

“TrackIT provides a revolutionary mobile positioning technology that calculates ones position more effectively than current solutions.”

Business Plan



**track it**  
accurate mobile positioning

Team:  
Eric Graf | Maximilian Hoene | Arra Khararjian | Manuel Noras  
Fredrik Tufvesson | Johan Karedal | Anders J Johansson

May 6th, 2011

Note: This business plan has been revised for publication purposes

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# I. EXECUTIVE SUMMARY



Throughout the last several years, mobile positioning has taken on an increased role in user function. However, current methods do not work well indoors, are power consuming and not as accurate as users desire. Our technology will change the way users get their mobile positions.

Scientists at Lund University have been researching in the field of mobile positioning systems in order to take interactive localization to the next level. Our research team has come up with an algorithm that relies on core components of most modern mobile phones (accelerometer, gyroscope, antenna, processor) to provide customers with enhanced mobile positioning possibilities by allowing mobile phones to efficiently calculate their positions both indoors and outdoors with estimated accuracy levels of 5-10 meters.

Through licensing agreements with chip manufacturers and strategic partnership with Original Equipment Manufacturers (OEMs - here: Mobile Phone Manufacturers) and Carrier Service Providers (CSPs), TrackIT will work towards having the algorithm embedded into mobile phones. We expect to break even by year four of operation. A patent for the technology was filed in May 2010 and is currently pending.

Our team consists of seven professionals whose skills complement each other to give TrackIT an attractive balance of business and science. The management team consists of four Masters in Entrepreneurship students and the research team is composed of three PhD Scientists from Lund University.

This business plan describes the commercialization process of this innovation, identifying several steps that need to be taken into consideration.

## II. OUR STORY

In early 2008, Lund University Associate Professor Fredrik Tufvesson and his team were conducting a research project about directional properties of radio channels when they thought about how nice it would be to use measurements from a person running with an antenna over a large area. This would result in a never been seen before resolution for directional estimation using a vast array of antennas and having hundreds of virtual antenna elements present. With these ideas in mind, TrackIT's technology was born.

After additional research and several rounds of discussion, Fredrik and his team discovered that with a single antenna element and accelerometer (used on aircrafts to calculate positioning), the idea could become feasible. Early investigations were done and the results, combined with previous knowledge from earlier projects, were promising enough for the team to move forward with the idea and implementation of this technique in positioning involving base station triangulation.

With the advent of the iPhone and other new highly functional Smartphones, the market for positioning services was and still is in its early stage, and promises to become the “New, New Thing”. Fredrik realized that if this technique really worked as theorized and also worked indoors, it could have tremendous commercialization potential because of the limitations of existing positioning techniques.

The project was offered to and accepted by a team of four Masters in Entrepreneurship students who currently form the management team. With the researchers technological ideas and the entrepreneurs commercialization dreams, the business of TrackIT has begun to take shape.



A glowing lightbulb is positioned above a person wearing a cap. The background is a soft, warm gradient. The text 'PART 1: BUSINESS IDEA' is overlaid on the left side of the image.

# PART 1: BUSINESS IDEA

# VALUE PROPOSITION

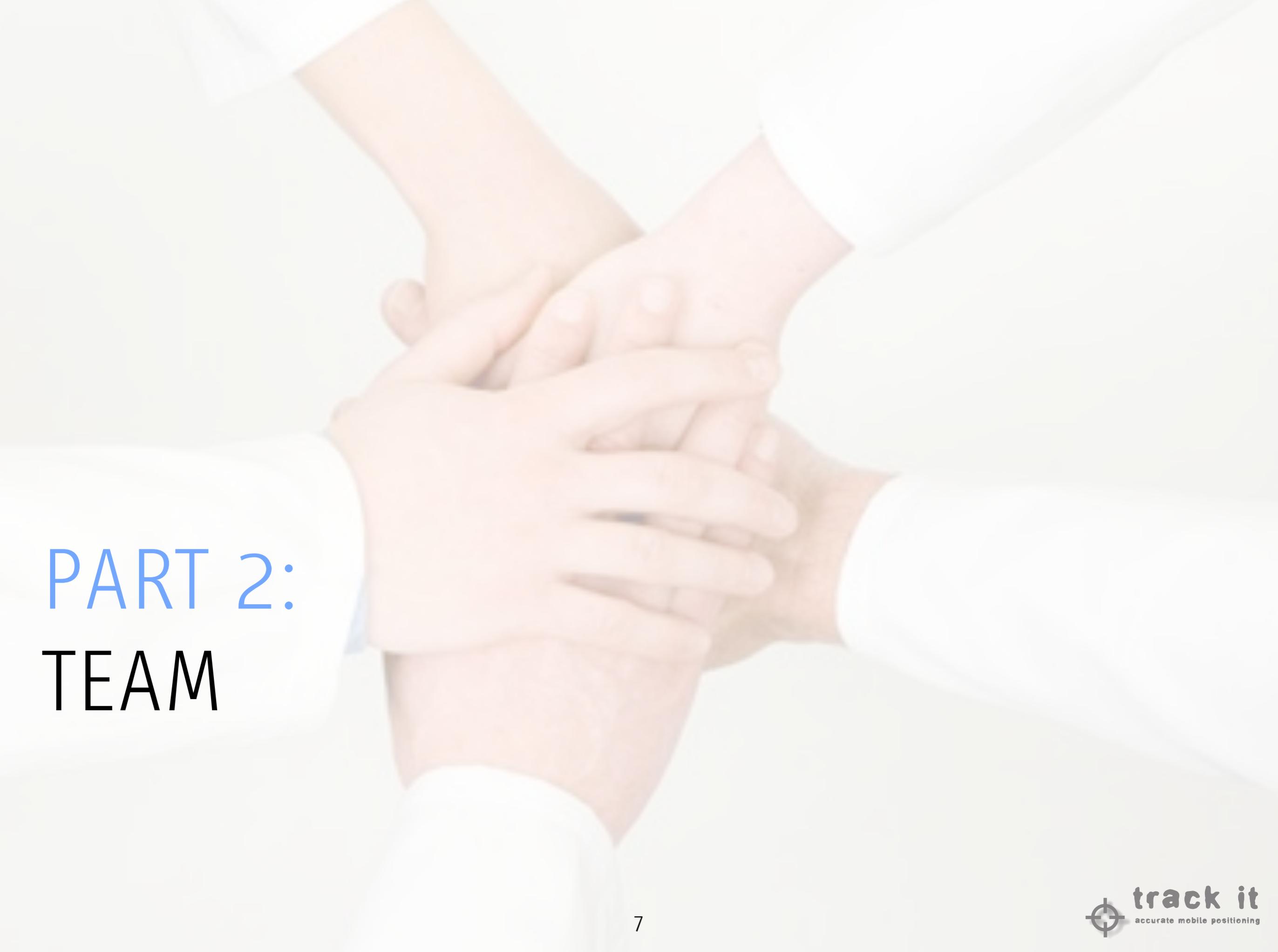
The value and customer savings of this technology cannot simply be put in monetary terms at this point, but several customer benefits can be identified:

TrackIT's technology will significantly improve the accuracy, especially indoors, of navigation and location based services in general, and thus adds value to a mobile phone by improving its functionality. Location Based Services (LBS) are those services that use the knowledge of the users' location to provide appropriate information like weather, nearby stores, etc. Specifically, our technology can increase the performance of: mapping and directions, advertisements, gaming, indoor tourism, parental control, rescue services, social networking etc.

Navigation and location-based services have been growing, catching attention and attracting more and more consumers, implying that consumers are willing to pay a premium for improved services of that kind. OEMs can therefore gain a competitive advantage by having our technology integrated in their mobile phones.

Additionally, the technology will make everyday use of mobile devices more convenient. The energy-consuming GPS chip built into mobile devices will not necessarily become obsolete, but will be used less. This means that the mobile device does not need to be charged as often, which adds to the convenience of the mobile phone user experience.

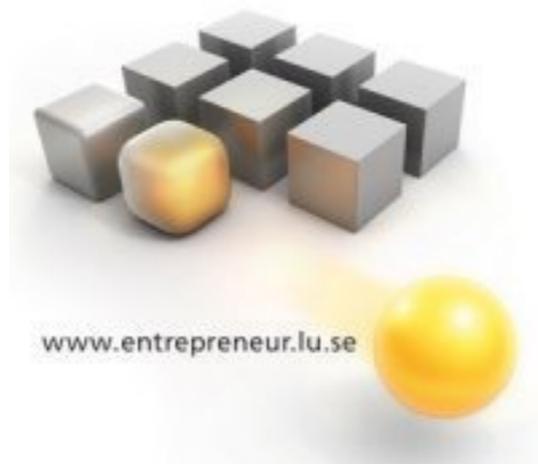
“TRACKIT PROVIDES AN INTERESTING SOLUTION FOR INDOOR POSITIONING THAT CAN BE READILY INTEGRATED IN THE CELL PHONES.”  
(Mats Lindoff, former CTO of Sony Ericsson)



PART 2:  
TEAM

# TEAM

Eric Graf, Maximilian Hoene, Arra Khararjian and Manuel Noras are assigned by Lund University researchers Fredrik Tufvesson, Johan Kåredal and Anders J Johansson to carry on the commercialization of the technology. In addition, Lund University's technology transfer office LU-Innovation helps the team with business advice, patent applications and financing. At this point the ownership is held by the researchers. A letter of intent determining the parameters of the collaboration was signed by all three parties on March 1st, 2011.



LUND UNIVERSITY

# MANAGEMENT TEAM

Eric Graf

Growing up in a family of diplomats, Eric lived in many different countries and experienced their cultures. After completing high-school in New York, he spent a year in the army as a tank driver in an armored infantry battalion. The forms of hierarchies in the army inspired him to study organizational structures during his liberal arts degree in The Netherlands, approaching this topic from the fields of psychology and economics at the same time. Following his graduation, he worked in Corporate Human Resources at BOSCH and later joined a small project oriented consultancy in Berlin, focusing on the socio-technological implications of renewable energies, biogas in particular. Eric brings into the project an affinity to technology in general and team management skills in particular.



Maximilian Hoene

Maximilian holds a master degree in business from Freie Universität Berlin, Germany. He specialized in strategic management and marketing. He has worked in the international marketing and sales department at Volkswagen AG. His team successfully developed pricing strategies for Volkswagen cars in various international markets, such as Africa, the Middle East and Russia. His expertise will help find a suitable business model to carry the project into the future.



# MANAGEMENT TEAM

Arra Khararjian

Arra holds a degree from the University of California, Davis in Economics. He worked for two years as the Junior Financial Analyst at Lieff, Cabraser, Heimann, & Bernstein, a nationwide plaintiffs class action law firm where he worked extensively on major class action lawsuits and investigations. Arra also has interned at ETX Capital (formerly TradIndex) in London as a trader support intern where he worked on various projects including the marketing and promotion of TradIndex. Arra will assist with finance and legal issues.



Manuel Noras

Manuel has a bachelor degree in Business Administration and ten years working experience in the healthcare industry. At University Manuel achieved valuable knowledge in managing, developing and organizing businesses. He worked in product and trade show management as well as company organization, business communication and marketing strategies. Manuel explored various markets and business cultures. His practical and theoretical background helps the team to manage the young company and find smart commercialization strategies.



# RESEARCH TEAM

Fredrik Tufvesson, PhD

Fredrik Tufvesson received his M. Sc. degree in Electrical Engineering in 1994, the Licentiate Degree in 1998 and his Ph. D. in 2000, all from Lund University. After two years at a start-up company developing mesh network technologies, Fredrik is now working as associate professor in Radio Systems at the Department of Electrical and Information Technology at Lund University. His main research interests are channel measurements and modeling for wireless communication, including channels for both MIMO and UWB systems. Fredrik is a previous Venture Cup winner and is co-founder of ResQU AB, a start-up company providing equipment for cell phone based search and rescue operations.



Johan Kåredal, PhD

Johan Kåredal received his M. Sc. degree in Engineering Physics from Lund University in 2002, and his Ph. D. in Radio Systems in 2009. Currently he is a postdoctoral fellow of the Communications group at the Department of Electrical and Information Technology. His research interests includes channel measurements and modeling for multi-antenna (MIMO) systems and ultra-wideband systems (UWB).



Anders J Johansson, PhD

Anders J Johansson received his M. Sc. (1993), Licentiate (2000) and Ph. D. (2004) degrees in Electrical Engineering from Lund University. From 1994 to 1997 he was with Ericsson Mobile Communications AB developing transceivers and antennas for mobile phones. Since 2005 he is an Associate Professor at the department of Electrosience at Lund University. His research interests include antennas and wave propagation for medical implants as well as antenna systems and propagation modelling for MIMO systems.



# BOARD OF DIRECTORS

Fredrik Tufvesson, PhD

Along with being the head of the research team Fredrik will also be part of TrackIT's Board of Directors.



Sven Olsson

Sven is Business Development Manager at LU Innovation and represents the technology transfer office at Lund University. The mission of LU Innovation is to facilitate the transfer of knowledge created at Lund University into commercially approachable innovations. Sven was also the CEO of Signal Control Sweden AB where he brings 15 years of working experience within the Professional Training & Coaching industry to the Board of Directors



Tomas Karlsson, PhD

Tomas has several years of international educational experience, as a PhD student at Stanford and the University of Alberta; and as a post-doctoral fellow at Wilfrid Laurier University and Queensland University of Technology. Since fall 2009, he has been employed as Associate Professor in Entrepreneurship at Lund University. He is currently responsible for the Master program in Entrepreneurship.



TBA

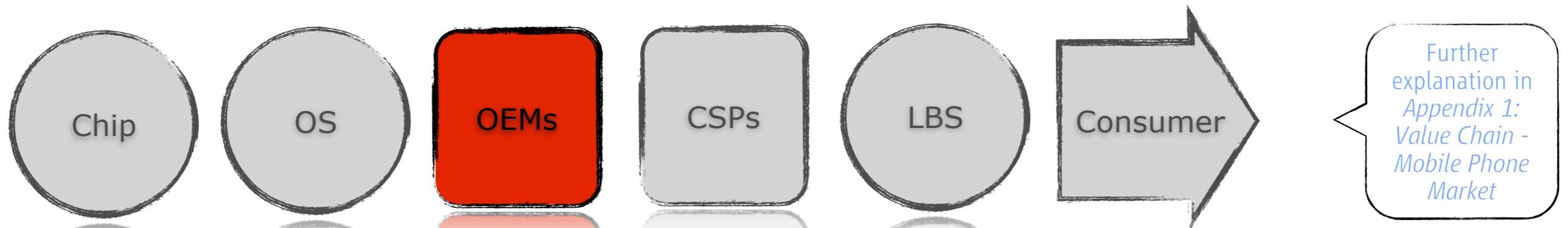
Currently we are working on the recruitment of a highly experienced person, both from a technical as well as a management side, from the cellular industry. At this point in time, no names are mentioned in order to avoid premature announcements and guarantee individual privacy until official appointment.





PART 3:  
MARKETING PLAN

# INDUSTRY ANALYSIS - MOBILE PHONES



"The mobile phone market has the wind behind its sails," said Kevin Restivo, senior research analyst with IDC's Worldwide Quarterly Mobile Phone Tracker. IDC believes the worldwide mobile phone market will be driven largely by smartphone growth through the end of 2014. "Feature phone users looking to do more with their devices will flock to smartphones in the years ahead," noted Restivo. "This trend will help to drive the smartphone sub-market to grow 43.7% year over year in 2011."

In fact, according to Gartner, Inc. an information technology research and advisory firm headquartered in Connecticut, USA, Smartphone sales already grew 96% in the Q3 2010 from Q3 2009, and smartphones accounted for 19.3% of overall mobile phone sales in the Q3 2010.

The most recent analysis of the mobile phone market is based on sales from Q4 2010. According to the International Data Corporation (IDC) Worldwide Quarterly Mobile Phone Tracker the worldwide mobile phone market grew 17.9% in Q4 2010, a new quarterly high driven by smartphones. This growth accounts for the fourth consecutive double-digit increase in sales year-on-year. Mobile phone sales increased to 401.4 million units in the Q4 2010 compared to 340.5 million units in the Q4 2009. On a cumulative worldwide basis in 2010, a total of 1.39 billion units were sold, an increase of 18.5% from the 1.17 billion units sold in 2009.

# INDUSTRY ANALYSIS - MOBILE PHONES

The mobile phone market is dominated by two major players with Nokia (33% market share) and Samsung (25% market share) providing more than 50% of the mobile phones to the world based on data from Gartner Inc. in 2010. Several companies also hold strong positions in the market with relation to market share: LG Electronics holds 8%, Research In Motion (RIM) and ZTE both hold 4%, and Sony Ericsson holds 3%. Other OEMs combined make up the final 28% of the market. Although Sony Ericsson is one of the smaller players with respect to the market, their geographical proximity being headquartered in Lund and connections with Lund University, MHBC and other local organizations make it a prime potential customer for TrackIT (see *Part 2: Team: References*).

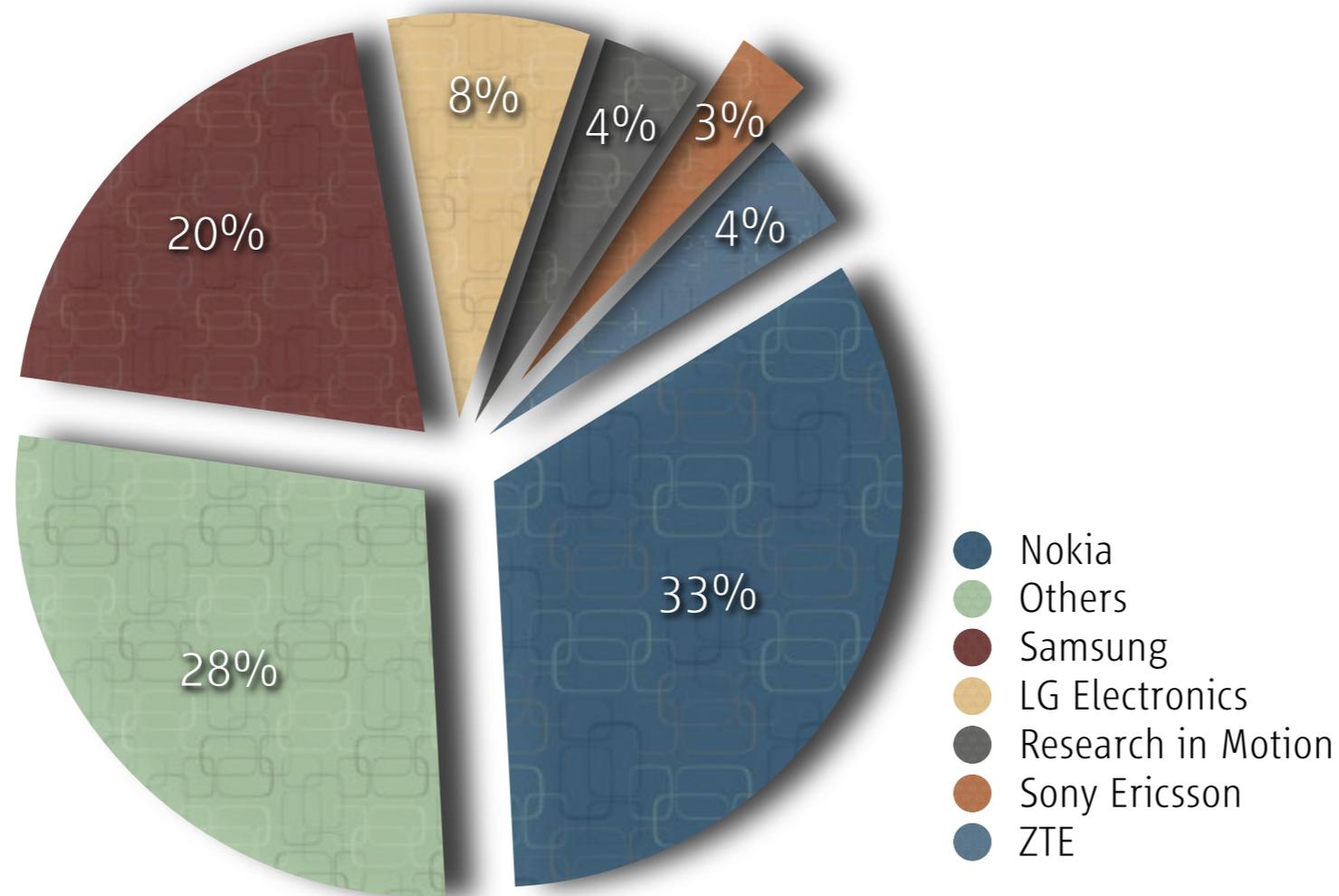
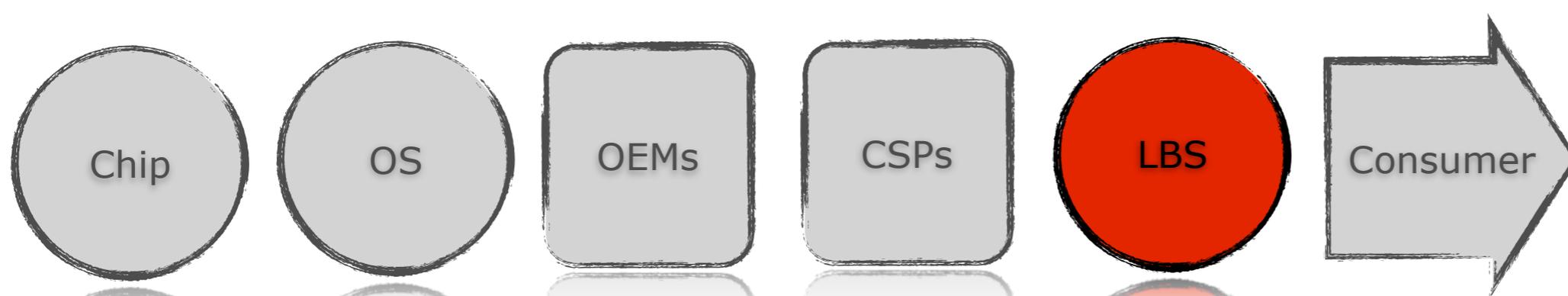


Figure 2: Mobile Phone Manufacturer Market Share (2010), according to data from IDC

# INDUSTRY ANALYSIS - INDOOR LBS



“INDOOR POSITIONING IS A PROBLEM THAT IS OF LARGE INTEREST FOR THE INDUSTRY WAITING TO BE SOLVED.” (Mats Lindoff)

Location based services (LBS) have arrived and are becoming an integral part in the everyday life of millions of consumers. In fact, Juniper Research predicts that location based services will result in revenues of over \$14 billion USD by 2014, with the greatest revenues coming from Western Europe. TrackIT has identified key areas where the technology can be used indoors and create sustainable customer benefits:

**Point-of-Sale Advertising:** “Location-based applications are extremely interesting for brands and retailers in that they allow those companies to direct consumers to outlets in their vicinity while simultaneously providing information about the products on offer.” - Gartner Inc.

**Office Management:** More accurate indoor positioning can help employers keep operations smooth by allowing employees in large buildings find an open meeting room or find a colleague. Employers can also track data patterns and behavior of employees to improve the working condition and optimize space.

**Airport Management:** Airline operators can give passenger notifications and manage crowds and staff during chaotic times. Passengers can receive advertisements for food and shopping depending on their location in the airport.

**Check-in Applications:** Companies like Foursquare, Gowalla and Facebook places can move from manual to automated check-ins. That is both more user-friendly and provides a new window of opportunity to expand on location-based targeting, servicing dynamic offers based on for instance which section you are in at Walmart.

# TECHNOLOGICAL DIFFERENTIATION

	Technological Infrastructures		
	GPS	Wifi	BSB
Accuracy			
Availability			
Battery life			



GPS modules embedded in every smartphone today consume a fair amount of battery power. When turned on, the GPS module on any given mobile phone drains the battery power on an average of five hours, even if no other function of the phone is being used such as calling, texting or playing music. GPS requires line-of-sight to satellites and thus does not work indoors.

A current alternative to GPS is the traditional network based positioning by base station based (BSB) triangulation. BSB triangulation is a matter of intersection of three signals and uses signal strength as a distance measure, which has proved to be inaccurate.

A third infrastructure for mobile based positioning is Wifi. Due to the uncertainty of Wifi-station locations, accuracy and availability levels are worse than GPS, however the accuracy levels are better than BSB technologies. Battery life using Wifi based positioning is better than GPS but worse than BSB.

# COMPETITION

Currently there are several companies engaging in similar research, such as Skyhook (Boston, USA), arguably the most prominent player in the indoor positioning market. Skyhook's Core Engine is a software-only location system that quickly determines device location with 10 to 20 meter accuracy. To arrive at accurate location results, the Core Engine collects raw data from Wifi access points, GPS satellites and cell towers with advanced hybrid positioning algorithms. Skyhook has deployed drivers to survey streets, highways, and alleys in tens of thousands of cities and towns worldwide, scanning for Wifi access points and cell towers plotting their precise geographic locations. Skyhook's coverage area includes most major metro areas in North America, Europe, Asia, and Australia.

The logo for Skyhook, featuring the word "SKYHOOK" in a bold, blue, sans-serif font with a registered trademark symbol.

GloPos, a spin-off of 4TS Corporation with offices in Dubai and the USA, promises to show the precise position of any cell phone outdoors, indoors, even underground as long as the phone is on the network through a data connection. GloPos independent tests claim accuracy of 7.7 to 12.5 meters indoors or in urban settings and 10-40 meters in suburban geographies. It is based on the cell phone collecting signal information from multiple base stations, then forwarding that information to the GloPos server.

The logo for GloPos, featuring the word "GloPos" in a green, sans-serif font with a registered trademark symbol, and a graphic of green dots forming a curved path to the right.

Qubulus (Sweden) and Ekahau (USA) use radio based finger printing technology. With fingerprinting the mobile device listens radio signals from surrounding networks. The measured signal strength patterns are then used to identify a specific spot indoors. Building up a grid of those spots linking it to a map creates the positioning. Accuracy is supposed to be at least 5-15 meters.

The logos for Qubulus and Ekahau. Qubulus is represented by the word "qubulus" in a black, lowercase, sans-serif font with a green and yellow swoosh to the right. Ekahau is represented by the word "ekahau" in a black, lowercase, sans-serif font with a blue and white graphic of dots and lines to the left.

# COMPETITION VS. TRACK IT

				 
Accuracy	5-15m	7.7 - 12.5m	10-40m	5-10m
Indoor positioning				
Server & Mapping independency				
Maintenance costs				

TrackIT’s technology has strong advantages compared to its competitors. Companies like Skyhook and Qubulus offer applications for the end consumer that rely on external servers for operation. This can lead to unreliable service should those servers fail. However, TrackIT will aim to integrate its technology into the processor chip of the mobile phone, giving OEMs more control over the final product/service. Moreover, the expected accuracy level of 5-10m outdoors and indoors is the most accurate non GPS based technology on the market. Since our technology is built upon a triangulation positioning algorithm that only requires two available base station signals, TrackIT does not require any server or database for information on Wifi station location, GPS signals or wireless base station signals to operate. This server independency allows for no maintenance costs after the algorithm is embedded in the chip and makes it easier to integrate for potential customers. In order to get an overview of the full competitive landscape please see *Appendix 2: Full Competition Comparison*.

PART 4:  
BUSINESS SYSTEM &  
ORGANIZATION



# POTENTIAL COLLABORATION PARTNERS

We aim to become part of MHBC and the Teknopol network. Through MHBC we have access to various consultants with many years of industry experience. Also, with this collaboration we will be able to introduce our technology to big players in the industry such as Sony Ericsson and ST Ericsson. TrackIT also has full support from Lund University, LU Innovation, and the Entrepreneurship program.



TEKNOPOL



LUND UNIVERSITY



# ORGANIZATION

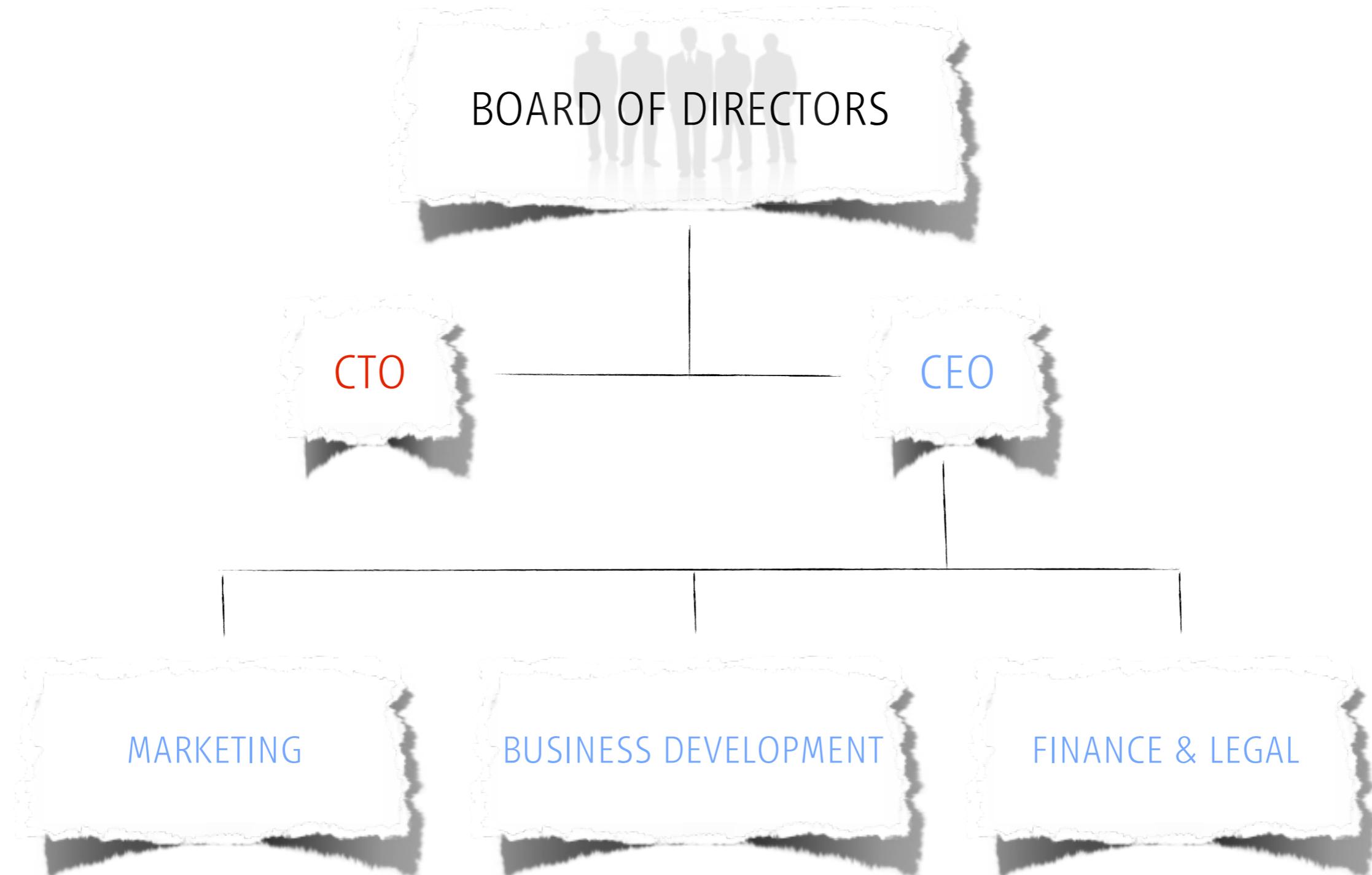
For our organizational structure we choose a traditional approach. The management team and research team will work hand in hand on this joint effort. Each with their competencies at the core of their respective competence within the organization. The board will meet on a regular basis with the management team to assume its supervisory and advisory role. Keeping an eye on the future, all board members as well as those of the research team are expected to be stationary in Lund for the next 2-5 years, at least.

As for the management team: At the time it was composed, the possibility of one or more members leaving by the end of June '11 was taken into account. It was agreed upon, that in any case, Eric Graf and Maximilian Hoene will remain in Lund as the core of the management team beyond the conclusion of their masters degree in Entrepreneurship if the feasibility of the business continues to remain high and adequate funding is secured.

The composition of the board is in accord with the rules and regulations of LU Innovation. One representative from the University and LU Innovation each will be in it, as well as Fredrik Tufvesson himself. The fourth member, as required by LU Innovation, will be an external business adviser, a highly experienced person, both from a technical as well as a management side, from the cellular industry.

We believe that this set-up will guarantee a flexible yet highly sustainable internal structure which reduces the stress on the need for external funding due to the minimization of labour costs.

# ORGANIZATIONAL STRUCTURE



→ The individual roles will be determined after the first board meeting.



# PART 5: IMPLEMENTATION



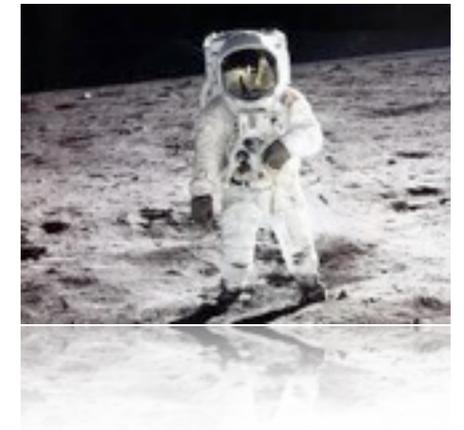
PART 6:  
PROFITABILITY &  
FINANCING



PART 7:  
RISK ANALYSIS

# FROM RISK TO OPPORTUNITY

The evaluation of weaknesses and the resulting assessment of associated risks is a task which requires honesty on the most fundamental level, honesty towards yourself, your business idea and most importantly stakeholders. The results of the SWOT - analysis (see *Appendix 6: SWOT - analysis*) show that there are certain risks present within the organization and the competitive environment, which need to be taken into account when considering the feasibility of the proposed business model. Nevertheless, we believe that with high risk, comes great opportunities with high rewards.



## INTERNAL RISKS

The core of the technology has been developed and its patent is still pending. Also, presentable real-life test results are still very limited. This reduces bargaining power on our side when it comes to engaging mobile phone manufacturers. With the current conduction of further tests and the realistic assumption to be able to run the technology on a TEMS phone by ASCOM\* in the upcoming weeks, we are confident to increase the strength of our case subsequently.

The issue of initial funding exists; however, researchers as well as the management team are either financed by the university or by other sources at least until the end of the current academic year. As office space is the only resource required in early stages, the financial pressure and therefore risk of financial shortcomings is minimized.

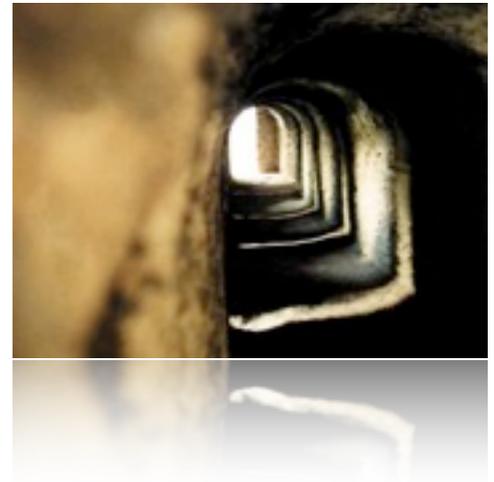
\*Ascom is an international provider of communication solutions. Its TEMS Portfolio is a complete set of trusted solutions for drive testing, benchmarking, monitoring, and analyzing network performance.

# EXTERNAL RISKS

When looking at the relevant, existing market, a handful of competitors have been identified. Companies like Nokia and Google are making efforts in areas close to our target market. However, it is not just those big players that pose risks to our endeavor. As identified above, Skyhook and GloPos contribute to external threats.

The bottom line is that the technology developed by the research team at Lund University is not the only one of its kind. However, none of the competitors have successfully entered the market we aim at on a large scale because the proposed solutions are still in development and require many resources and have high costs. The risk of a competitor entering the market before us is off-set by the opportunity of creating strategic partnerships with these companies.

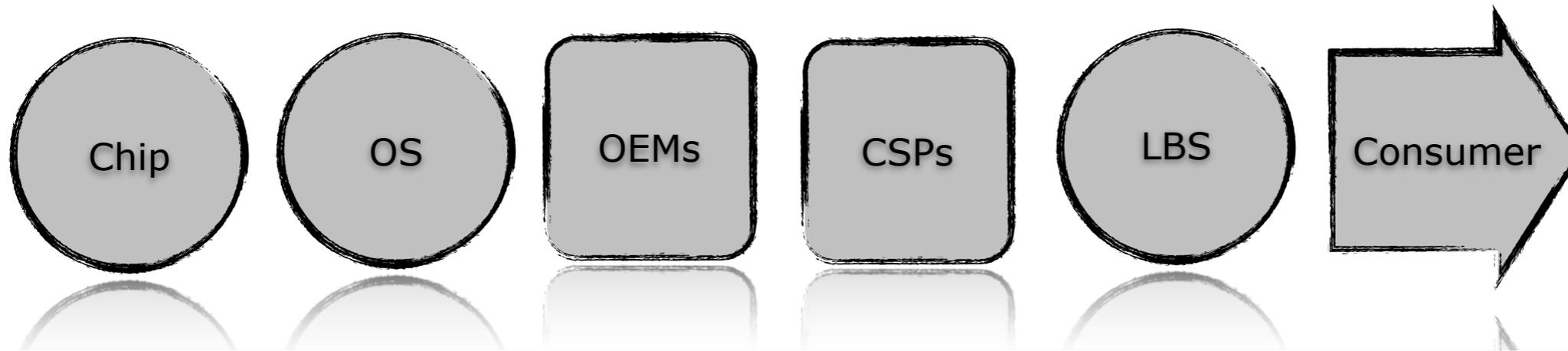
Another external risk associated with this technology is the short life-cycle of software in general. New developments in technology could change the market beyond our ability to adapt and a large competitor could wipe out our market position through just a small change in their focus. Additionally, we are aware of the fact that the cellphone manufacturing industry is prone to be subject to complicated and time extensive product development cycles, which also translate into relatively slow-moving bureaucratic organizational structures.





# PART 8: APPENDICES

# APPENDIX 1: VALUE CHAIN - MOBILE PHONE MARKET



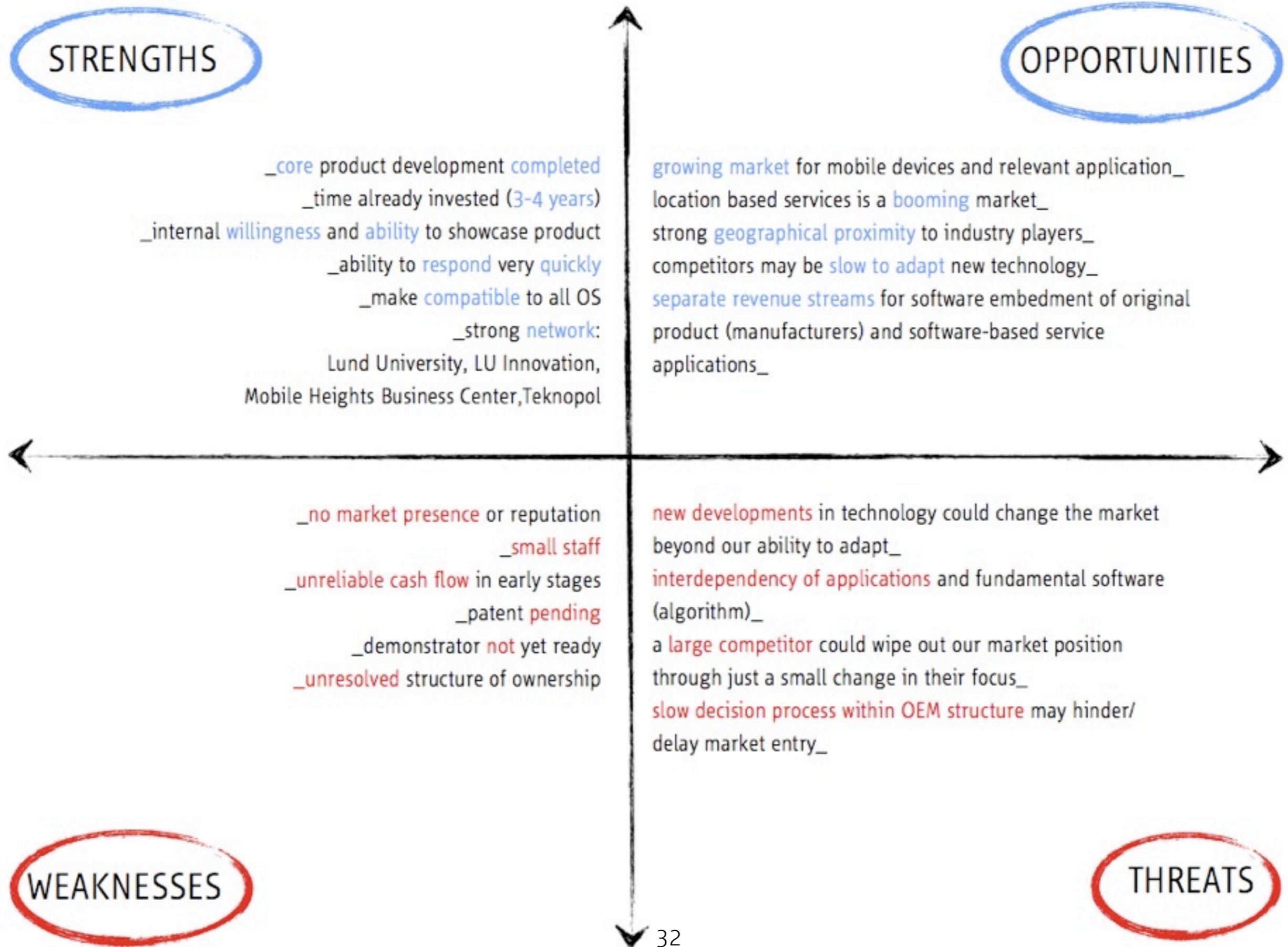
Chip	Chip manufacturers, e. g. ST Ericsson, produce the processing unit that is embedded in a mobile phone.
OS	Operating Systems (OS), e. g. Android, consist of programs and data that act as intermediaries between application programs and computer hardware.
OEMs	Original Equipment Manufacturers (OEMs), e. g. Sony Ericsson, produce mobile devices for the end consumer.
CSP	Carrier Service Providers (CSPs), e. g. Telia, are telephone companies that provide services for mobile phone subscribers. Together with the OEMs they have the most control over the mobile phone market.
LBS	Location based services (LBS) like Android or iPhone applications, provide services for the end-user.
Consumer	Mobile phone users are the end of the value chain.

# APPENDIX 2: FULL COMPETITION COMPARISON

	Infrastructures			Applications			
	GPS	Wifi	BSB	SKYHOOK <sup>®</sup>	GloPos	qubulus ekahau	track it accurate mobile positioning
Accuracy	u: 5-100m	u: 20-50m	u: 100-500m	7.7 - 12.5m	10-40m	5-15m	5-10m
	su: 1-30m	su: 20-50m	su: 300-1000m				
Indoor positioning							
Mapping independency							
Server independency							
Availability							
Battery life							

high      u: urban areas  
 medium      su: suburban areas  
 low

# APPENDIX 3: SWOT - ANALYSIS



# III. REFERENCES

Gartner Inc. press release: “Gartner Says Worldwide Mobile Phone Sales Grew 35 Percent in Third Quarter 2010; Smartphone Sales Increased 96 Percent”. Retrieved January 31st , 2011, from <http://www.gartner.com/it/page.jsp?id=1466313>.

Horney, Carter L.: “Cellular Handset Chip Markets '10 - An In-Depth Analysis of Chips Used In Cellphones”, FWD Concepts. Retrieved January 31st, 2011, from <http://www.fwdconcepts.com/Cellchip10/index.htm>.

IDC press release: “Mobile Phone Market Grows 17.9% in Fourth Quarter, According to IDC”. Retrieved January 31st , 2011, from <http://www.idc.com/getdoc.jsp?containerId=prUS22679411>.

Wauters, Robin: “Mobile Location-Based Services Could Rake In \$12.7 Billion By 2014: Report”. Retrieved February 4th, 2011, from <http://techcrunch.com/2010/02/23/location-based-services-revenue/>.

## Theoretical Reflections

Name: Eric Graf

E-mail: Eric.graf@erkost.net

**Title:** *Roads to entrepreneurship: Long journeys and how they come to an end – or not*

### Introduction

“There are many roads to Rome.” – This millennia old phrase also applies to the many ways to start a company. But not all the ways are the same. Some seem to be narrow, mysterious; others are clear and open. They have one thing in common: hard work.

What has become clear to me over the past months is that you meet many advisors and consultants, who pretend to know the way ahead, without ever having gone there themselves. What has also become clear is that the main road is usually blocked. Rarely will a regular guy own a technological patent, meaningful research results or lots of capital.

In this discourse, I shall take a look at my own way and relate it to conclusions based on contemporary literature. It is a way which has less to do with research and high-tech than the actual development of ideas. It is more concerned with commerce than the acquisition of capital. A more contemporary way of using components and tools which are accessible to almost everybody and therefore opens the doors to entrepreneurship for many more people. This way is closer to the characteristics of a (survival-)artist or composer than traditional entrepreneurs or managers. Therefore, personal characteristics of the entrepreneur will need to be looked at also. As the author has walked down this path himself, this is an autoethnography (see *method*).

Nowadays, it is easier and more affordable to travel to Rome than ever before!

## **Theoretical literature review**

### *Bootstrapping*

In their article, Winborg and Landström (2001) take a closer look at options for financing for small businesses, especially during the early stages of their start-up phase. Instead of examining institutional financing options, which in their opinion has gotten too much attention compared to informal financing options and is overrepresented in the academic literature which is available at this point, they look at the informal method of bootstrapping, which they found to be employed by many entrepreneurs and managers of new ventures. In their words, “financial bootstrapping refers to the use of methods for meeting the need for resources without relying on long-term external finance from debt holders and/or new owners” (Winborg and Landström, 2001, p. 235-236).

Through the use of exploratory, qualitative research methods – which were necessary to employ because of the lack of previous studies with this focus – they were able to identify 32 methods of financial bootstrapping. After a careful cluster analysis, six categories were formed: “(1) delaying bootstrappers; (2) relationship-oriented bootstrappers; (3) subsidy-oriented bootstrappers; (4) minimizing bootstrappers; (5) non-bootstrappers; and (6) private owner-financed bootstrappers” (Winborg and Landström, 2001, p. 236).

These somewhat abstract cluster names become more concrete, when we look at the specific actions that are related to them. For example, a delaying bootstrapper will delay payments to suppliers or rent machines rather than buying them. Cluster two is known for joint utilization of (human) resources. Cluster three will obtain subsidies from governmental institutions, if available. Minimizing bootstrappers for example speed up invoicing processes and avoid customers who pay late. The last cluster of bootstrappers will use their own funds and those of family, friends and fools first, as well as their work force.

All these methods will be known to entrepreneurs and some will be used more, some less. What this study points out, is that small businesses can be self-sufficient without the need for external capital. It puts question marks behind the claim that venture capital and bank loans are vital in the development of entrepreneurship on a large scale.

### *Bricolage*

In an article from 2005, which has been cited extensively since its publication and therefore had profound influence on the research community - especially surrounding the fields of entrepreneurship and strategy – Baker and Nelson examine the concept of bricolage and its forms and applications. Bricolage means “making do, with whatever is at hand” (Baker and Nelson, 2005, p. 330) and can be seen as a form of entrepreneurial improvisation.

The point of departure is a certain refusal to accept existing limitations, to push the boundaries of what is possible and acceptable. This includes coming up with new, innovative ways of using existent resources but also exploiting grey areas of institutional limitations, e.g. laws. The resulting actions are located in five domains, namely physical inputs, labour, customers, skills and institutional/regulatory.

In their study they investigated 29 resource-constraint firms, i.e. entrepreneurial start-ups which were characterized by scarcity of capital. It was found that those firms which either used bricolage in all/most of their domains (parallel bricolage) or not at all, they had trouble growing. A finding which cannot necessarily be seen as a direct effect, but rather emphasizes the fact that *despite* those measures growth was not achieved. However, the use of selective bricolage showed indications of fostering growth and success.

The implications these finding bear for managers and entrepreneurs are concerned with finding the right mix between bricolage and routinization. The more the firm grows, the

less frequent the use of bricolage should become in order to sustain or extend growth phases. Creating something from scratch is therefore possible with limited resources.

### *Personality traits of entrepreneurs*

On the micro-level, entrepreneurship and the success of entrepreneurial endeavors depends on the individual skills the entrepreneur (and his team) will bring with him. Moreover, confidence in and derived from those skills will prove to be pivotal (self-efficacy). In social psychology this confidence related to trusting your own abilities is called *self-efficacy*. Boyd and Vozikis (1994) review former literature concerned with this topic, e.g. Bandura's social learning theory and further examine some of the character traits that are prevalent with entrepreneurs.

Character traits which were found to be especially present in entrepreneurs are for example: locus of control (external vs. internal), drive to achieve, willingness to take risks and self-efficacy. This is not to say that someone who has these traits will necessarily be a better entrepreneur, nor vice versa, i.e. these traits are a necessary pre-condition for a successful entrepreneur. Especially, because there can be many confounding variables, most of all the environment, the context that entrepreneurship occurs in and that the entrepreneur is exposed and subjected to.

### *Trust*

In their article from 1998, Doney, Cannon & Mullen attempt to explain three things: Why trust is important, why it gets even more important in a globalized world and how to create trust in business especially concerning international partners with different cultural backgrounds. Norms, values, and underlying behavioral assumptions often differ between national cultures. This leads to differences in those cognitive processes which are essential in the creation of trust.

Trust is risky business for the trustor and involves, according to the authors, five general cognitive processes directed at the target of trust. These are: calculative, prediction, intentionality, capability and transference. In other words, the trustor will weigh the risk of untrustworthy behavior against the benefits of a trustworthy one. He will evaluate the predictability of the target's behavior and the target's motivation. Furthermore, he will assess the ability to fulfill his promises and look for examples (proof) that can transfer trust to the target. If these processes come to a favorable outcome, cross cultural trust building should be possible.

## **Method and Data**

### Method

The data collection method in this case was very simple. Well, not simple, but straightforward: my brain. It has collected immense amounts of data over the past 27 years and with a special focus on the past few months during my entrepreneurship masters I shall access and use this data. Also, using the learning journals I have written during that time as direct input and a way of looking back – without individually quoting them - will complement this method and allow me to draw meaningful conclusions in the end.

The method of applying autobiographical data to theory is called autoethnography. In his article from 2006, Anderson, on page 373, “proposes the term *analytic autoethnography* to refer to research in which the researcher is (1) a full member in the research group or setting, (2) visible as such a member in published texts, and (3) committed to developing theoretical understandings of broader social phenomena.”

All three conditions are fulfilled, as 1. I am *a* - if not *the* - object of the observations, 2. this thesis, the learning journals (data) I will be quoting from describe my action and

thoughts and 3. again, this thesis itself represents an attempt of applying theory to social contexts, narrow and broad.

This method, while potentially raising hopes of getting to the core of a problem through thorough and in-depth observation has clear limitations. First of all, there are always a number of biases present, when a person becomes its own object of study. It would be an illusion to claim that an autoethnography can make an honest attempt at being objective in its data collection and analysis. Second, the scope itself is limited, well, again, to the realm of one person mostly. Ideally of course, the application of theories allows a broader scope, get from the WE to the I and back to the WE, so to speak.

### Data

#### *26 years of life, a prelude to the past 10 months*

Already in school I enjoyed reading and hearing about people like Henry Ford, Carl Benz and the above mentioned Richard Branson. Not as part of the required readings but under the table. While I have a fascination for the latter, I always knew that I did not share his energy level, his overtly extraverted personality. Of course, I eventually went ahead and studied economics and business. To my surprise, this field - or at least the respective studies - soon proved to be much drier and more boring than I thought. Stories about entrepreneurs, which had appeared to me quite lively, turned into dead corpses and academia into pathology/anatomy of the same. Even when you study medicine, eventually you get from anatomy courses to living beings. That only happened when I started to increasingly take more psychology course at university, parallel to economics and business. The fascinating figure of the entrepreneur, as I was introduced to by Schumpeter's writings, was replaced by the postulate of maximizing profits. As a business and economics student I was busy studying math and abstract models and concepts. I got these courses over with as quickly as I could.

This definitely left me thinking about whether it was necessary to turn a field as vivacious as entrepreneurship is into a static, almost dead object by means of scientific alienation. Would anyone come up with the idea to teach sports in such a way that you are only interested in analyzing the participants' ambition to win? By means of mathematical formulas no less? So that sports education is not about actually competing anymore, like for instance in the form of a handball match, but about math? What might sound like a joke actually is not funny. The current teachings about the competitions between companies in markets seem to be like this: with the postulate of maximizing profits as a starting point, formulas and (mathematical) models are shifted into the focus. The confrontation of the student with the living object of entrepreneurship rarely takes place in reality. Business becomes marketing, finance, accounting, organization and strategy. The living object is dissected, so to speak. The motivation and abilities of the people involved are barely considered.

The examination of business and economics under the sole focus of maximizing profits reduces the object to too much. It is not a question whether or not the postulate and its mathematical formulas are good or bad. With this approach, only the (often unintended) result counts. This however kills the fascination for the field, which is so important for society and more specifically those people who are actual actors in it.

Become an entrepreneur, me? It was a difficult thought to finish. How is this supposed to work? Don't I need to have a patent, lots of capital and advanced business skills? This is at least what most traditional teachings suggest ...

Often enough in life, we feel a calling from exactly those fields, which we criticize the most. I had to start somewhere. So I figured I should find a different approach to business practice. What better way than to actually engage in a start-up? Since my education had not been completed in the traditional sense and I was lacking a master degree – and in order to

reduce financial risks at such a young age – I decided to come to Sweden to attend one of the few entrepreneurship masters that are available in Europe.

*The past 10 months – my diary*

Right from the start of the program I was to learn many things about entrepreneurship itself, its theories and practices, but also about myself. How I am perceived by others and how I interact with them, be it my team for the entrepreneurial project or more remote, external actors.

The first event, which was to turn into a learning experience, was the start-up challenge. Here we were provided with 100 SEK and three days time to come up with smart ways to increase this amount for a chance to win the contest against the other teams of entrepreneurship students. My team, consisting of three guys in total, decided to use different channels for potential revenues instead of bundling our efforts on one endeavour. This was to ensure that we would not suffer a total loss. A somewhat conservative approach. Without going into miniscule details, I can say: We did OK. More than the financial results, this exercise taught me that no matter how little capital, time and resources you have – you can always come up with creative ways of generating profits. On a very basic level, it taught me I will never have to starve, even if I go bankrupt. Even though I did not know a name for it, the basic concept of bootstrapping, i.e. pulling yourself out of a swamp, was introduced to me.

Later on I was introduced to financial matters related to starting a business, i.e. target and cost planning. A field I had not had any training in, neither in my previous studies nor in my private life. My goal had to be, to understand the matter better and consequently incorporate it into my business planning. However, instead of pursuing my goal of digging deeper into the understanding of the finance part of a venture, I was ripped out of my academic efforts by a disturbing personal matter which made me re-assess my priorities in

life. On top of that, a new business opportunity with possible long-term ramifications for my personal development presented itself to me. My learning outcomes from this week therefore are somewhat karmic and my conclusion was: what goes around, comes around. Both in positive and negative ways.

In December things got more concrete and I was approached by researchers, who wanted to commercialize one of their inventions. A high-tech patent for the mobile positioning industry, allowing mobile devices determine a geographical position, with incredible accuracy and even indoors. We (me and my newly assembled team) were quick to decide on the name *TrackIT* for our new 'baby', as it reflected the main features of our product and seemed catchy. There was no need to outsource the creation of the name nor the logo, as the relevant skills were present in our team. Project planning and setting milestones became the most essential task at that time. I also learned that there will always be obstacles to your own work and agenda that are created by external forces. During these times, it is important to prioritize and focus on what you can control yourself.

Subsequently we had meetings with young entrepreneurs who had successfully started their own business in the same industry we were trying to launch our product in, software technology. They advised us to set up informal meetings with technical officers from the main Original Equipment Manufacturers (OEM), pitch the idea – ideally after obtaining some test results first. They told us to be prepared to have to put up a big fight, once it comes to convincing the manufacturers to embed our algorithm, as product development cycles are very long and big companies are often the slowest ones to act. Our role in the commercialisation process and the respective business model needed to be re-considered. Especially the timeframe for marketing the software is in question. Is the technology mature enough yet to be commercialized? How much value can we, as a student management team add to this endeavour?

The following week showed me that the time and effort I had previously invested into the team composition was paying off. The two team members who have a financial background were able to create a financial section for the business plan. A task that would have been much harder to perform by me. Another team member used his skills with graphic design programs to create a presentation that will help our pitches in the future. Also, I made sure that any technological discussion between the research team and external entities, e.g. OEMs, will be relayed through us. I find this to be paramount in creating value for our team and taking unnecessary work off the research team, who's focus it should be to work a demonstrator, so that useful data can be obtained soon, which would help us in approaching manufacturers with concrete numbers.

Hard work pays off! At the dragon's den event, the pitch we had worked on the past week and a half was well received both by the audience and the dragons. We also had to learn once more that our product might be a little too far away (time wise) from being introduced to the market. So our task for the near future was to further assess the timeframe for completion of the technology and accordingly the feasibility of our current efforts.

The last weekend in February our management team went to Copenhagen to attend the StartupWeekend at the prestigious Copenhagen Business School. Having spread around the world in less than 7 years, this get-together of entrepreneurial spirits proved to be useful for our project. Useful, both in positive and negative ways: The many IT-and business developer that were present made it clear to us that our project does not quite fit into the usual framework of this event, as it does not seem feasible for immediate realisation.

A discussion with the patent lawyer about possible weaknesses in the patent due to the discovery of a PhD thesis from 2009, which partially mentioned principles used in our patent, yielded the conclusion that the patent is still strong. Also, the time for the first real-life demonstration of the technology was getting closer.

In the beginning of March, *TrackIT had* attended Venture Cup's expert evening. We had arranged meetings with representatives from MINC (an incubator), Venture Cup (the institution organising the business plan competition), Teknopol (a non-profit business advisory and PWC (world-renowned consultancy). The meetings were very short, yet we received valuable feedback – for free. Discouraging was that the two consultants from PWC told us that “putting a price tag” on TrackIT technology “was too difficult”. They were clueless as to who could even help us with this. Our hopes were slowly fading...

Our requests for updates on the progress of the tests that were supposed to be conducted by then had been unanswered. The same goes for requests concerning the speedy establishment of a board, which would allow us to become more functional and access the resources available through LU Innovation, the technology transfer office of the university. This project obviously went beyond the realm of collecting the academic credits necessary for graduation. It was the main reason why most of us choose to do this master program. And it beard consequences for our immediate and mid-term future. That being said, assessing its progress and feasibility for future success and income, was the most vital task at that moment.

To make matters worse, 1 day before the deadline for the business plan submission, at 11:30pm, one of our potential board members writes me an e-mail saying, he doesn't want to be mentioned in the business plan. So we had to improvise and leave the respective section blank, giving an indication of what we were looking for.

As the board was never set up, we were not operational. We could not access the funds which would have been available through LU Innovation. Consequently, we had massive resource constraints. In May we were to set up a booth at the trade show which was organized by our master program. We printed the business cards ourselves, on thick paper and cut them into shape at the university's library. Instead of roll-ups, which would have cost us around

2000 SEK, we went to the tourist office and got maps of Lund to serve as a background in the booth. As an attention getter we installed a Nintendo Wii, which we borrowed from a friend.

The lesson to learn from this is to understand that there will always be uncertainties and risks involved in this sort of lifestyle/work habit. Some nights will be sleepless because things seem to be going out of your control. But then, in the end it will be ok. If it is not ok, it is not the end!

As a concluding learning outcome I figured that the past 10 months had been quite a journey. In academic terms I did not find it challenging at all. However, with respect to personal development, it helped me a great deal to learn about my own strengths and weaknesses, other people's work ethics, the concept of incubation – which I barely knew anything about before – and that adaptability, flexibility and a talent for improvisation, i.e. bootstrapping and bricolage, are vital in self-reliance, which in turn is essential for entrepreneurs.

## **Analysis**

This account of 10 months of entrepreneurship education can be related to the theories which have previously been reviewed in the respective section.

First of all, from certain parts of the data, i.e. my learning journals, it can be concluded that our team engaged in bootstrapping on a few occasions. Relationship oriented bootstrapping was used for example in the framework of our masters program, which allowed us to jointly utilize the office spaces at Ideon business incubator. Private owner-financed bootstrapping was used, for example, when we printed business cards ourselves and when we used parts of the money won in the dragon's den competition to create a short video clip showcasing the basic functions and customer benefits of our technology, instead of raising external capital.

While we did not make use of any ‘grey’ areas in our institutional environment, we did use bricolage in some small ways. As a very specific case, the city maps can serve as an example. They are handed out by the city of Lund to tourists so that they can find their way through Lund. While they are paper-based and therefore barely anything new or technological in their nature, they are in one way or another connected to the concept that stands behind our technology: mobile positioning and navigation, even localized advertisement as an application. Instead of using terrestrial cell phone signals, one finds their current position by means of finding a point of reference (e.g. landmark buildings, street names, etc.). Certain stores or restaurants will have bought advertisement space on the map to indicate their location and lure people to their premises with the hope of generating revenue. These are all potential features of our tech-based product. Therefore, using the maps as backgrounds in our booth, we found an affordable (free) way of modifying the traditional use of an artifact (physical input) to apply to a new context.

So what can stand in the way of an entrepreneur who knows about such wonderful tools like bootstrapping methods and bricolage. First of all: He himself. The drive to achieve and willingness to take risks were two dimensions of the above mentioned personality traits of entrepreneurs, which I believe were sufficiently present in our team. But, we might have failed in correctly assigning the locus of control to the outcomes of our work on some occasions. As was pointed out by our professor at some point during our project, we should “Try carefully not to fall into a situation where you internalize success (take credit for success yourself), and externalize failure (blame others for failure)”. This definitely proved to be harder than we thought.

Either a lack of self-confidence or a lack in self-efficacy can cause entrepreneurial endeavors to fail. The former I do not see in general as the origin of the problems that arose during the course of this project. It is my observation that it was the lack of very specific skills

that ultimately made the researchers and us realize that - besides the fact that the technology itself simply was not developed enough to be introduced to the market anytime soon – well, we were simply not up to the task to sell a product with such a high degree of technological complexity. Since none of us had a background in electronic engineering, our self-efficacy was very low as a result of the inability to fully understand and be able to explain the specific features and principles of the technology.

Moreover, a lack of trust between the parties involved can be suspected. But on which dimension? Communications with the researchers were very honest and direct from the beginning on. Predictability of our behaviors and intentionality were not the problem. Once again, it is my belief that the lack of technology specific skills led to the belief of the researchers that our capabilities to achieve commercialization were limited. Since trust could not be transferred from shared experiences from the past, the result of their calculative cognitive process was negative. I interpret this not as distrust in itself, but an insufficient amount of trust compared to the risk of failure with this high-potential invention.

## **Conclusion**

You got to be crazy to become an entrepreneur! 14 hours or work every day, no vacations in the first few years of a new endeavor, barely any private life. You risk losing friends and life-partners to people who are less stressed. The first one to arrive at the office in the morning - the last to leave in the evening. You need to know about accounting, tax law, and labor law. You need to know how to set up a contract and how to lead and manage employees. You got to be a good marketer and know how to talk to financial institutions and other investors. Moreover you will be facing many risks, all the time. Your probability of survival is less than 50% some studies even say that four out of five start-ups will fail within 5 years. So you are looking at a – statistically - high likelihood of bankruptcy as a result of all

your hard work. That is why, living in a society with as much state-socialism as we have achieved over the past decades, you have to be crazy to become an entrepreneur!

In any society there are people who not only defer from the mainstream, but actually compose an extreme category of risk-takers: mountaineers, racecar-drivers, stuntmen - Richard Branson. Just like the Virgin franchise mastermind, many entrepreneurs are of the type: 'Extreme sport athlete with masochistic tendencies'. But: more people die of obesity than of extreme sports. Our society needs entrepreneurs. And not just a few; but as many as possible.

Should an entrepreneur's main focus be on technology-based inventions only, secured by a strong patent case? Is this the only base for a start-up? Are patents alone sufficient inputs, which in combination with business administration skills guarantee a successful entrepreneurial endeavor? Of course it seems logical to push for the commercialization of inventions which were made at university or resulted from university research. After all, lots of money and (public) workforce were invested into the development of patents. But one vital issue is often missed: It is not the quality of an invention or specific technology, which will make it feasible for commercialization. It is about its acceptance in the market. The inventor/researcher may have done a great job, even won awards for his work. But it is the potential customers who will decide about the faith of the product, not a scientific committee.

Concerning the implications for further research, well, two things should be said: 1. There is an immense lack of relevant research in the area of entrepreneurship. The author came to this conclusion both during the course of his master degree, where teachers often had to admit that the literature, which was often not of very high quality, was selected simply because of a lack of alternatives, and, during the database searches conducted for the purpose of this thesis. 2. It is not so much a question of whether more research should be conducted, but for what purpose. To give managerial advice? To improve teaching practices? Can we

actually teach student entrepreneurship in a traditional university setting, with all the restrictions and requirements academia has in place? Maybe these questions alone give grounds for the pursuit of finding profound answers.

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