 Mobile project management proves itself

Skanska's interest in mobile project management was increased after research made by Michael Moran (2012). The Skanska research project showed that using Field Data Management Tools (FDMT) the manager saved on average 9,1 hours of their weekly work time. (JWS, 2012; Bloomberg, 2013). On annual basis (11 months) this would turn to saving over 400 hours annually. That could be used for better management, increased productivity and better quality. Monthly cost for a site manager in Finland could be calculated to be 3500 euros + the additional labour cost (78%), this makes 6230 euros of monthly cost for the company. The saved 400+ hours turns to 2,5 months which costs for the company 15 575 euros. If the company has ten managers on staff the savings are 155 750 euros and for bigger companies of 50 managers the saving would be 778 750 euros.

It was difficult to find quantifiable evidence of the benefits of mobile project management, but the study made by Moran (2012) shows the way and can be used as a reference point when marketing the benefits of mobile project management software or as a base for further research. This is important starting point in sales of Mobile PM software.

In order to prove more of the tangible mobile project management benefits, following example from Autodesk university is provided.

After services to Skanska Michael Moran has position as a consultant in Autodesk. Autodesk promotes their software BIM360 that combines the Building Information Model and mobile project management. Moran has published along with colleagues Manu Venugopal and Ken Stowe short presentation on *ROI for Cloud Based Collaboration and Mobility for Construction*. The publication lists various projects that have been able to use mobile construction software and get significant savings on both time and money. (Autodesk University, 2014)

Table 1. Summary of Customer-Led case studies to establish baseline and quantify savings adopted from Autodesk University (Moran et al. 2014)

Customer	Area of Improvement	Details
Skanska USA Building	Productivity	Users on 15 projects report on average 16% efficiency gains
	Schedule	1 Billion Dollar Stadium project reduced schedule by 10 days saving at least 1 million dollars
	Quality and productivity	95 million library project increased user efficiency by 10% decreasing rework
Barton Malow & Maryland General Hospital	Schedule and productivity (during operations)	57 million Dollar Hospital project decreased commissioning and handover duration by 30% and saves 30 min per work order during operations
Gensler	Schedule and productivity	Architect saved 95 man days during punchlist inspection of 2000 room hospital project

Careful further study of Moran (2012) study and Autodesk University document is recommended because of competitive analysis and also in order to gain more perspective on the tangible savings that mobile construction project management can offer. BIM360 is a competitor to Consight Ltd and more careful study could reveal the true position and relations in the competitive environment. BIM360 is operating, like its name suggest, in BIM environment and is designed to work well together with Autodesk design products. However, price range of Autodesk design software is quite high around 5000 euros / per annum but using the collaborative BIM360 is significantly lower in price, 120 euros / 10 months per single user (Nowedge.com, 2017).

3.3 Benefits of mobile construction software

The benefits of mobile construction management software can be summarised as follows (Moran 2012; Moran et al 2014; Kemppainen 2016):

1. Improved efficiency
2. Improved quality
3. Improved control and documentation
4. Savings in time and money
5. Improved communication and collaboration between the parties

Collaboration is vital

Construction industry has not traditionally been in the forefront of innovation and efficiency gains have lacked other industries e.g. in manufacturing. There has been a chasm between the trades of General Contractors (GC), Architects and other designers. There has been a “fighting” stance where all the other are guarding their interests instead of collaboration. Later when this work has moved to BIM, Building Information Modelling, environment the challenge remains the same. There is no BIM without collaboration. The sheer complexity of projects demand collaboration and therefore new forms of organization have emerged in the scene in the form of Alliance and Integrated Project Delivery.

This problem of collaboration is vividly described in the documentary movie, *The End of Babel*, made in 1994. It is construction related documentary by James Burke, where Burke shows how “*interoperability*” and collaboration could change designing and constructing buildings. The content of the film has endured the test of time and is still relevant. Even though technology has advanced since 1990s problem with human heart remains the same. The problem can be experienced both in academic sphere of and in construction site. Business culture of mutual respect and honour should permeate the whole construction industry creating collaboration, better and more efficient buildings.

4 Theoretical framework Internationalization

4.1 Introduction

This theoretical framework includes theories involving internationalization process and lay foundation for recommendations for internationalization road map for Consight Ltd.

In a globalized economy companies live in constant change to internationalize in active or passive means. Even though change has not been so rapid in construction, new technologies are paving way to construction. New mobile construction software and applications are popping up like mushrooms in rain, but there is still a lot of markets to be conquered in construction software business.

Traditionally internationalization has been slow paced and gradual, but especially in ICT it is common that software companies represent so called born global pathway in their internationalization (Äijö, Kuivalainen, Saarenketo, Lindqvist & Hänninen, 2005).

This shortly means that the company becomes international straight from conception within very short period of time.

In this section traditional, collaborative and born global theories are explored in light of internationalization, how they differ and what is needed for different approaches.

Finland based Technology Business Research Centre (TBRC) conducted survey in 2001- 2002 interviewing SME sized IT companies. Nearly 33% of the firms were categorized as born global and more than 50% of the companies had international operations. The criteria for born global in this research was that 25% or more of their total revenues had to come from different than domestic markets and they also had to have their international operations started with in two years of founding the company. (Äijö et al 2005, 22.)

4.2 Globalization and Internationalization defined

According to Daniels, Radebauch and Sullivan (2006) Globalization is growing interdependence among nations. Most companies are engaged in international business and compete in the international markets. During the recent decades following trends have influenced globalization and rise of international business:

1. *“Increase and expansion of technology*
2. *Liberalization of cross border trade and movement of resources.*
3. *Development of services that support international business.*
4. *Consumer awareness and wants of foreign goods and services*
5. *Increased global competition*
6. *Improvement in political relationships among major economic powers*
7. *Co-operation in transnational issues.”*

(Daniels et al 2007, 9)

Luostarinen and Welch (1990) define internationalization as follows:

“Internationalization of a firm can be seen as process of increasing involvement in international operations, where the firm transfers products, services and resources across countries when expanding its trade outside the domestic markets, and thus required to select which countries to operate in and the mode of operation” (Luostarinen & Welch 1990, 360)

Internationalization can be examined from holistic viewpoint that include inward internationalization covering import of raw materials, particles and Foreign Direct Investments and also outward internationalization that covers export, foreign manufacturing and co-operation in its different forms. (Luostarinen & Hellman 1993).

This thesis will deal only with outward internationalization.

4.3 Concept of life cycle

Theories of lifecycle can be used to describe and analyse different kind of phenomenon that grow and mature over time. Theories can be applied to describe e.g. product, company, markets and customers. Several models have been introduced by scholars Adizes, Churchill, McHugh and Moore. Some of these are especially interesting for software companies. According to Äijö et al (2005, 3) life cycle models fit well to describe the challenges of internationalization in software companies and it is imperative to understand the requirements of each phase. This model can be used in adoption curve of mobile project management technology. According to Äijö et al (2005,2) Moore classifies the phases and adopters of high technology products in the following five categories:

- “Innovators = technology enthusiasts at introduction and early market stage
- Early adopters = visionaries in early markets
- Early majority = pragmatists at mass market adoption and growth stage
- Late majority = conservatives in mainstream mass markets
- Laggards = skeptics in end of life markets”

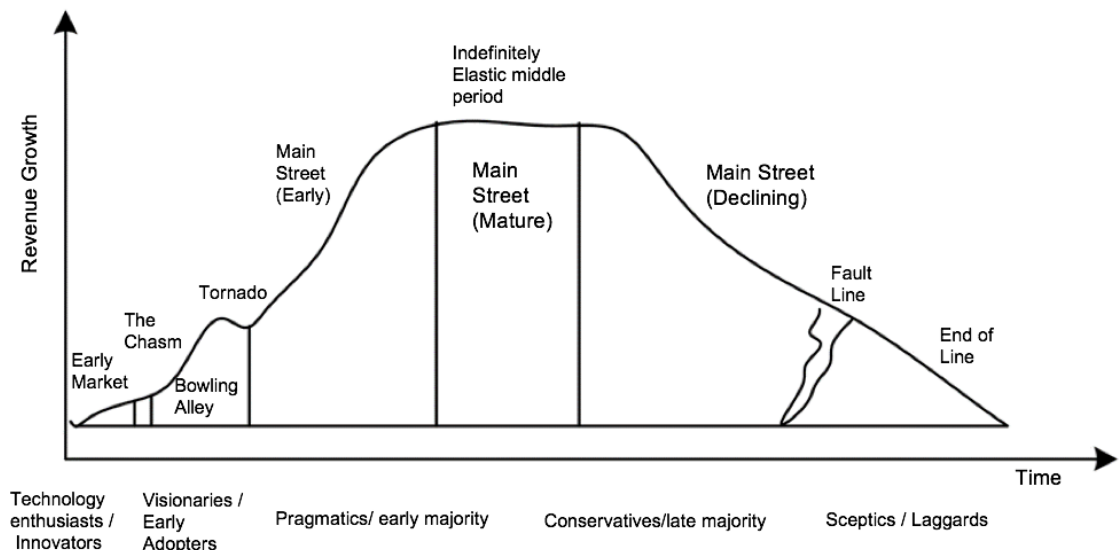


Figure 6. Technology adoption life cycle for high tech adopted from (Äijö et al 2005,3)

BIM and Project management software in PLC curve

According to the expert interview (Henttinen, 2016) during Aalto University BIM school (2016), BIM is entering main street in the product life cycle. In some parts it is in early main street and in other markets it is more mature. More depth information is provided in the BIM section of this thesis. The mobile project management has captured Early adopters and is little by little moving towards Early majority.

According to Äijö (2005) it is important to consider product concept in the international business, as the base product or service is not likely to fully fill the end customer's demands. Complementary services or system integration might be necessary. YIT's SVP Pirinen (2013) emphasizes and highlights the challenges of having several different systems that are not integrated. (See chapter 6.3) It needs to be evaluated what is the time when BIM is needed in PM software and what additional services are needed. Scalability of product is vitally important for international success (FSIS, 2015) but can it be reached without localisation of the product?

Software business has been growing strongly in Finland since late 1990s, software development was seen as strategic cluster of growth. Centre of Expertise for Software product business made vision year 1999 to map the growth and future of the business cluster. (Ottuli, 2005; Äijö et al 2005, vii). This has been reason why so much effort has been made in order to advance international software business from Finland. Exports in Finnish Software business had been growing until year 2002 and taking down turn year 2003.

The Centre of Expertise for Software Product Business proposed projects that would support the cluster companies in internationalization. Bright minds and top scholars were selected produce: *The Internationalization Handbook for the Software business*. The book, along with other support programs (Äijö et al, 2005, iv), would help Finnish Software companies to international markets. The book is written by renown scholars Toivo Äijö, Olli Kuivalainen, Sami Saarenketo, Jani Lindqvist and Hanna Saarinen.

The main framework of internationalization of this thesis and the Road Map is derived from The Internationalization handbook, complemented with other resources and more recent studies and interviews.

4.4 Theories of Internationalization

“It is often that firm going into export adventure should have stayed home market, because it did not have the competencies to start exporting.” If the company has limited international experience and weak position in home markets, internationalization may prove to be disastrous. (Hollensen, 2007, 6.)

4.4.1 Born Global, Organic and Collaborative models

There are three distinct internationalization modes. They are 1. Organic, 2. Collaborative and 3. Born Global. Organic model means that internationalization process is series of incremental stages. Organic model is traditional recipe described in many internationalization literatures. This means that the company consolidates its position in domestic markets and increases its involvement in neighbouring countries gradually as it gains experience and knowledge. (Äijö et al 2005, 4-6)

Empirical evidence especially for software companies does not support this proposition of organic growth. Many software companies begin their international journey straight from

beginning. (Äijö et al. 2005,4) The often slow Organic model and fast paced Born Global model represent the opposite ends of internationalization. Collaborative model means that companies are involved in co-operation and partnerships in order to facilitate internationalization. In real life hybrid models are used and the model can be changed to another as time progresses. (Äijö et al. 2005, 4-6; Väisänen, 2013; Huhtanen 2009).

Born Global, Organic and Collaborative models are dealt with greater detail in Internationalization Road Map part of this thesis.

Choice of internationalization path Organic vs. Born Global illustrated

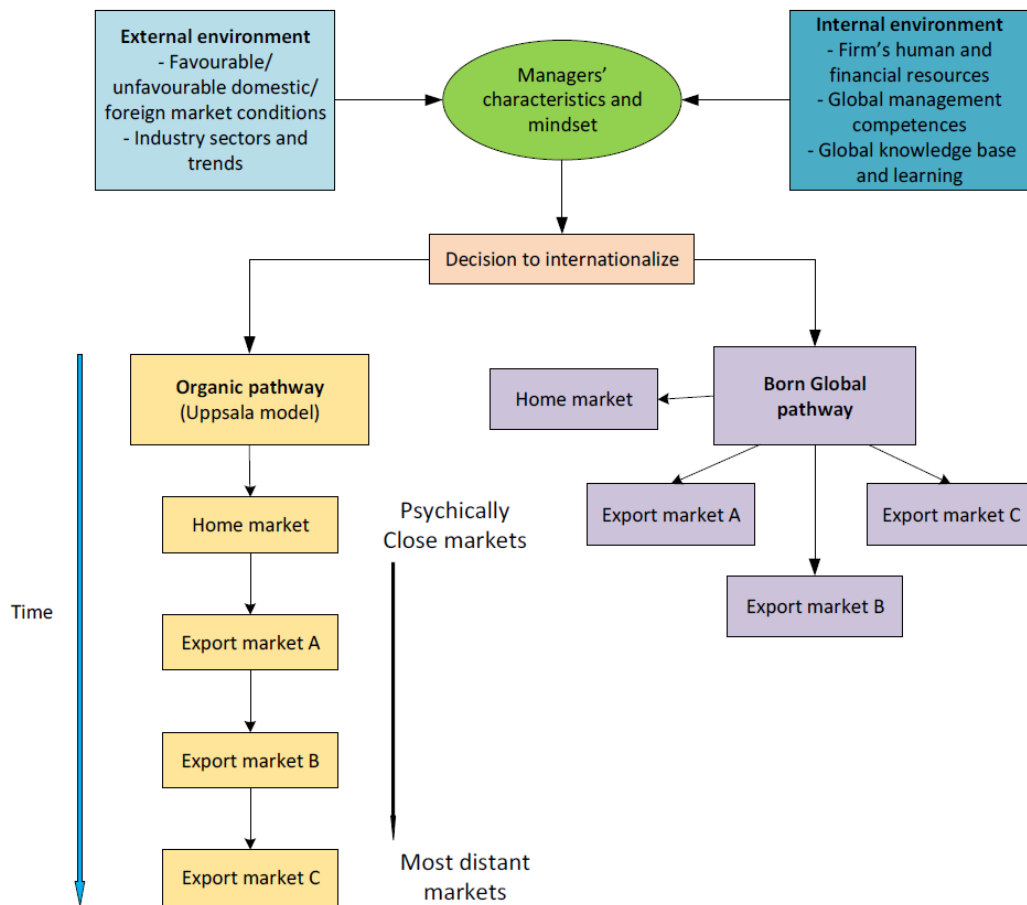


Figure 7. Two extreme pathways of internationalization: the organic vs born global adopted from (Hollensen, 2007,79)

4.4.2 Uppsala model of internationalization

Other models describing internationalization are 1. Uppsala internationalization model and 2. Innovation Related internationalization model and 3. Network model. Uppsala model is

based on internationalization of Swedish manufacturing firms. Companies that were studied appeared to start their operations abroad in nearby countries and then advancing further. (Hollensen 2007, 63). Basic assumption of Uppsala model developed by Johanson and Wiedersheim-Paul in 1975, is that company would enter new markets gradually depending on psychic distance. Uppsala model has behavioural approach regarding internationalization as process, it has emphasis on learning theory. (Andersen, 1997, 216)

The Figure 8. (Hollensen 2007, 64) illustrates the Uppsala models idea of increasing market commitment, diversification and operational modes along with increasing degree of internationalization (DOI).

Mode of operation / Market (Country)	No regular export	Independent representative	Foreign sales subsidiary	Foreign production and sales subsidiary
Market A	Increasing market commitment			
Market B	Increasing geographic diversification	Increasing Internationalization		
Market C				
Market D				
Market N				

Figure 8. Internationalization of the firm: and incremental (organic) approach adopted from (Hollensen 2007, 64)

Critics of Uppsala model

Uppsala model has been criticized from various directions. It has been said to be too deterministic (Reid 1983, Turnbull, 1987, as cited in Hollensen, 2007,64) and not taking account interdependencies between different countries (Johansson and Mattson 1986, as cited in Hollensen, 2007, 65). The Uppsala internationalization model does not fit for service industry (Sharma and Johansson, as cited in Hollensen, 2007,65). Nordströms's studies (1990, as cited in Hollensen 2007 65) have shown that Swedish companies have

targeted UK, Germany and US as their initial entry market instead of neighbouring Scandinavian countries. This may be due to market fundamentals and market size. UK 64,08 million, Germany 80,85 million and US 321,36 million (total 466,29 million inhabitants) (CIA, 2016) in oppose to Norway 5,2, Finland 5,2, Denmark 5,58 million. = 15,98 million. The target countries currently comprise nearly 30 times bigger market than Nordic countries.

According to Hollensen (2007,65) there is tendency that companies 'leapfrog' to more distant markets and also jump over operational modes not acting sequential. This is verified also by Huhtanen (2009) in his research of Operational Mode Strategies. Following figure 9. illustrates company entering target markets with different commitment and operational mode at the same time.

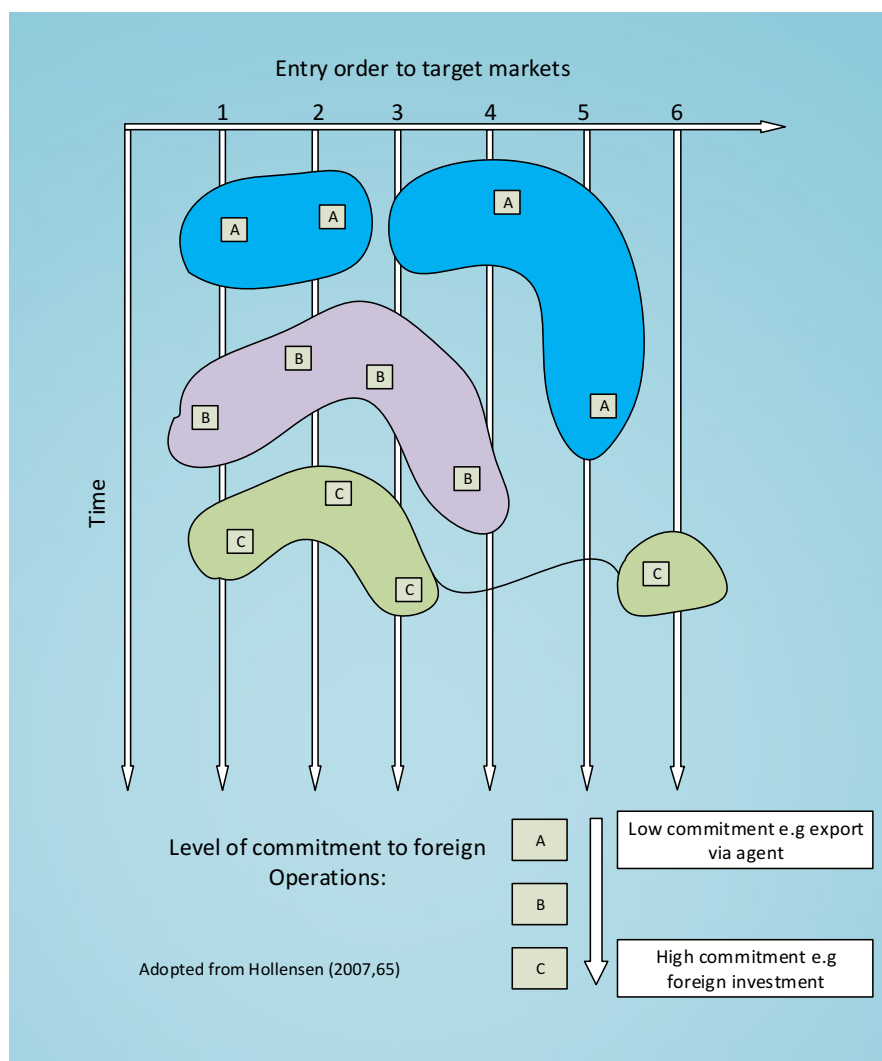


Figure 9. Internationalization pattern of the firm as a sum of target country patterns adopted from (Hollensen 2007,65)

In the case of highly internationalized companies and industries e.g. service or ITC, “competitive forces and factors displace “psychic distance” as the principal explanatory factor for the company’s internationalization process.” (Hollensen 2007, 66). According to Nordström (1990, 173; 175) world has become more homogeneous and distance factor, even though valid by Uppsala model in some cases, has decreased in significance.

Infant multinational by Lindqvist

Maria Lindqvist (1991, 83) has researched Infant Multinationals, Technology based firms and concluded that smaller firms tended to follow traditional internationalization, whereas companies that had received substantial amount of capital proceeded quicker in their internationalization. Bailetti & Erik Ziedemans (2014) have studied Early and Rapid Globalization and list the factors leading to better position to attract capital in order to grow quickly. According to Lindqvist (1991,83) and Manolova & Bush (2002,13) executive experience had key role in speed of internationalization and in moving to less traditional markets. Multitude of research highlight that “*high experiential knowledge (experience and skills) of managers and low perceived environmental uncertainty are important determinants of SME internationalization*” (Gavusgil 1980, 1984; Johansson and Vahlne 1977,1990; Reid, 1981, cited in Lindqvist 1991,83).

In other words, if the goal of Consight is rapid internationalization, Consight should try to position itself so that it attracts Venture Capital and also talented managers to lead internationalization. It might be beneficial to shadow the possibilities to use Global value generator matrix created by Bailetti & Ziedemans (2014) to evaluate possibilities for rapid growth. According to Äijö et al start-ups should remember the importance of convincing and realistic business plan as part attracting Venture Capitalists (Äijö et al, 2005,80).

Rapid internationalization could be also facilitated by internationalization of other domestic or partner firms. This could be seen as possibility for Consights internationalization. Consight could try to build networks with international companies in AEC like Sweco or Ramboll and internationalize in partnership with them using Collaborative model approach as one tool in their internationalization.

According to Carlson research 1979 (cited in Lindqvist 1991, 214) Swedish firms have had traditional willingness to enter co-operative agreements. Some pioneer Swedish compa-

nies like SKF and Swedish Match have had sales offices around the world and other Swedish companies have been building up their own sales through agent agreements. This illustrates a potential path also for Consight.

In cases of technological innovations, the companies were providing, certain time was required for market creation before sales could take off (Lindqvist 1991, 84). Increased level of competition could be seen advantageous as customer awareness was increased in the market. Even though amount of companies researched by Lindqvist (1991, 213) was limited to 15 it is interesting to note that the speed internationalization of Infant Multinationals technology companies was relatively high no more than 3.2 years. Consight might consider partnering as option for internationalization. The time the companies held the partnership was relatively short. Even though competition is increasing in mobile project management software, the heightened competition brings awareness of the products and makes way for a bigger window of opportunity.

Once foreign markets were entered new countries were added to business rapidly, on average 5 markets were established with in 3.5 years after the initial entry to foreign markets (Lindqvist, 1991). According to study by Lindqvist (1991,214) co-operative development projects enabled companies to provide internationally acceptable products from the beginning.

This kind of co-operation / pilot projects may help internationalizing companies in their product development. When companies and their products had emerged from university research, international seminars, symposia and trade fairs were likely to result in international contact network (Lindqvist 1991,227). University based technology start-ups have also been able to leverage their academic network to promote internationalization according to BIM summer school lecturers (Aalto university BIM School, 2016).

4.4.3 Innovation Based Internationalization model

According to Simin (2012, 2-4) "Innovation based model views internationalization as process of steps that are analogous to new product adaptation" presented by Rogers (1962, 241-247). According to Simin (2012, 2-4) Researchers like Bilkey and Tesar (1977), Cavusgil (1980), Czinkota (1982) and Reid, (1981) have developed and worked with the Innovation based theory. Researchers have concluded that the decision of internationaliza-

tion is an innovation for enterprise and therefore company is engaged in incremental development of internationalization. Each step of the internationalization is an innovation push for the enterprise demanding new skills and approach. According to different viewpoints and researchers' internationalization is influenced by "push" or "pull" force. (Ibid.) Moore (1991) has studied product and technology adoption life cycle and has similar approach to previous researchers (Moore 1991, cited in Äijö et al 2005, 2-3). According to Moore (1991) "*technology, product concept, customers and strategies change depending on the life cycle*" phase (Ibid).

Leonidou and Katsikeas have argued that Innovation based Internationalization model can be divided in three stages: 1. Pre-export stage, 2. Export Trail Stage and 3. Advanced Export Stage (Leonidou and Katsikeas, cited in Simin 2012, 5-6). In *Pre export stage* the company is working on domestic market and is evaluating the possibilities to reach foreign markets. In *Export Trail Stage* the company is engaged in exports and has the potential to expand its international reach. *Advanced Export Stage* the company has extended experience from foreign markets and assumes other commitments to international markets (Ibid).

The role of decision maker is emphasized in the I-model. The limitations of both Uppsala model and Innovation Based Internationalization model have become evident with researching the Born Global companies, that do not follow the traditional models.

The I-model explain how the internationalization commences, the role of executives and the aspects influencing their decisions (Simin 2012, 6). Similarly Lindqvist (1991) and Manolova et al (2002), as well as developers and researchers of *Innovation Based Model* Reid, Reuben and Fisher emphasize the importance of the decision making: 1. attitude, 2. experiences, 3. motivation and 4. the expectations of the decision-makers in the internationalization process (Reid 1981, Reuben and Fisher 1997, cited in Simin 2012, 6)

4.4.4 The network approach model

According to Simin (2012,7) the network approach model is developed by Uppsala School of Internationalization by improving the original model of Johanson and Vahlne (1977). The network theory of internationalization implies to higher focus on relationships and sees them as assets for the company. According to Coviello and Munro (1997) SME's show patterns of externalizing their activities to their networks in their internationalization

process and rapid internationalization can be launched by using networks to their advantage (Coviello and Munro 1997, cited in Simin 2012,7). Companies compete also in network level including their suppliers, customers and their customers' suppliers (Tykesson & Alserud, 2011, 7). In general "*network approach provides complementary perspective to other internationalization models*" (Simin, 2012,9).

4.5 Strategy and internationalization

According to Äijö et al (2005,13) internationalization of a software company should be incorporated in company's strategic thinking and strategic process. This process should be done as on-going process based on reliable information and analyses. In spite of the operational mode and particular internationalization path chosen company should define and draft strategic plan (Äijö et al, 2005,13).

Äijö emphasizes the importance of strategy in ICT. The diverse field gives its unique challenges (Äijö, 2008, 175-177) with acceptance to mass market, small home market, global competition, companies small size and lack of resources is posing a challenge. There are major challenges in strategy work and strategy implementation. A study made by Corboy and O'Corrbui (1999) showed that "*nearly 70% of strategic plans and strategies are never successfully implemented*". Finnish Software Industry Association arranges high profile events with successful entrepreneurs presenting lessons learned from internationalization. Highly successful entrepreneurs Sami Inkinen from Trulia and Kim Väisänen from Blanco both emphasized that planning strategy is great but "failing" fast forward is more important than perfect and time consuming strategic plans (Ohjelmistoyrittäjät, 2015, Kasvuforum, 2013).

Former Aalto University professor Kontio (2004) who was responsible for internationalization clinic for Finnish Software companies describes the problems as following:

"The problem with internationalization in Finnish Software companies is too small company sizes and limited resources. Even though internet might help internationalization and companies to become known in the market, competition has toughened considerable. When the company succeed it has to have resources for rapid growth. Previously there was time to internationalize and educate people for many years. Now the company needs at once scalable billing systems, quality control and delivery processes. The right market window can be open only for six months and within that period you have to become from marginal player to first league champion." (Kontio, 2004)

Inkinen (2013) the founder of Trulia start-up that became acquired by Zillow Inc in 2014 with 2.5 Billion USD states the same as Kontio. According Inkinen toughened competition means that companies need “all-star team” and processes. In order for the company to be category leader the company needs to re-invent and come up with something new every 18-month cycle.

Kontio (2004) describes rapid internationalization as necessity. The core issue according to Kontio (2004) is that competency for growth and internationalization has to be built in advance. Usually technology site is in order with Finnish companies but they lack skills in marketing and internationalization. According to Kontio (2004), communities are very important in software development. The core competence is that the right kind of technology can be identified and connected to right customer segment. (Tivi, 2004). According to Inkinen (2013) the problem with Finnish companies is that they work on their own developing products for 1.5 to 2 years without going inside the head of the customer and without failing fast forward with the product development with the customers.

Tony Mets (2012) Estonian scholar and professor provides different glance at the problem described by Kontio (2004): “*Finnish Software companies are too small in sizes and they have limited resources.*” Even though Kontio is right in his statement, Estonia has successful BG start-ups that succeeded in spite of their many constraints. The implication is that it is not only resources that count. Following more detailed example of Mets study reveals the details.

Mets research team in Tartu University researched eight successful born global high tech companies starting from Estonia. The companies were from various business fields of ITC and bio-technology. Some names of the researched companies are: Skype, Asper Bio-tech, Fractal and Sportslyzer. All of the companies were successful start-ups Born Globals with environment, resource and financial constraints. Several success factors were distilled from the research that correspond with earlier research work made in the field.

It needs to be mentioned that some of the companies in Mets’s (2012) research had freemiums as part of their business model. Freemium means that the product or service is provided free of charge but money (premium) is charged with added rights, feature or functions. Use of freemium should be carefully considered as one possibility for pricing strategy of Consight and additional research should be made on the topic.

Vineet Kumar (2014) former assistant professor to Harvard Business School and current assistant professor to Yale School of Management has researched the topic of “Free-mium”s in depth with his colleagues and states that:

“free features are a potent marketing tool. The model allows a new venture to scale up and attract a user base without expending resources on costly ad campaigns or a traditional sales force. But despite its popularity and clear benefits, freemium is still poorly understood. It has inherent challenges, as demonstrated by the many start-ups that have tried but failed to make it work.” (HBR, 2014)

Mets criticizes that *“the born global model does not explain why some High Tech Small and Medium Sized Enterprises (HSME) become global and other do not”*. The main force according to Mets (2012,170.) can be seen in creative entrepreneurial processes. It includes experiential learning in individual (entrepreneur) and organizational levels. According to Mets companies should create POM Strategy introduced by Luostarinen (1979) and refined by Luostarinen and Gabrielsson (2004). POM strategy encompasses from 1. The Product, 2. The Operational mode and 3. The Market.

The POM strategy helps the company to create value to its stakeholders and leads to marketing strategy consisting from pricing, distribution and customer strategy (Luostarinen & Gabrielsson 2004 as cited in Mets (2012,171). Mets (2012, 172) shares the view that BG internationalization is dependent on company’s ability to attract Venture Capital and professional management with international experience. According to Mets this is vital to accelerate the internationalization process. According to Mets (2012,173) not only strategy, entrepreneurship *“to second power”* are the vital success factors but also protecting and deepening competitive advantage with knowledge creation.

4.6 Strategy work and Internationalization planning

For strategy work the company needs multitude of information and analysis. These are: (Äijö, 2008,8-11)

1. *“Analysis of the planning situation*
2. *International Trend and Environment analysis*
3. *Analysis for Selecting Target Country(-ies) and Product(s)*
4. *International Market- and Customer Analysis (4 different analysis included)*
5. *International Competitor Analysis*
6. *Analysis for Entry Mode, Channel and Partners (2 different analysis included).*
7. *Other specific marketing research analysis (might include 13 different analysis)*
8. *Corporate/Company specific analysis (resources and qualifications)*
9. *Summary analysis: (SWOT, Challenges, choices, Critical success factors analysis included)”*

Internationalization is strategic decision and has significant and long lasting consequences for the company. The owners and management have to share common vision and commitment (Vahvaselkä, 2009, 106). The company needs to start internationalization by examining the internal readiness and requirements to internationalize.

According to Technology Industry association (Vahvaselkä, 2009, 107) internationalization can be planned in five levels, they are 1. Readiness to internationalize, 2. Market opportunities, 3. Strategy, 4. Resources and 6. Execution. When mapping the readiness for internationalization the company should clarify the internal preconditions for internationalization. They are: 1. basic readiness for internationalization, 2. matching products for export markets, 3. marketing readiness, 4. technological capability and production capability and 5. key employees. (Vahvaselkä, 2009,107.)

Internationalization planning by Technology Industry association (Vahvaselkä, 2009, 105;107), Internationalization planning and development planning, and Centre of Expertise for Software Product Business Internationalization planning (Äijö et al 2005,xiv) share similar views on flow of the planning process. Äijö et al (2005) focuses more on pre stages in internationalization planning and strategy before the actual market penetration. Vahvaselkä (2009) focuses also on the marketing communication, sales side of internationalization and also execution and follow up. For engineer led company familiarization of the internationalization process is important so that the requirements and constraints of the process will become evident. Both Äijö et al (2005) and Vahvaselkä (2009) offer solid platform for understanding internationalization. This thesis and the product part tries to distil the main path or Road Map for the process and help the commissioning company to get required view on the internationalization process.

4.6.1 Basic readiness to internationalize

Basic readiness to internationalize means that the company has made *business plan*, that states the growth goals, growth strategy and the opportunity to internationalize. The company management should understand the needs to change the business plan as internationalization takes place. Other aspects of basic readiness include: 1. ownership structure and financial structure of the company now and in the future, 2. orientation and skillset of the management considering international business, 3. product market fit and international marketing. (Vahvaselkä, 2009, 107.)

Careful consideration has to be made in order to evaluate the financial strength in the internationalization phase. Internationalization requires considerable financial strength from the company along with managements education, language skills, knowledge of international markets, networks and marketing expertise in international markets. (Vahvaselkä, 2009, 107-108).

Product market fit and international marketing requires considerations on the product:

“the features, brand name, immaterial rights, customer value creation, product concept, quality considerations, product development, product superiority, strength to price competition, distribution channel considerations, marketing communication, market position, sales strength, conspicuousness in selected marketing segments, marketing material, after sales functions and problem solving.” (Vahvaselkä, 2009,108)

In order to get into the market requires time, careful research, planning, originality, creativity in marketing and product superiority (Vahvaselkä 2009, 108-109.) Mediocre performance is not enough to get through thick and thin of international markets.

4.6.2 Marketing considerations

Internationalization and exports to new geographical region require research, skills and networks as markets are different in different locations. The evaluation of the size of the market, competition, hindering factors and trends need to be addressed. The company needs to quantify the share of the new market that it can reach and create their sales potential in the new market. Different kind of institution can help the company to reach the

market information. They are FinPro (former Ulkomaankauppaliitto), Confederation of Finnish Industries (EK), Technology Industries of Finland (Teknologiateollisuus ry), The Federation of Finnish Enterprises (Suomen yrittäjät ry), Finland Chamber of Commerce (Keskuskauppakamari) and other Chamber of Commerce's. Finland as part of EU can receive information from EU related sources. Some of them are EU market Access database (<http://madb.europa.eu/madb/indexPubli.htm>) and EU SME Centre that specializes to help European companies to vast Chinese markets (<http://www.eusmecentre.org.cn>).

4.6.3 Analysing tools

Market environment can be analysed by using tools like **PESTLE** which is macro environment analysis tools. The acronym comes from words: Political, Economic, Sociocultural, Technological, Legal, Ethical and Ecological. Each of these factors are country sensitive and are analysed for each country (Hollensen, 2007, 247; Vahvaselkä, 2009, 112; 158). After macro-economic analysis the conclusions are taken as part of **SWOT** (Strengths, Weaknesses, Opportunities and Threats) analysis either opportunities or threats. In order to be able to evaluate the target market opportunities *basic market survey* needs to take place it can be either *condensed* or *wide* depending on the company. (Äijö et al, 2005, 124; Äijö 2008, 122-123)

4.6.4 Market surveys

Condensed basic market survey on the economic area should include: 1. Basic market area information, 2. Competitive products and their price range, 3. Expert evaluation on the market (strength of competition, used technologies, trends and market potential) (Vahvaselkä, 2009, 112).

Wide market survey should include in addition to previous: 4. Accurate information on the market size and potential, 5. Comparative information on competitor, their products and their customers (including market shares, strengths, weaknesses, and the possible customer segments), 6. Information on specific product features in the target market (subcontracting, ad on products and services, product testing in the market and marketing experiments) and 7. Distribution channel research. (Vahvaselkä, 2009, 112.)

If the company has already surveyed the market making both the condensed and wide market survey, yielding positive research results and the company has decided to proceed with the process of internationalization it should make further research to specific issues, concerns and considerations. The company should make systematic and thorough evaluation on the *operational modes* (yrityksen ulkomaantoimintamuodot) of *market entry*, evaluation on marketing procedures (product, package, design, sales and pricing) and thorough operational procedure recommendation in order to enter the target market and succeed in the market. (Vahvaselkä, 2009,113.)

The possible operational modes can be divided in 1. Contractual modes, 2. Exporting Modes and 3. Investment Modes. The following figure will illustrate more on the options of each category. It has to be reminded that changing the operational mode during the internationalization is more than likely (Huhtanen, 2009; Väisänen 2013). Previously operational modes were seen as static but new research by Pedersen et al. (2002), Benito et al. (2008) as cited by Huhtanen (2009,14) represent the new thinking regarding foreign operation modes. Real life examples of successful entrepreneurs (Väisänen, 2013) reveal that operational mode switching, stretching and combinations are more common than previously in modern business environment (Huhtanen, 2009, 69-70).

Figure 10. The major foreign operation mode options adopted from (Welch et al, 2007,4)

Exporting	Contractual modes	Investment modes
• Indirect	• Franchising	• Minority Share (alliance) JVs
• Direct: Agent/ distributor	• Licensing	• 50/50 JVS
• Own Sales office/ subsidiary	• Management contracts	• Majority share JVs
	• Subcontracting	• 100% owned
	• Project operations	
	• Alliances	

Careful evaluation should be made to determine the selected markets and the operator who would conduct the preliminary, basic and wide market surveys. (Vahvaselkä, 2009, 143-170)

5 Empirical part: Internationalization plan /road map

5.1 Internationalization Road Map

According to Naumanen (2001) author of book "Road map to success" Road map is versatile term. In generic term road map can be used as a synonym to plan of any kind. More specifically Road map is a tool developed to plan, manage and integrate complex projects. The goal of Road Map is to take strategic and business planning activities and present it in actionable form. Road map can be used in 1. Business level, 2. Product level and 3. In Technology level (Naumanen, 2001,48.) Technology Road maps and road mapping can be a formidable tool to facilitate complex technological planning and R&D investments (Garcia & Bray, 1997).

For this product oriented thesis and commissioned work, the roadmap was defined as steps that are necessary in the process of internationalization.

The internationalization handbook for software business (Äijö et al, 2005) describes internationalization process map for Software Company. This map could be used in Consight internationalization process. The map offers clear guideline to follow and guides through questions that need to be asked and answered in the process. This thesis will base the road map on internationalization handbook especially made for Finnish software industry.

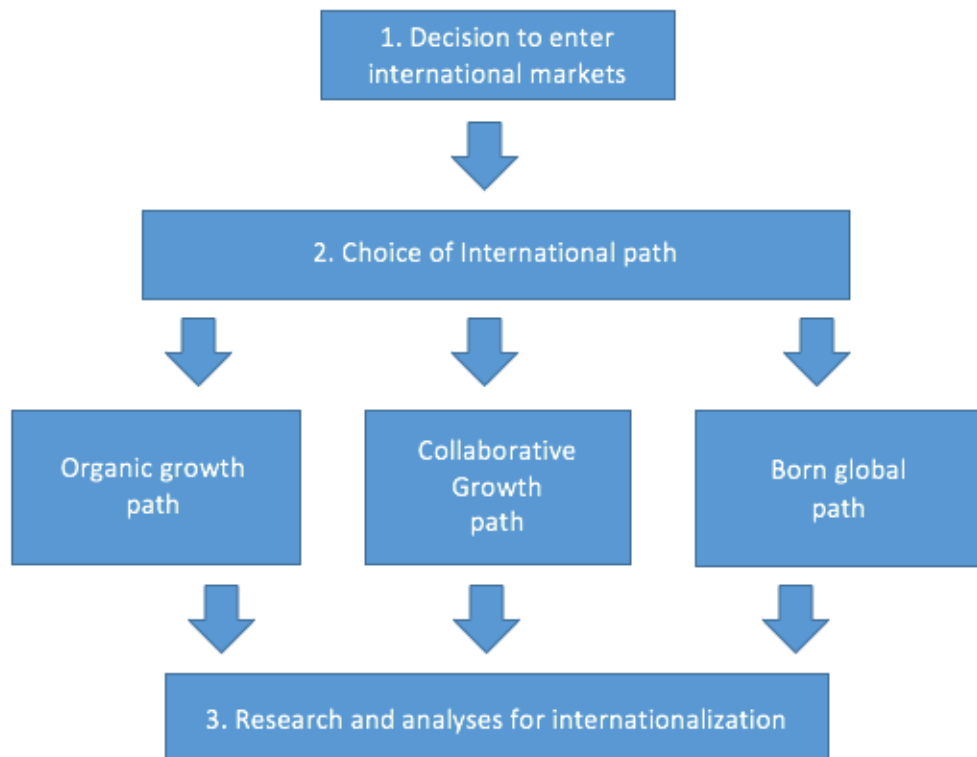
It is obvious for Consight that internationalization needs to be part of Consights strategy, software business is inherently international. According to Michael Baum (2015) serial entrepreneur and start up guru, the startup company can roughly scale its worth in the eyes of VC's by the size of the problem they are solving. If the company wants to build 10-million-euro company it needs to solve a 100 million euros' problem.

Assuming that the total market potential in Finland would be 3 million euros in improved mobile construction project management and problem solving, 10% market penetration would render meager 300 000 euros to maintain operations. Michael Baum has worked with start-ups 25 years and taken his companies to grow in shareholder value to over 6 Billion dollars, creating 3500 jobs and 150 millionaires. According to Baum (2005) if the

start-up company has truly disruptive innovation the company will get 10-20% of the market spend over the life time of the company.

Following Figure 11 shows the general decision that have to be made in the process on internationalization. Also Vahvaselkä (2009, 105; 317-320) presents four-part Road Map process with 1. Pre-requirements for internationalization, 2. Internationalization Planning, 3. Execution of Internationalization and 4. Securing and following up Internationalization.

Figure 11. Internationalization in general path choice adopted from Äijö et al (2005, xiv)



Following assumption are made for this internationalization roadmap. Company has decided to internationalize. Consight should develop strong internationalization mindset which means that the vehicles for internationalization are placed central in strategy. In order to have viability and strength to live Consight should aim for rapid organic growth and product development in domestic markets. In the internationalization strategy Consight should aim to develop strong collaborative relationship with key international players in like Sweco, Ramboll and e.g JLL. Developing at the same time way and capability to become Born Global.

Following Figure 12 visualizes the various analysis that have to be made in the process on internationalization.

Figure 12. Internationalization analysis and strategy adopted from (Äijö et al. 2005, xiv)

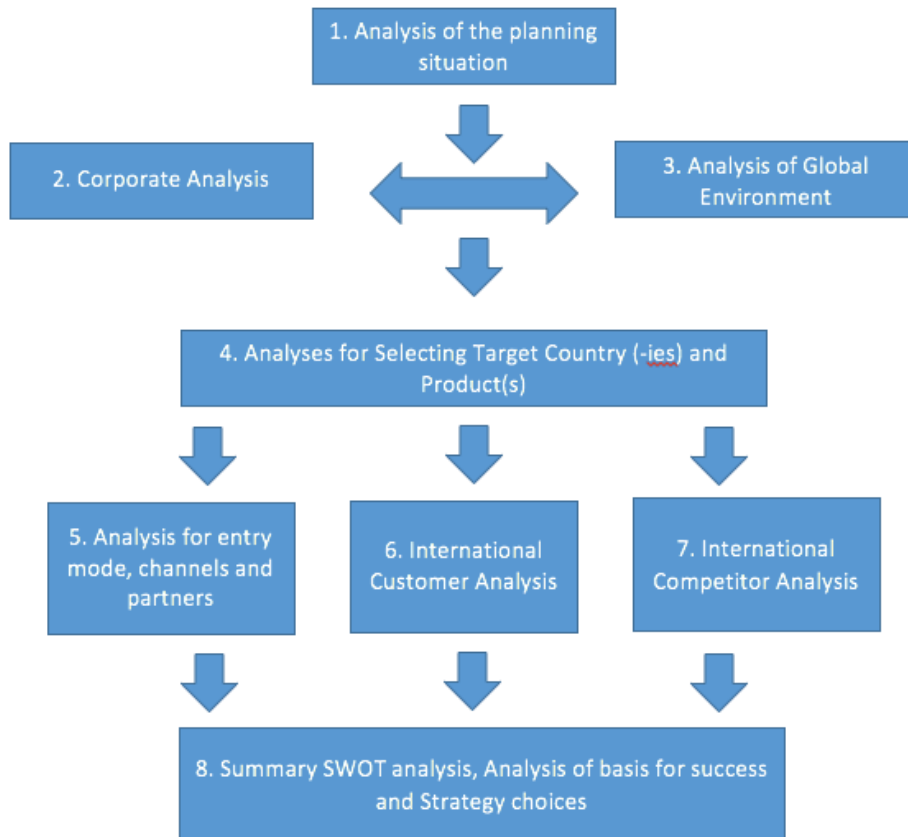


Figure 13. Analysis and Strategy Further Steps adopted from (Äijö et al. 2005, xiv)



5.2 Product Internationalization Road Map

According to interaction with company's management and ownership this part looks in more detail to accelerated internationalization. Even though company constraint might suggest more classical organic growth the main focus in this part is to find possible path for company to use either collaborative or born global approach to internationalization.

Competitive landscape and expert presentation of the future of mobile project management suggest aiming for accelerated if not born global pathway of internationalization. The aim of this section is to raise relevant questions outline path of possible steps and bring counterpoints for each step in light of specific internationalization stories and examples.

Company has three main paths for internationalization 1. Organic, 2. Collaborative and 3. Born Global as mentioned and explained in detail earlier in the thesis part.

The table 2. Internationalization pathways summarises the differences between different paths adopted from (Äijö et al, 2005, 33)

Pathway	Level 1 Pre-start	Level 2 Start	Level 3 Growth	Level 4 Maturity / Consolidation
Organic	<ul style="list-style-type: none"> Idea, development of technological know-how 	<ul style="list-style-type: none"> Tailor-made Product Nearby markets 	<ul style="list-style-type: none"> Slow growth, bootstrapping to new markets 	<ul style="list-style-type: none"> Building and growing international network
	<ul style="list-style-type: none"> No previous international experience, learning by doing 	<ul style="list-style-type: none"> Reactive, Ad hoc internationalization, opportunity rather than plan 	<ul style="list-style-type: none"> Transition from project based to product business 	<ul style="list-style-type: none"> Possible transformation to Born-Again-Global firm
Collaborative	<ul style="list-style-type: none"> Idea co-development, piloting with other (large) firms Social networks 	<ul style="list-style-type: none"> Customer followership Systemic product 	<ul style="list-style-type: none"> Productization and leapfrogging to born global pathway, or drifting to organic slower growth 	<ul style="list-style-type: none"> Continuing collaboration vs. Dissolution
Born Global	<ul style="list-style-type: none"> Innovation, development of core technologies Internationally Experienced management 	<ul style="list-style-type: none"> Packaged product and / or global niche Proactive, systematic building of international network 	<ul style="list-style-type: none"> Fast growth, external resources for marketing and financing the growth 	<ul style="list-style-type: none"> Active management and maintenance of international network
	<ul style="list-style-type: none"> Growth orientation 	<ul style="list-style-type: none"> Lead markets 	<ul style="list-style-type: none"> Growing the international network 	<ul style="list-style-type: none"> Expanding product range, continuous innovation

The following Road Map is suggested to Consight comprising of elements such as:

1. Decision to internationalize (internal analysis)
2. Familiarization of the internationalization paths
3. Research for internationalization
4. Analysis of Planning situation (Corporate and Global environment)
5. Target country analysis (a. customer, b. competition, c. entry mode)
6. Summary analysis for success factors and strategy
7. Formulating International competitive strategy
8. International operations

The Internationalization Road Map document, 24 pages in all, can be found in appendix 1. It is advisable that Consight management will use this Road Map in order to familiarise themselves with internationalization process and conduct e.g. internationalization workshops in order to honestly evaluate the capabilities of current management in the internationalization process. One of the crucial success factors is the previous hands on experience on international markets. Global competition requires world class team of professionals to be successful.

The constraints for Consight in mobile project management are the already established project management software from bigger competitors like Trimble that are increasing their mobile capabilities. They are already attached to company specific expensive IT infrastructure and thus have advantage prior to new entrants. In the current competitive landscape several companies are entering the emerging market of mobile project management. Understanding the customer needs is crucially important. There might be difficulties or challenges in product development to be able to produce market area fit for multitude of markets. It requires resources and agility to be able to research and influence foreign markets.

The next wave of digitalization is hitting the shores of construction with BIM becoming mainstream and should be integral part of product development, even though renovation

and remodelling might stay in the world of 2D because of cost efficiency. 3D laser scanning producing BIM models is becoming more cost affordable and should be considered in product offering.

Getting enough funding has played key role in many successful accelerated internationalizations. The operations of Born Global internationalization need funding for multitude of tasks, especially to top class international management team. If company has constraints in finances, company might seek collaborative internationalization in the beginning, and plan their internationalization so that, the company can change back to Born Global track. The company should consider the qualities that will likely help in raising money to become born global company.

These same features with global mind-set will help to attract venture capital in to the company (Bailetti & Ziedemans, 2014). Research made by Bailetti & Ziedemans (2014) studied importance of early and rapid globalization on Cybersecurity start-ups. They have produced Global Value Generator matrix that illustrates actions that companies could do to help technology start-ups to globalize. Findings of the Global value generator indicate importance of international management experience, networks and partners. Similarly, many other researchers point out the importance of hands on international management experience in global markets (Äijö et al 2005, Cusumano, 2004; Lindqvist, 1991,83; Manolova & Bush, 2002, 12-13).

6 BIM

6.1 Foreword

To be fair and honest project management software and BIM could be in its own right a separate thesis. There is so much to consider. It was seen in the initial meetings with Consight Start-up, that it would be needed to be considered. It was wise choice even though it has meant a lot more work and it is not possible to deal conclusively. The findings with BIM research revealed that there is already competition in the market with more or less sophisticated BIM solution and project management. Very specific items were considered when it comes to cost of developing BIM features in Consight's program and interoperability with Building Information Models.

This part of thesis will not consider the specific issues but rather aims to give general view of BIM, 1. what it is, 2. how it is used and 3. What might be the implication for project management and future software development of Consight. In order to get extra insight to Building Information Modelling the author enrolled in Aalto University BIM Summer School to get the best from the brightest in BIM.

6.2 What is BIM Building Information Modelling?

There is not a definite consensus in defining BIM. According to Tomi Henttinen director of BuildingSmart Finland BIM means different to different professionals in AEC. Henttinen emphasizes importance of common standards and collaboration in design and manufacturing process of buildings (Henttinen, 2016).

According UK based National Building Specifications (NBS, 2015):

"BIM is a way of working; it is information modelling and information management in a team environment, all team members should be working to the same standards as one another. BIM creates value from the combined efforts of people, process and technology."

According to BIM handbook (Eastman, Teicholz, Sacks & Liston 2011):

“With BIM (Building Information Modelling) technology, one or more accurate virtual models of a building are constructed digitally. They support design through its phases, allowing better analysis and control than manual processes. When completed, these computer-generated models contain precise geometry and data needed to support the construction, fabrication, and procurement activities through which the building is realized.”

BIM is way to work and produce value. BIM is not Computer Aided Design (CAD) even though 3D computer software is used extensively in designing of buildings. BIM is encompassing the whole life cycle of the building with optimization and collaboration between the stakeholders.

6.2.1 BIM Classification

Building Information Modelling in AEC can be classified in different levels of BIM. UK government has legislated that usage of BIM is mandatory for Government building projects by 2016. UK has adopted top down model in their Government Construction Strategy and aims to be global leader in digital construction (BIS, 2016). Moving towards more efficient and collaborative construction is seen as progressive path with recognisable milestones. National Building Specifications UK (NBS) states the UK Government levels “milestones” of BIM as following:

Level 0 BIM

In this level, there is little or no collaboration between parties and disciplines. 2D CAD drawing is used for producing the information. End product is distributed with paper or electric prints or mix of both. According to NBS national BIM report 2014 most of UK construction has exceeded this level. (NBS, 2014.)

Level 1 BIM

In this level mix of 3D CAD is used for concept work and 2D drafting for official documentation for the government. Data is shared in common data environment (CDE). Each of parties publish and maintain their own data and there is usually no collaboration between AEC disciplines. (NBS, 2014.)

Level 2 BIM

This level has substantial amount of collaborative work between the parties. All disciplines use their own 3D CAD models, but they are not working with single shared model. The collaboration is through information exchange. The design information is shared through a common file format, which enables making federated BIM model from all parties designs and carry out clash detection and checks on the model. All the programs used in the project must be able to export file formats in IFC (Industry Foundation Class) or COBie (Construction Operations Building Information Exchange). UK government has set this level to be the minimum target for public sector works. (NBS, 2014.)

Level 3 BIM

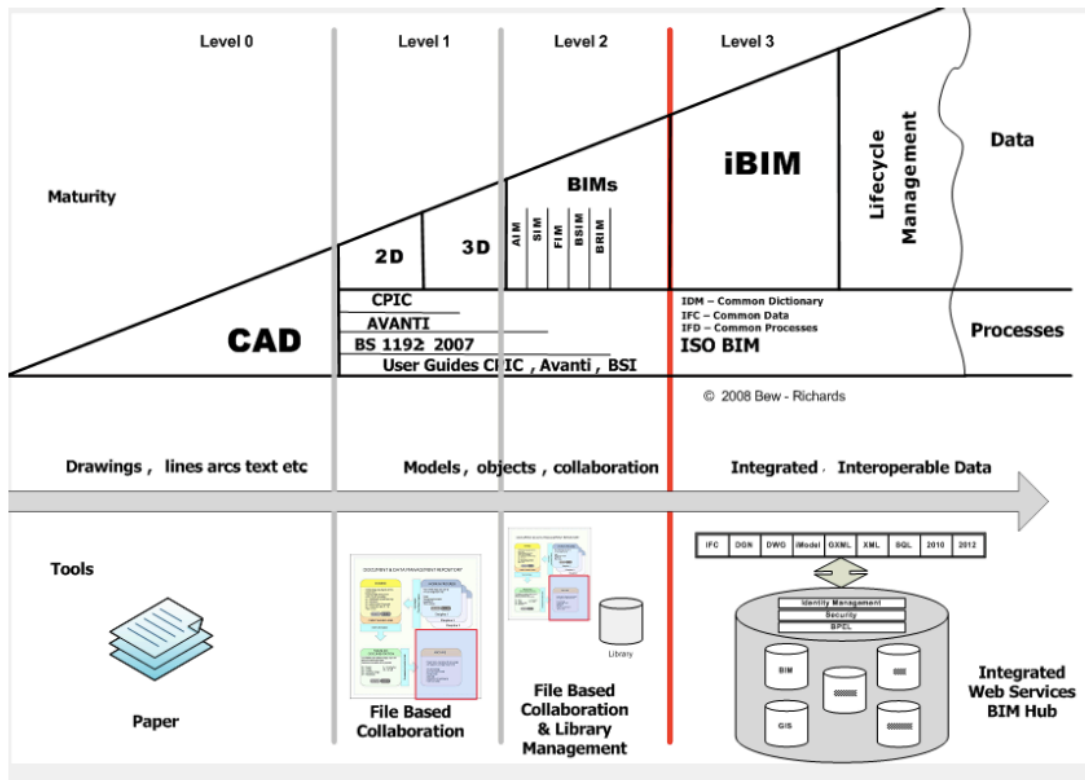
“Level 3 BIM means full collaboration between the AEC disciplines by using a single shared project model which is held in central project bank. All parties can access and modify the same model aiming to remove the risk for conflicting information.” (NBS, 2014)

The issue in level 3 BIM is copyright and liability issues that are tried to be solve by CIC BIM protocol. The aim of UK Government Construction Strategy is to reduce waste of time, money and effort in construction by 20%. According to UK Government goal, having a £ 103 Billion construction market in 2014 (House of Commons, 2015), saving in construction would be 20,6 Billion Pounds on yearly basis (e.g. over 23 Billion Euros). The possibilities of savings and increased efficiency are driving the digitalization of construction industry throughout the nations. In the light of examples provided by Moran et al (2014) 20% efficiency gains are challenging but realistic.

Levels 4, 5 and 6 BIM

Levels 4D, 5D and 6D BIM are more advanced BIM working models. 4D BIM refers to using BIM data to analyse time in construction project, 5D BIM includes cost management and 6D BIM includes Facilities Management (FM) (NBS, 2016). Processes of 4D, 5D and 6D BIM can be done in Level 2 environment. The following picture by HM BIS (2011) illustrates the levels of BIM.

Figure 14. BIM classification levels (HM Government BIS Department of Business, Innovation and Skills. BIM Task group, 2011)



6.2.2 Finland's BIM initiative

Finland does not have a top down approach to In Finland Ministry of Transport and Communication has launched program that is aiming at digitalization of building industry through KIRA-digi project (VM, 2016). This government funded project will focus on 1. Foundations of BIM: specifications and standards, 2. Network (väylä): information services, interfaces and linking things and people together (accreditations of people) 3. Services: Digital processes that can use the standards and network (Henttinen, 2016). Through this BIM initiative Finland is aiming to stay in the forefront of BIM development and is one of leading nations applying BIM.

BIM Standards IFC and LandXML

BIM is different to different people and it is important to clarify what BIM means in the context it is used, without standards and collaboration BIM is just a model (Henttinen, 2016). Standards are very important and many more standards exist in addition to traditional IFC (Industry Foundation Classes format). The information is most important thing in BIM. 2D drawings are human readable and BIM is machine readable. If collaboration is not possible by using BIM it is not BIM. (Henttinen, 2016)

There is not any BIM based program that could handle all the information surrounding BIM. The data transfer is needed from one application to another. New formats for data transfer in InfraBIM are LandXML and Inframodel 4. BIM is beginning to be mainstream in construction projects according to BuildingSmart director Henttinen (2016) 20-30% of Finnish construction projects are utilizing BIM in some level.

Bigger companies are more advanced in utilizing BIM e.g. major international construction Company Skanska is using BIM in all its projects. Skanska has 99 projects ongoing in Finland and in almost 100% of projects Architectural model is BIM based, in 93% of projects Structural Design is made in BIM and in 80% of projects pre cast concrete models are BIM based (Romo, 2016).

6.2.3 Successful BIM implementation

It is not easy to find quantifiable data on the benefits of BIM even though a lot of data can be accumulated in BIM building process. The financial benefits of BIM are seen as strategic producing competitive advantage. This may hinder companies' willingness to share their BIM successes. According to NBS national BIM report 2014, 70 % of the respondents to the report said that BIM has given them competitive advantage.

Howard Jeffery Skanska BIM specialist (2012) points out in his presentation on BIM Benefits substantial financial gains obtained using BIM. The Barts Hospital in UK avoided approximately 1,7 million Pounds (£) of cost due to improved design co-ordination and clash detection. Using tablets in Royal London Hospital, site management reduced 50% of time

used in transit from office to site and back, meaning significant improvement on management time efficiency. Take off quantities from BIM model reduced Quantity Survey (QS) time rendering 350 000 Pounds (£) savings.

Patric MacLeamy (2012) CEO of HOK (renown Global Design, Architecture and Engineering Firm), FAIA and founder and Chairman of BuildingSmart International and developer of industry standards believes that companies using BIM and BAM in construction can save in design and construction phase 30% compared to conventional / traditional building procedure. "Collaboration view Building Industry has suffered because we do not build together, It is not BIM but working together that is important.": states MacLeamy (2014). The overall aim of UK government BIM initiative is to increase profitability by 20%.

Design management

Innovations from production industries have been gradually permeating into real of construction. The primary focus of design management is to produce better value to customers (Morgan and Liker, 2006). Design management has been criticized for its inadequacy and inefficiency by many practitioners and academics (Ergo, 2016). Successful design management takes into consideration the whole life value of project. Familiar concepts and principles of Lean management have been brought into realm of construction (Bhargav et al 2015).

According to Roche (2016) BIM is especially practical when designing complex buildings. The optimal design can be calculated and various possibilities can be studied with BIM tools. This possibility of optimization was brought up by almost all leading BIM experts in Aalto university BIM School (Roche; Pikas; Järvinen; Louhisola and Romo, 2016). Optimization could be reached in both architectural, structural and MEP designing phase as well as in building phase in both building construction and in infrastructure. BIM and other Virtual Design in Construction (VDC) software can be used to check and detect automatically clashes and most expensive ones can be solved in the designing table (Herva, 2016).

Building business is in Process Re-engineering where assumptions and traditions of the way business has always been done are disregarded, and instead new processes are developed that create time cost and quality benefits. BIM is considered to be the third industrial revolution in construction (Schoch, 2016)

Construction site

Advances in BIM utilization has been rapid and literature has difficulty in keeping up with describing the latest developments. Here are some successful cases presented from construction sites.

In building renovations *laser scanning* can be used map the current structures that are going to be under renovation or renewal. The laser scanner produces point cloud of basic shapes of the building and its geometry that can be used to produce BIM model or 2D drawings. The scanners take up to 1 million measurements per second to produce the geometry of the target. It is likely that amount of laser scanning will increase in the future and is going to be used in more projects as price of scanning has decreased due to lowered cost of scanners and their better efficiency (Kostamo, 2016). This future development should be remembered when evaluating the need for Consights programs to interact with IFC or native file formats.

It is possible to use either portable or drone laser scanners in infrastructure targets and make as built models to the end customers and during production make mass calculation based on point clouds (Herva, 2016; Kostamo 2016). Certain advanced infra projects operate in LandXML based format with no printing of pdf's. The excavators have two GPS antennas and the machine is calibrated to use BIM model. The machine operator knows from his tablet how much to dig and does not need as much guidance as in the past. The accuracy of machine guidance in infraBIM is 2-3 cm, which is well within standards.

The recorded benefits of using BIM based solutions in Destia – YIT E 18 Public Private Partnership model (PPP) infra project have been: 1. Better team work, 2. Shorter lead times, 3. Real time information, 4. Owner of the project can have real time influence on the project, 5. Increased collaboration, 6. Efficiency in subcontracting, 7. Less need for surveyors, 8. Improved mass calculation, 9. Centrally managed documents, 10. Updated planes, 11. Significantly improved excavator efficiency (Louhisola, 2016).

Not only infrastructure sites benefit from BIM solutions. UK based Midland Steel uses of Tekla for rebar detailing and fabrication. The MD Tony Woods (2014) says that the company saves money on daily basis on call offs saved, possibility to create videos and calculation of efficiency. In some very complex rebar detailing projects the total time savings have been 60%. The prefabrication according to model has also increased work safety.

According to Woods (2014) using BIM solutions has brought collaboration and superior customer value to the company clients as concrete contractors working with Midland benefit from concrete poor management provided by Tekla software. The software and other technological solutions provide highly advanced traceability using QR and call off procedures. Celca Steel Service provides similar kind of advance service Internationally and also in Nordic countries (Tekla, 2017).

Benefits of BIM in construction can be divided according to usage of Building Information Modelling broadly in three categories (Korpela 2011, 7-9):

1. Project development and feasibility phase: Evaluating project profitability, evaluating building functionality, ecology and energy efficiency.
2. Design phase: Making energy analysis, simulating design options, visualisation, improved co-operation, improved design and design process, clash detection and quantity surveying.
3. Building phase: Quantity information, Scheduling and site planning (e.g area , logistics)

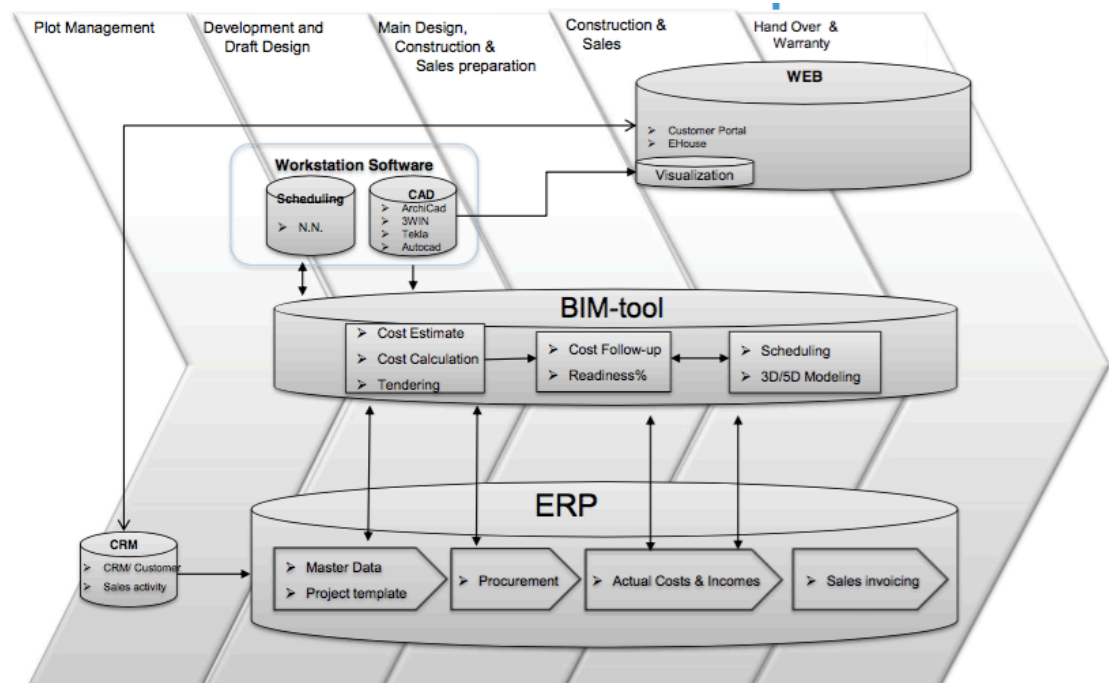
Korpela has also researched the problems in implementing BIM in construction. She interviewed 19 different stakeholders from 7 different work professionals (architects, structural engineers, MEP designers, developers, contractors, construction site managers and BIM consultants) and identified seven key problems in BIM environment (Korpela, 2012, 10;12). They are: 1. Functionality of BIM hardware and software, 2. Quality problems in BIM design, 3. Extra work caused by modelling, 4. Time constraints, 5. Lack of knowledge and poor attitude, 6. Lack of procedures and 7. Problems in collaboration.

Interestingly different disciplines in construction shared different views of most significant problems (Korpela, 2012 12,13). The most pressing problem is understanding each stakeholder position and viewpoint and collaborating in the building project. Kranz (2012) from Kungliga Högskolan in Stockholm has researched the challenges in Sweden in BIM implementation. According to Henttinen (2016), BIM without collaboration is just 3D planning.

6.3 Where is BIM utilized?

Utilization of BIM varies from company to company. The leading companies in Finland have been adopting BIM in different phases. Skanska and NCC have been in the forefront of BIM utilization. YIT has had its first major projects in Finland using BIM just recently and was piloting BIM in 2013 in targets like Dixi Tikkurila Office and Retail Center (Pirinen, 2013). YIT has used BIM in other business regions successfully. It was seen by YIT that in the early 2000's technology was too complex and not ready for mass production (Pirinen, 2013). YIT was starting to use BIM in Russia and Baltics from Quantity take offs to cost estimating from the 2002 and has continued ever since.

Figure 15. Scope of BIM usage in YIT 2013 (Pirinen, 2013)



Scope of BIM usage (2013) in YIT reveals the parent need of software to produce information to cost follow up and estimation e.g. mobile work planning solutions. There is also definitive need for the systems to be integrated to possible ERP software and other software.

Major challenges in profitability in IT solution in YIT 2013 were according to Senior Vice President Pirinen (2013): 1. *Several different systems* during project lifecycle which are *not integrated* - manual work, data not seamless. 2. *Reliable data* between different applications. 3. *Reporting through the projects*, Different contents in different reports between

project phases. 4. Difficulty to see *overall calculation to one project if more than one unit is involved*. 5. *Schedule and cost estimation and follow up/cash flow are not connected in the IT system*. Even though specific challenges described by one company, BIM summer school revealed similar challenges with other companies.

It would be worthwhile for Consight Ltd. to evaluate their product towards the light of the problems YIT has faced and consider how Consight software would be able to address these issues in their project management software. Premeditated inquiries could be made to validate the current situation in YIT.

Successful BIM and mobile project management implementation has started early in Skanska USA (Moran, 2012). Research for mobile computing in Skanska was made as early as 2005 (Löffgren, 2006,8). Nowadays Skanska is using BIM in addition of different Design disciplines in 1. Zoning, 2. Visualization, 3. Scheduling, 4. Sales and Marketing, 5. Cost Estimation and 6. Installations. (Romo, 2016)

According to Vice President of R&D Ilkka Romo (2016) BIM is included in the profitability strategy of Skanska and newly published *2020 Strategy* common for all business units. Skanska is doing on the site small group training to educate employees and management to use BIM. Skanska has 99 projects in 2016 and almost 100% use BIM in architectural model. BIM usage in Structural planning is 93% and 80% of projects use BIM in pre cast concrete models. Skanska follows the National COBIM standard along with BEC-2012 standards and their own guidelines (Romo, 2016).

Interestingly Skanska use Tekla Field3B software in the field project management, 2000-3000 people in Skanska are using it. All projects have Field3D BIM in use. (Also 360BIM used)

What this means: 1. With right kind of software there is a huge potential in bigger firms. 2. Skanska has already chosen and is using several mobile project management software. 3. Consight should carefully study the different software, their benefits, features in short the competitive landscape and evaluate the situation and their product offering. This could mean also interviews with key people to get hold of the situation whether people in Skanska are satisfied with the current situation and what would be the switching cost and motive to change to different software.

6.4 BIM challenges and future trends

Although BIM is offering significant advances in AEC industry it is not without contradictions. Using BIM is knowledge intensive demanding new education and advanced IT skills. The literature brings up following challenges (Korpela 2012, 12;13):

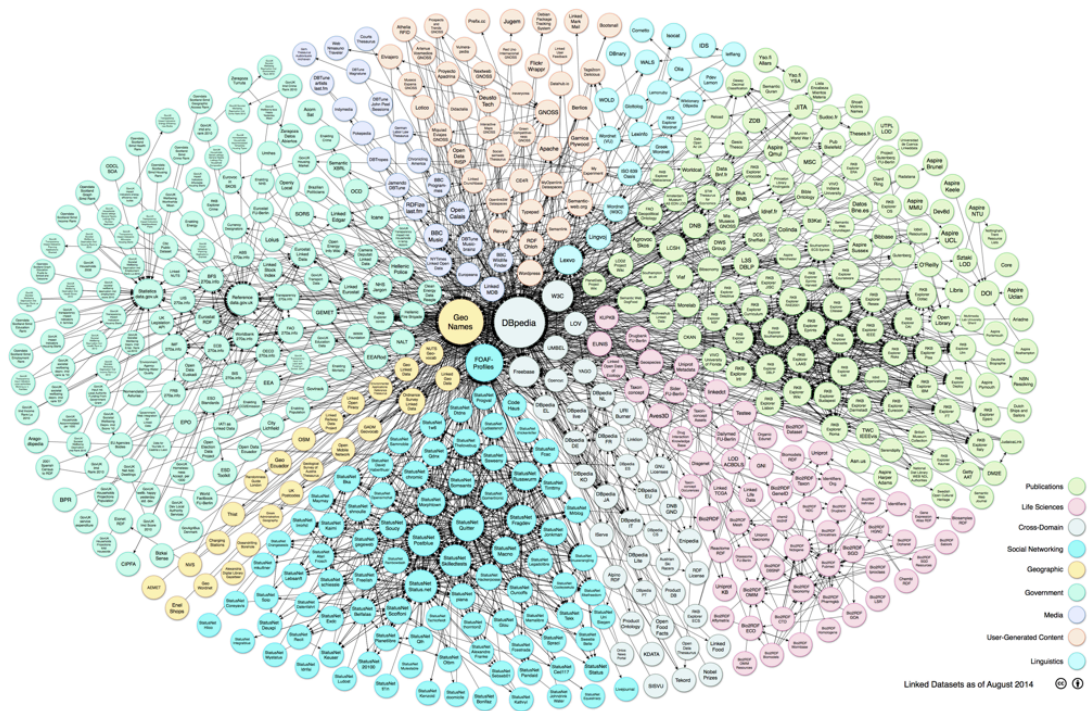
1. Collaboration if all the parties are not using BIM. The work load of others is increased.
2. Juridical issues, who owns the models and rights and analysis and who is paying for them.
3. Updating and making the model takes time and may add design costs.
4. Who is responsible that the information in the model is right and accurate.
5. Managing information between different BIM software, schedule and cost data might be lost.
6. Size of BIM models and reliability of IT might be challenging.

Predicting future might be daunting task. Both international surveys and expert opinions offer glimpse to the future. The future is leading towards joint model /shared model that is used by all project participants. According to BIM Alliance Sweden (2016,9), BIM organizations across the nations are working to solve the Juridical issues.

According to Vice President of R&D Ilkka Romo (2016) in future: 1. Construction process is developing to become paperless, 2. Visualizations become more efficient in residential sales and marketing, 3. Site management will be mobile, 4. Industrial augmented reality enters construction, 5. On site data gathering, drone point clouds, 6. Concrete printing, 7. Architectural 3D printing and 8. Robotic drilling for MEP installations.

More and more information is accumulated on exponential rate. According to Maila Herva and Seppo Törmä (2016) Big Data is big thing in the future. The following picture illustrates (Cyganiac, 2014) the many connections that is can be made in linked data environment. KIRA-digi is aiming to utilize digitalization and Big Data in building new business opportunities.

Figure 16. Complexity of Linked data environment (Cyganiac Richard, 2014)



IoT, the internet of things, industrial internet is changing business and markets in every business field. IoT means products, items and services connected to internet so that they are starting to produce enormous amount of data to their surroundings. How well the company can understand the potential and value of data and is able to use it to its benefit, determines the success of the company (Solita, 2016).

For Consight the concept of IoT could mean that Consight is part of producing valuable information for its clients to be used in further processing. The Think Tank report (2016), produced by Solita and 8 high profile IT and industry professionals, explain and exemplifies the needs for new kind of business thinking.

The 8 main thesis of the group are:

1. Everyone is in the service business (customers do not want products, but solutions and services),
2. Digital business is competition in the customer interface (agile companies will highjack interface from traditional companies),
3. IoT is not technical enterprise but way to renew business (traditional R&D needs to be seen as business model development),
- 4.

Future success demands companies to use data and intelligent algorithms fast to create new business models, 5. Agility and speed is a must in product development, 6. Be smart to find the right IT-ecosystem to utilize, 7. Optimize the risks, and 8. Do not wait for standardization it is too late at that point. (IoT Think Tank, 2016, 51)

6.5 BIM impact Finland

According to BuildingSmart Finland chairman Tomi Henttonen (2016) BIM is beginning to be mainstream in Finland. In certain areas of bulk residential construction 2D planning is more cost efficient and it has maintained its status versus to BIM (Sulankivi, 2016). 20-30% of Finnish construction projects are utilizing BIM in some level. According to Finnish BIM survey the construction professionals predicted that by year 2018, 92% of the professionals are using BIM in some of the projects and 79% of that 92% would be using BIM in most of their projects (Rakennustieto, 2013).

Bigger companies are more advanced in utilizing BIM e.g. major international construction Company Skanska is using BIM in all its projects. Skanska has 99 projects ongoing in Finland and in almost 100% of projects Architectural model is BIM based, in 93% of projects Structural Design is made in BIM and in 80% of projects pre cast concrete models are BIM based (Romo, 2016).

According to Finnish BIM survey 2013 expanding of BIM usage is seen as inevitable, after a while there will not be any other method used.

6.6 BIM and Collaboration considerations.

Although technologies are fantastic to improve quality control, communication and project management, it is not sufficient. Technology is needed to facilitate the change but change is needed also in the human hearth. The construction industry has a multi century chasm between designers and builders (Illustration by BuildingSmart founder Patrick MacLeamy). Collaboration is a must in order to get the benefits that BIM is promising. David Jellings Solibri UK Managing director, BuildingSmart and CBU visiting professor describes BIM as follows (2015) :

“Process that is based upon trust and collaboration and means of open communication will provide an environment to create quality information, BIM is a process that is based on collaboration and trust without that it is useless.”

According to KPMG study trust was issue on most companies only 32% had high trust on their contractor partners. The form of organization of the construction project either facilitates or hinders collaboration. There is research made in the arena of collaborative project organization in construction in Aalto and Stanford Universities dealing with forms like Alliance, IDP and PPP (Bushnell et al, 2013).

Enforcing quality and improving managerial performance in construction project may be significantly improved by mobile technologies. The forms of project organization should promote collaboration instead of rivalry. Usage of BIM and mobile project management is becoming mainstream in the coming years. According to Partrick MacLeamy (2015) The new developments will change from BIM on wards will be Building Assembly Model (BAM) and Building Operation Optimization Model (BOOM). The industry and the clients demand better buildings, better design, better quality, at a fair price, more sustainable buildings that perform well.

The future can be summarized by father of BIM Patrick MacLeamy: “We all have to work in a new way, - World is getting smaller and the world in architecture and construction is getting smaller indeed, the world needs, good designing, good construction, good buildings at a fair price, with constantly improving quality and price. The rest of the world have changed the world “.

6.7 BIM and Consight

BIM is gaining momentum in construction planning and will become the dominant method in the future. 2D drawings still hold cost advantage in bulk residential construction (Sulankivi, 2016). BIM is already partly used in mobile construction management. The challenge is operability (the size of IFC or other format), ease of use and possibility to store data linking it in to the model (Törmä, 2016). Construction project management software that is not constructed around BIM can be faster and easier to operate in fast moving site management tasks.

Apparently there will be time when BIMs significance will increase. Half of Building construction business in Finland is renovations and only very rare renovations have BIM model constructed. This means that will be still demand for mobile construction site management programs that do not utilize BIM. Speed, agility and usability are key factors in ensuring proper performance in site management. Further analysis and research is required to validate the situation and future development. This should include careful analysis and comparison of competitors' products (price, benefits, customer demands, switching costs etc.).

7 Discussion

7.1 Consideration of results

The main objective for this thesis was to make a road map for internationalization for Consight Ltd and encompass in the process a pilot project of marketing automation using Mautic. The Mautic part was excluded from this thesis due to commissioning the company's program development delays and could not be done within the projected timeframe. The realigned idea was to look and evaluate opportunities of internationalization in software business, Building Information Modelling and its meaning to mobile construction project management. The initial thesis time frame was challenging but realistic and the thesis plan included risk analysis and evaluation.

Risks of delays realized during the thesis writing process, some of them were caused by the project company but the greatest was my family tragedy. Our unborn child was diagnosed with a serious condition that in most cases leads to premature death. We had the privilege to love and serve our daughter Priscilla two months until her death and departure to heaven. This tragedy cast a shadow on the thesis process that was hard to tackle.

The main results of this thesis are: 1. Compact but comprehensive construction overview of Finnish construction business with a glimpse to global construction developments, 2. Validations regarding the efficiency of mobile construction project management using written sources. 3. Considerations of internationalization theories, 4. Building Information Modelling and future considerations of mobile project management software development and 5. Product: Internationalization Road Map for software company.

In my estimation, theories of internationalization were considered fairly consistently and I enjoyed especially reading about the versatility of thoughts considering internationalization and cultural differences between scholars. I believe that the interaction with this company has brought value to the company by reflection and also with providing the product internationalization map.

Consight management had a multitude of questions that required to be answered regarding internationalization. Even though I realized that there were too many questions, I did not have the ability to ward off the excess work load, so I tried to the best of my ability to serve

the commissioning company to get answers to their questions. The product part of this thesis contains answers to the commissioning company's specific questions. The challenge of the thesis was also that I had to familiarize myself with software business, combining that with construction and project management.

Starting to work with start-up firm has many challenges and benefits. The challenge for Consight has been that the main energy and effort has been used in software development. This has meant that internationalization scope and competition has not been considered prior to this thesis. Working closely with company management and doing research meant constant discovery of competitors and competitive landscape. Main results of this work was finding out and discovering more thoroughly the international competitive landscape, even though it is not displayed widely in the pages of this thesis. Re-evaluation needed to take place in predicting the potential of the market and the future development of Mobile PM software.

Attending international Aalto University Building Information Modelling school, in order to gain perspective on the future of project management and BIM, proved to be successful and beneficial for the company's future development.

7.2 Trustworthiness of the research and Ethical viewpoint

Not having much experience in international business leads to resting on the shoulders of other that have gone ahead. The main ideas of the road map for software company internationalization rest upon team of researchers Äijö, Kuivalainen, Saarenketo, Lindqvist and Hänninen that produced the: Internationalization Handbook for the software business.

I'm grateful for the rich material and insights provided by Finnish Software Industry and Entrepreneur Association (Ohjelmistoyrittäjät ry). Their material and presentations provide hands on real life experiences in software entrepreneurs internationalization processes and challenges, sometimes challenging the present theories.

I'm grateful to the diligent and bright minds of researcher's and entrepreneurs whose thoughts and theories I have had privilege to use in this thesis. Due to lack of experience I do not have much to say about internationalization, but I have tried to combine thoughts of different researchers and apply them in to the specific situation of construction software internationalization process to best of my ability considering time and situation.

Regarding to BIM part of thesis my privilege was to participate Aalto University BIM Summer School and receive instruction and insight from top people regarding Building Information Modelling. This has inspired me to go forwards with BIM studies in the future.

7.3 Conclusion and suggestions for development

Internationalization is time and resource consuming process. Multitude of decisions need to be considered and critical market information needs to be acquired in order to proceed in the ladders of internationalization. This is even more challenging when internationalization combines software development, project management and construction. This requires high level of expertise form various disciplines.

Suggestions for Consight

Consight management should thoroughly familiarize themselves with internationalization process. This is partly facilitated by reading and studying this thesis and product part. This process could be taken even further by organizing Internationalization workshops that would facilitate further understanding and preparations of internationalization. Specific questions considering competition and country should be researched. The aim should be to construct internationalization strategy that could be used in internationalization and also acquiring Venture Capital for rapid internationalization.

Further study

Further study possibilities and directions would be formulating internationalization strategy for mobile construction project management company, international competitor analysis, market analysis for specific target markets.

7.4 Self-Reflection

This Thesis has been great journey for me. I have learned tremendous amount on software business, software development and international project management that were previously unknown to me. I want to thank Haaga-Helia and my instructors that I was admitted to continue my studies after a long break. I want to thank also thank my wife who

has been so kind to allow me spend time studying even though she has had to take care of our lovely children, as I was studying. Time of writing has not just been a walk in the park. I was facing the most difficult and sorrowful situation in our family as our youngest child died in October 2016. My thoughts have shifted towards heaven and it has been most difficult to continue and finish this thesis.

Evaluation of the thesis process and own learning

This writing and research process has been valuable to me. My scope has not only been to deliver a product that is beneficial to commissioning company but to widen my understanding and skills in the process. This is why I chose to explain more on project management specifics in construction to give a clearer picture where the commissioning company's software product fits. I have also looked beyond the frame of research to get extra push widen my understanding and listened to dozens of successful company executives' interviews in software business, development and internationalization. This has truly been exciting and rewarding experience.

Afterthought

"God is opposed to the proud and haughty, but [continually] gives [the gift of] grace to the humble [who turn away from self-righteousness]" James 4:6 AMP

"For I am convinced that neither death nor life, neither angels nor demons, neither the present nor the future, nor any powers, neither height nor depth, nor anything else in all creation, will be able to separate us from the love of God that is in Christ Jesus our Lord." Romans 8:38-39 NIV

"Love is patient, love is kind. It does not envy, it does not boast, it is not proud. It always protects, always trusts, always hopes, always perseveres. Love never fails. And now these three remain: faith, hope and love. But the greatest of these is love." 1 Corinthians 13:4,7,8,13 NIV

"If it is possible, as far as it depends on you, live at peace with everyone." Room 12:18 NIV

8 References

Ahlsted Magnus. 2007. Implementation of an IT based Marketing information system in a high tech company. MBA thesis, University of Gävle, Department of Business Administration and Economics.

Ammattinetti 2014 Kiinteistövälittäjän ammattikuvaus http://www.ammattinetti.fi/ammatti/detail/2/1/359_ammatti visited 26.4.2016

AMP, 2017. Bible the Amplified Version, the Zondervan Corporation Inc. USA <https://www.biblegateway.com/> visited 11.2.2017

Andersen, Otto, 1991, On the Internationalization Process of Firms: Critical Analysis. Agder State College, published in: Journal of International Business Studies, Vol. 24, No. 2 (2nd Qrt., 1993 pp. 209 - 231 1991 pp. 11)

Autodesk product pricing Nowedge.com <https://novedge.com/products/14044/tab/1> Visited 12.1.2017

Bailletti Tony, Zijdemans Erik, 2014. Technology innovation management review November 2014 <https://timreview.ca/article/843> visited 7.6.2016

Baum Michael, 2015. Slush presentation: No one gives shit about your start-up company. <https://www.youtube.com/channel/UCv2JYTjV80AuHODJO0R6EnQ> Visited 23.6.2016

BIM Alliance Sweden, 2016, BIM påverkan på affär och avtal report. http://www.bimalliance.se/~media/OpenBIM/Files/Projekt/BIM_och_juridiken/BIM_paverkan_pa_affar_och_avtal_Forstudierapport_Rev_A_7_april_2016.ashx visited 1.10.2016

BIM BAM BOOM Patrick MacLeamy <http://www.archdaily.com/262008/the-future-of-the-building-industry-bim-bam-boom> visited 23.6.2016

Bloomberg article, 2013: Ipads supplanting blueprints boosts builder productivity
<http://www.bloomberg.com/news/articles/2013-05-31/ipads-supplanting-blueprints-boosts-builder-productivity> visited 24.6.2016

BuildingSmart Finland <http://buildingsmart.fi/5> visited 17.9.2016

Bushnell Tyler, Kokkonen Anne, Lavikka Rita, Lehtinen Teemu, Neelappa Aman, Senesco Reid. 2013. Collaboration and contracts in Integrated Project Delivery – Exploring the roles of owners and architects. Aalto University.

Capterra Inc <http://www.capterra.com/construction-management-software/> visited 31.5.2016

Central Intelligence Agency (CIA), 2016 World Fact Book, <https://www.cia.gov/library/publications/the-world-factbook/> visited 26.5.2016

CIOB (The Chartered Institute of Building). Code of Practice for Project Management for Construction and Development (4). Hoboken, GB: Wiley-Blackwell, 2011. ProQuest Ebrary. Visited 20.5 2016.

Corboy, M., & O'Corrbui, D. (1999, November). The Seven Deadly Sins of Strategy. Management Accounting: Magazine for Chartered Management Accountants, 77(10), 29-30. EBSCOhost database. Visited 21.5.2016

Cusumano, Michael (2004). The Business of Software – What every Manager, Programmer, and Entrepreneur Must Know to Thrive and Survive in Good Times and Bad. Free Press, New York, NY

Cygniac Richard, 2014 The linking Open data diagram, <http://lod-cloud.net> Visited 16.6.2016

Daniel Tykesson and Mikael Alserud, 2011. The Uppsala Model's Applicability on Internationalization Processes of European SMEs, Today, A Case Study of Three Small and Medium Sized Enterprises. Master Thesis, Lunds University <http://lup.lub.lu.se/luur/download?func=downloadFile&recordId=1977477&fileId=2436199> visited 21.9.2016

Daniels, Radebauch, Sullivan, 2007. International Business 11th Edition Environments and Operations, Pearson Prentice Hall. New Jersey, USA.

Dave, Bhargav & Kubler, Silvain & Pikas, Ergo & Holmström, Jan & Singh, Vishal & Främling, Kary & Koskela, Lauri. 2015. Intelligent Products: Shifting the Production Control Logic in Construction (With Lean and BIM). Proceedings of the 23rd Annual Conference of the International Group for Lean Construction. Perth, Australia, 29-31 July 2015. 10.

Documentary End of Babel https://www.youtube.com/watch?v=g_jmGQvr6dQ Visited 20.5.2016

Eastman, Teicholz, Sacks & Liston, 2011. BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors, 2nd Edition House of Commons United Kingdom Construction Industry Statistics and Policy briefing 6th October 2015. www.parliament.uk/briefing-papers/sn01432.pdf Visited 17.6.2016

Finnish BIM Survey 2013 https://www.rakennustieto.fi/material/attachments/tutkimus-ja_kehittamistoimita/6JKcTDSMO/BIM_Survey_Finland_findings.pdf visited 17.6.2016

Finnish Software Industry Survey (FSIS) 2015 Ohjelmisto yrittäjät ry <http://ohjelmistoyrittajat.fi/fi/software-survey-2015> visited 17.5.2016 or http://teknologiateollisuus.fi/sites/default/files/file_attachments/oskari_2015_press_print.pdf

Finnish Software Survey, Ohjelmisto yrittäjät ry <http://ohjelmistoyrittajat.fi/fi/software-survey-2015> Visited 25.5.2016

Garcia Marie L, Bray Olin H, 1997. Fundamentals of Technology Road mapping. Sandia National Laboratories report <http://prod.sandia.gov/techlib/access-control.cgi/1997/970665.pdf> Visited 28.1.2017

HBR, Kumar Vineet, 2014. Article Making "Freemium" Work, Harvard Business Review May 2014. <https://hbr.org/2014/05/making-freemium-work> visited 11.2.2017

Henttinen Tomi, 2016. Building Smart presentation in Aalto BIM School 11.6.2016

HM Government BIS Department of Business, Innovation and Skills. BIM Taskgroup, 2011 A report for the Government Construction Client Group Building Information Modelling (BIM) Working Party Strategy Paper, 2011. <http://www.bimtaskgroup.org/wp-content/uploads/2012/03/BIS-BIM-strategy-Report.pdf> visited 24.9.2016

HM Government, BIS Department of Business, Innovation and Skills <http://www.bim-taskgroup.org> visited 24.9.2016

Hollensen Svend, 2007 Global Marketing 4th Edition, FT Prentice Hall

Hollensen Svend, 2013, Global Marketing 6E, Pearson Education.

Howard Jeffery Skanska BIM specialist <http://www.slideshare.net/SoBEVPSeries/open-bim-benefits-howard-jeffrey/16> Visited 24.9.2016

<https://en.wikipedia.org/wiki/IPad> 24.6.2016

https://en.wikipedia.org/wiki/Samsung_Galaxy_Tab_series visited 24.6.2016

https://en.wikipedia.org/wiki/Tablet_computer visited 24.6.2016

Huhtanen Heikki, 2009, The Operational Mode strategies of Finnish Firms in South Korea with a Special Emphasis on Mode Switching, Stretching and Mode Combinations. Master's Thesis Helsinki School of Economics. http://epub.lib.aalto.fi/fi/ethesis/pdf/12072/hse_ethesis_12072.pdf Visited 10.7.2016

Infra ry <https://www.rakennusteollisuus.fi/INFRA/> visited 25.4.2016

Inkinen Sami, 2013. Kasvuforum, Ohjelmistoyrittäjät ry <https://www.youtube.com/watch?v=Zmgwdve3XtQ> visited 15.6.2016

Inkinen Sami, 2013 Lessons from market Distructor Part 1 https://www.youtube.com/watch?v=Y0_KT6ZQHQs visited 15.6.2016

Intelligent Products: Shifting the Production Control Logic in Construction (With Lean and BIM) <https://aaltodoc.aalto.fi/handle/123456789/17643> or https://aaltodoc.aalto.fi/bitstream/handle/123456789/17643/A4_dave_bhargav_2015.pdf?sequence=1&isAllowed=y visited 29.9.2016

Kemppainen Niilo, DI. Metropolia, Helsinki. Interview 23.4.2016, interviewer Heikki Närhi

KIRA DIGI <http://www.rakli.fi/raklin- uutiskooste/karkihanke-digitalisoi-kiinteisto-ja-rakentamisan-toimintaymparisto-ketteraksi-tieto-liikkeelle-ja-kokeiluilla-uutta-bisnesta.html> visited 26.10.2016

Kranz Frida, 2012. Building Information Modeling In the production phase of civil works. Kungliga Tekniska Högskolan. Stockholm. https://www.kth.se/polopoly_fs/1.339908!/Menu/general/column-content/attachment/Master%20Thesis%20-%20Frida%20Krantz%2020120603.pdf visited 29.1.2017

Kontio, Jyrki, 2004, Ohjelmisto ala on vaikeasti tapettavissa, TIVI, <http://www.tivi.fi/Arkisto/2004-04-20/Professori-Jyrki-Kontio-Ohjelmistoala-on-vaikeasti-tapettavissa-3090064.html> visited 10.6.2016

Korpela Jenni, 2011. Challenges and benefits of building information modelling in construction projects. Aalto University. http://www.helsinki.fi/cradle/bim/Dtyo_Korpela.pdf visited 25.6.2016

Korpela Jenni, 2012. Tietomallintamisen käyttöönoton ongelmat rakentamishankkeessa. Cradle. Helsinki University http://www.helsinki.fi/cradle/bim/Korpela_Konsepti.pdf visited 29.1.2017

KPMG Global Construction Survey 2015 <https://assets.kpmg.com/content/dam/kpmg/pdf/2015/04/global-construction-survey-2015.pdf> Visited 10.6.2016

KVKL 2015 Kiinteistövälitysalan keskusliitto. Total value of housing transactins article. http://www.kvkl.fi/ajankohtaista.html#ajankohtaista_id_31524 visited 26.4.2016

Luostarinen, R. & Hellman, H. 1993. The internationalisation processes and strategies of Finnish family firm. 2 print. Helsinki: Helsinki School of Economics

Löffgren Alexander, 2006. Mobile Computing and Project communication Mixing oil and water? Royal Institute of Technology. Licentiate thesis.

<http://www.diva-portal.org/smash/get/diva2:10164/fulltext01> visited 16.6.2016

MacLeamy Patrick, 2015. BIM Prospects (26 March, 2015) The journey so far. BRE conferences. <https://www.youtube.com/watch?v=1M-TwxhRvm4> visited 15.6.2016

Jellings David, 2015. BIM Prospects (26 March, 2015) The journey so far. BRE conferences. <https://www.youtube.com/watch?v=1M-TwxhRvm4> visited 15.6.2016

Manolova, T.S. and Brush, C.G. (2002) 'Internationalization of small firms – personal factors revisited', *International Small Business Journal*, 20(1), pp. 9–31. [https://www.researchgate.net/publication/240056380 Internationalization of Small FirmsPersonal Factors Revisited](https://www.researchgate.net/publication/240056380_Internationalization_of_Small_FirmsPersonal_Factors_Revisited) visited 19.9.2016 (requires subscription)

Maria Lindqvist, 1991 Infant multinational, Internationalization of Young, Technology Based Swedish Firms. Institute of International Business, Stockholm School of Economics. <https://ex.hhs.se/dissertations/526751-FULLTEXT01.pdf> Visited: 3.6.2016

Moran Michael, 2014 Autodesk University <http://au.autodesk.com/au-online/classes-on-demand/class-catalog/2014/bim-360-field/co5007-r> ; http://aucache.autodesk.com/au2014/sessionsFiles/5007/4353/handout_5007_AU%20Handout%20-%20Roundtable.pdf Visited 18.6.2016

Morgan and Liker, 2006. Temple University Philadelphia. http://astro.temple.edu/~rmudambi/Teaching/BA951/Week_04/Toyota-Sunny-Side-Liker-Morgan.pdf Visited 14.5.2016

National Building Specifications UK (NBS), 2015. BIM definition <https://www.thenbs.com/knowledge/what-is-building-information-modelling-bim> visited 17.6.2016

National Building Specifications UK (NBS), National BIM report 2014 <https://www.thenbs.com/knowledge/nbs-national-bim-report-2014> visited 24.9.2016

NIV, 2017. Bible the new international version, the Zondervan Corporation Inc. USA

<https://www.biblegateway.com/> visited 11.2.2017

Nordström Kjell A, 1990. Internationalization Process of a Firm – Searching for new patterns and Explanations. Doctoral Dissertation. Stockholm School of Economics Print 1991
<http://www.diva-portal.org/smash/get/diva2:511751/FULLTEXT01.pdf> visited 2.6.2016

Otuli hanke, 2005. Ohjelmistoliiketoiminnan kansallisen klusterin visioprosessi. University of Turku <https://www.utu.fi/fi/yksikot/ffrc/tutkimus/hankearkisto/kansallinen-ennakointi/Sivut/otuli.aspx> Visited 15.5.2016

Otuli loppuraportti, 2005 Ohjelmistoliiketoiminnan kansallisen klusterin visioprosessi. University of Turku <https://www.utu.fi/fi/yksikot/ffrc/tutkimus/hankearkisto/kansallinen-ennakointi/Documents/otuli-loppuraportti.pdf> Visited 15.5.2016

Oxford Economics 2015, Global forecast for construction industry 2030. Article: Building.co.uk 10th November 2015 Yoosof Faraah <http://www.building.co.uk/global-construction-to-grow-85-by-2030/5078595.article> and <https://www.pwc.se/sv/entreprenad/assets/global-construction-2030.pdf> Visited 15.6.2016

Pirinen, Vesa, 2013. Skaitmenine statyba “Digital construction” Lithuania lecture: YIT Challenges taking BIM in use & Development in YIT 2000/2013: http://www.skaitmeninestatyba.lt/files/Konferencija/Prezentacijos/7_Vesa%20Pirinen_BIM-Case%20YIT_Challenges%20taking%20BIM%20in%20use.pdf visited 1.10.2016

Rakennusteollisuus 2012 Rakentamisen yhteiskunnalliset vaikutukset. <https://www.rakennusteollisuus.fi/globalassets/suhdanteet-ja-tilastot/rakentamisen-yhteiskunnalliset-vaikutukset-2012.pdf> visited 24.4.2016

Rakli 2013 Kiinteistö alan yhteiskunnallinen merkitys. <http://view.24mags.com/publication/rakli/fb33d7b6630db4a6374deb6c0a94d801#/page=9> <http://www.rakli.fi/tietoa-kiinteistoalasta.html> visited 24.4.2016

Rogers, Everet M., 1962. Diffuse of Innovations. The Free Press MacMillan Publishing Co. USA. <https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf> Visited 21.9.2016

ROI on mobile project management Michael Moran <http://au.autodesk.com/au-online/classes-on-demand/class-catalog/2014/bim-360-field/co5007-r> Visited 16.6.2016

Romo Ilkka, Skanska BIM practice presentation in Aalto BIM School 11.6.2016

RT 10-10387 Building Project, Rakennustuote Metropolia intra visited 24.5.2016;
http://freshproject.eu/data/user/01_public-area/Articles/Rakennusprojek-tin_kulku_Kyösti_27_4_2010.pdf visited 24.5.2016

RT 2011 Rakennusalan työmarkkinat perustietoa. <https://www.rakennusteollisuus.fi/Tieto-alasta/Tyoelama/Tietoja-tyovoimasta-rakennusalalla/> visited 24.4.2016

RTT 2015 Rakennustuoteteollisuus toiminta. See: Subdivisions: Concrete, Small residential building industry, Building materials Steel <https://www.rakennusteollisuus.fi/Toimialat/Rakennustuoteteollisuus-RTT/> visited 25.4.2016

Sears, S. Keoki, Sears, Glenn A., and Clough, Richard H. Construction Project Management (6). Somerset, US: Wiley, 2015. ProQuest Ebrary. Visited 20.5.2016.

Simin Lin. 2012. Internationalization of the SME: Towards an integrative approach of resources and competences, Ph.D student in Management Science IAE - Université Jean Moulin Lyon. France. <https://halshs.archives-ouvertes.fr/halshs-00692465/document> Visited: 21.9.2016

Sipiläinen Miska, 2014, Thesis: Site Organization Lack List, Civil Engineering Metropolia https://www.theseus.fi/bitstream/handle/10024/73779/Insinoorityo_jar-jestyksen%20puutelista_MiskaSipilainen.pdf?sequence=1 visited 15.5.2016

Software Advice Inc <http://www.softwareadvice.com/construction/?more=true#more> visited 31.5.2016

Software Advice Inc. Job Roles on Construction Software Purchasing Decisions <http://www.softwareadvice.com/resources/job-role-impact-on-construction-software-purchases/> ;Software Advice Inc. Construction Buyer Report 2015 <http://www.softwareadvice.com/resources/construction-buyer-report-2015/> visited 31.5.2016

Solita, <https://www.solita.fi/ajankohtaista/solita-think-tank-suomalaisyriykset-varovat-liikaa-iot-kokeiluja/> visited 1.10.2016

Suurimmat Rakennusliikkeet ja erikoisurakoitsijat (2016) p. 20-21 Rakennuslehti
13.5.2016

Tekla, 2017. Celsa Steel focuses on rebar total costs. <https://www.tekla.com/fi/referenssit/celsa-steel-service-keskittyy-raudoitusten-kokonaiskustannuksiin> Visited 28.1.2017

Trible, 2011. Trimble acquires Tekla. <https://www.trimble.com/news/release.aspx?id=050911a> visited 11.2.2017

Trimble, 2012. Trimble acquires Vicosoftware. <https://www.trimble.com/news/release.aspx?id=110212a> visited 11.2.2017

Tönis Mets (2012). Creative Business Model Innovation for Globalizing SMEs, Entrepreneurship - Creativity and Innovative Business Models. http://www.intechopen.com/download/pdf/pdfs_id/29838 Visited 28.6.2016

Törmä Seppo. 2016. Aalto University Summer School Otaniemi 7th- 15th

VM, Ministry of Transport and Communication, 19.5.2016 <http://valtioneuvosto.fi/paatokset/paatos?decisionId=0900908f804c23c7> and YM Ministry of the Environment <http://www.ym.fi/kiradigi> visited 18.6.2016

Väisänen Kim, 2013. Ohjelmisto yrittäjät ry. Kasvuforum <https://www.youtube.com/watch?v=GWzLsQljs4g>

Väisänen Kim, 2015. Experiences from successful internationalization. Ohjelmisto yrittäjät ry. <https://www.youtube.com/watch?v=pyPOlwYVWs4>

Wall Street Journal 2012 <http://blogs.wsj.com/cio/2012/11/20/skanska-opens-mobile-app-development-to-field-workers/> visited 24.6.2016

Welch, Lawrence S, Benito, Gabriel R.G., Petersen, Bent. 2007. *Foreign Operation Methods. Theory, Analysis Strategy*. Edward Elgar Publishing, Inc. Massachusetts, USA.

Woods Tony, 2014. Midland Steel use Tekla for rebar detailing and fabrication.

<https://www.youtube.com/watch?v=h8X-v0R3oXk> visited 25.5.2016

Äijö Toivo, Kuivalainen Olli, Saarenketo Sami, Lindqvist Jani and Hanninen Hanna. 2005. *Internationalization handbook for the Software Business, The Model of Internationalization Paths & Internationalization Workbook*. Centre of Expertise for Software Product Business (Ohjelmistotuoteliiketoiminnan osaamiskeskus).

Äijö, Toivo. 2001. *Suomalaisyritys kansainvälistyy. Strategiat vaihtoehdot ja suunnittelu*. Helsinki: Yliopistopaino Oy.

Äijö, Toivo. 2008. *Kilpailukyky huippukuntoon*. Suomalaisyritys kansainvälistyy. Helsinki, WSOY Pro.

APPENDIX 1