"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.

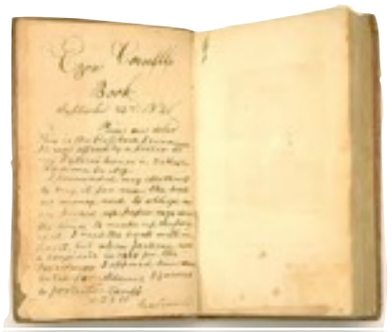
Scientists at Lund University have been researching in the field of mobile positioning systems in order to take interactive localization to the next level. Our research team has come up with an algorithm that relies on core components of most modern mobile phones (accelerometer, gyroscope, antenna, processor) 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.

PART 1:
BUSINESS IDEA

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VALUE PROPOSITION

"TrackIt provides an interesting solution for indoor positioning that can be readily integrated in the cell phones."
(Mats Lindoff, former CTO of Sony Ericsson)

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.

PART 2:
TEAM

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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

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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 Electroscience 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

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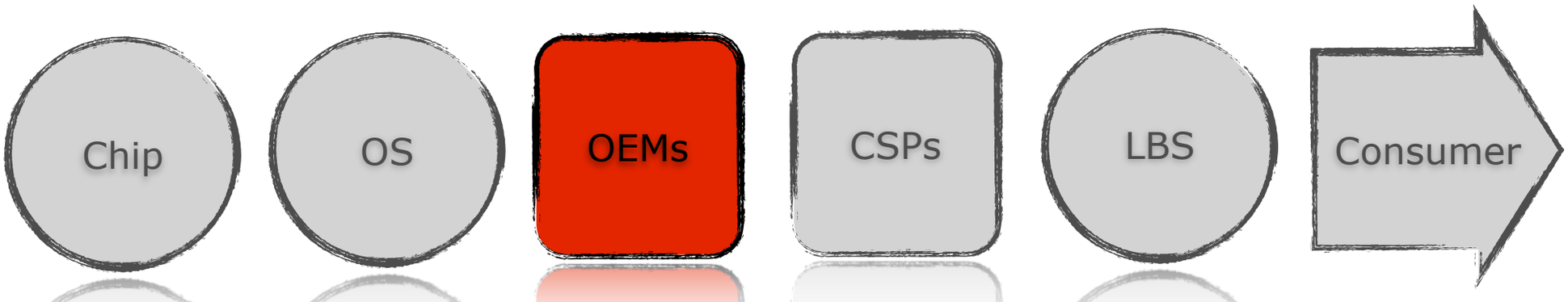
INDUSTRY ANALYSIS - MOBILE PHONES



Further explanation in *Appendix 1: Value Chain - Mobile Phone Market*

"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).*

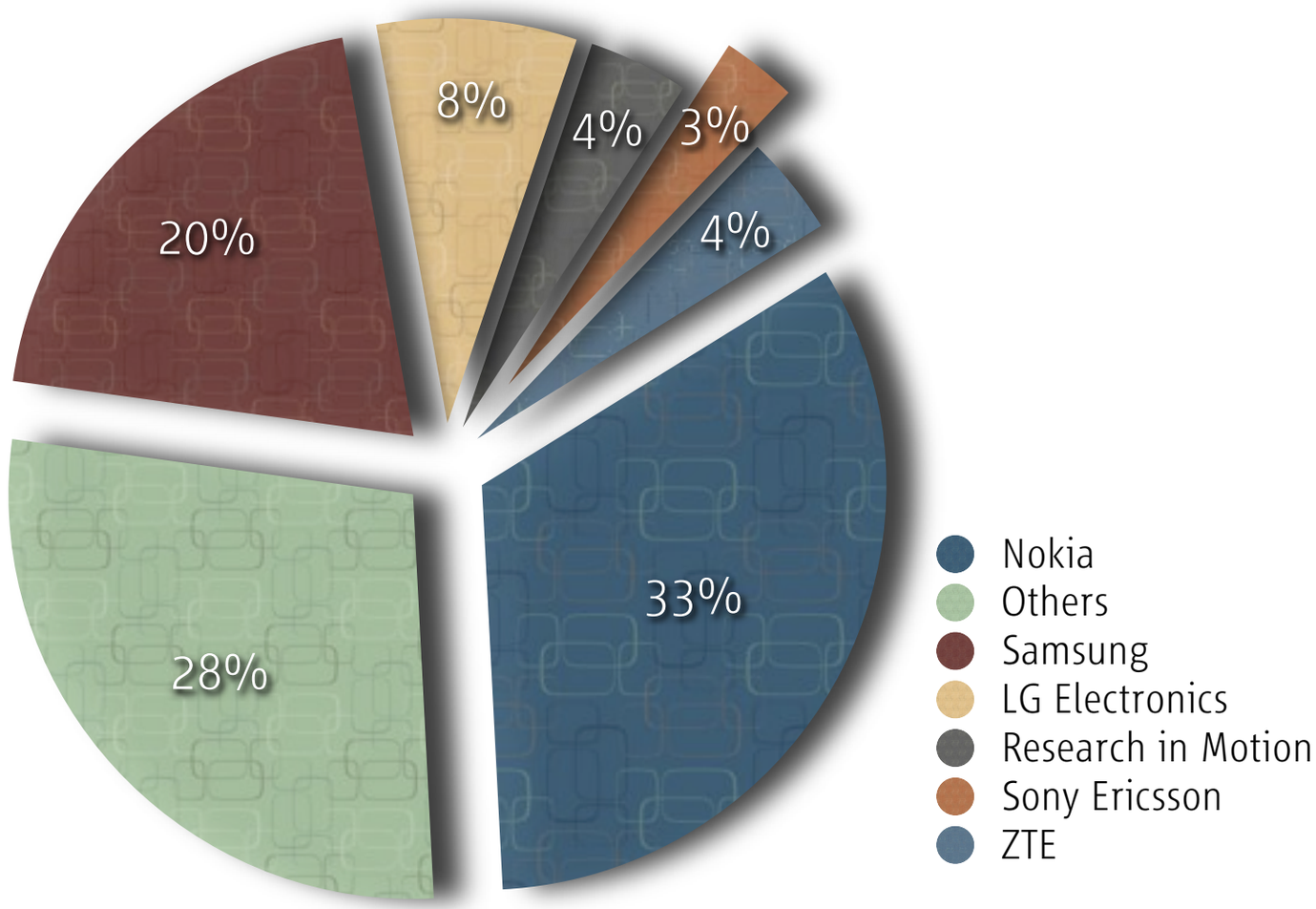
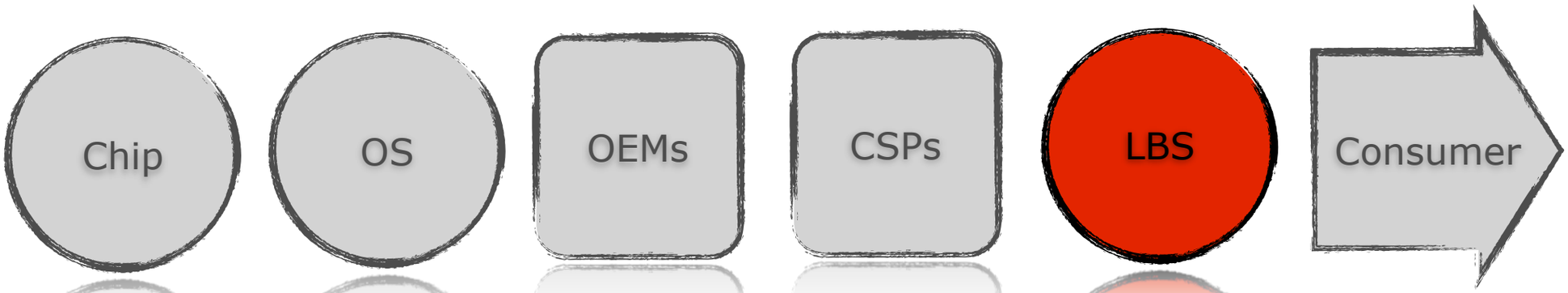


Figure 2: Mobile Phone Manufacturer Market Share (2010), according to data from IDC

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.

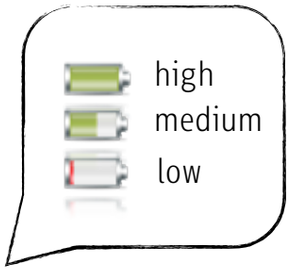
Office Management: More accurate indoor positioning can help employers keep operations smooth by allowing employees in large buildings find an open meeting room or find a colleague. Employers can also track data patterns and behavior of employees to improve the working condition and optimize space.

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.

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.

Qubulus (Sweden) and Ekahau (USA) use radio based finger printing technology. With fingerprinting the mobile device is 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.

COMPETITION VS. TRACK IT

	qubulus ekahau	SKYHOOK	GloPos	track it accurate mobile positioning
Accuracy	5-15m	7.7 - 12.5m	10-40m	5-10m
Indoor positioning	✓	✓	✓	✓
Server & Mapping independency	✗	✗	✗	✓
Maintenance costs				FREE

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

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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.

ORGANIZATION

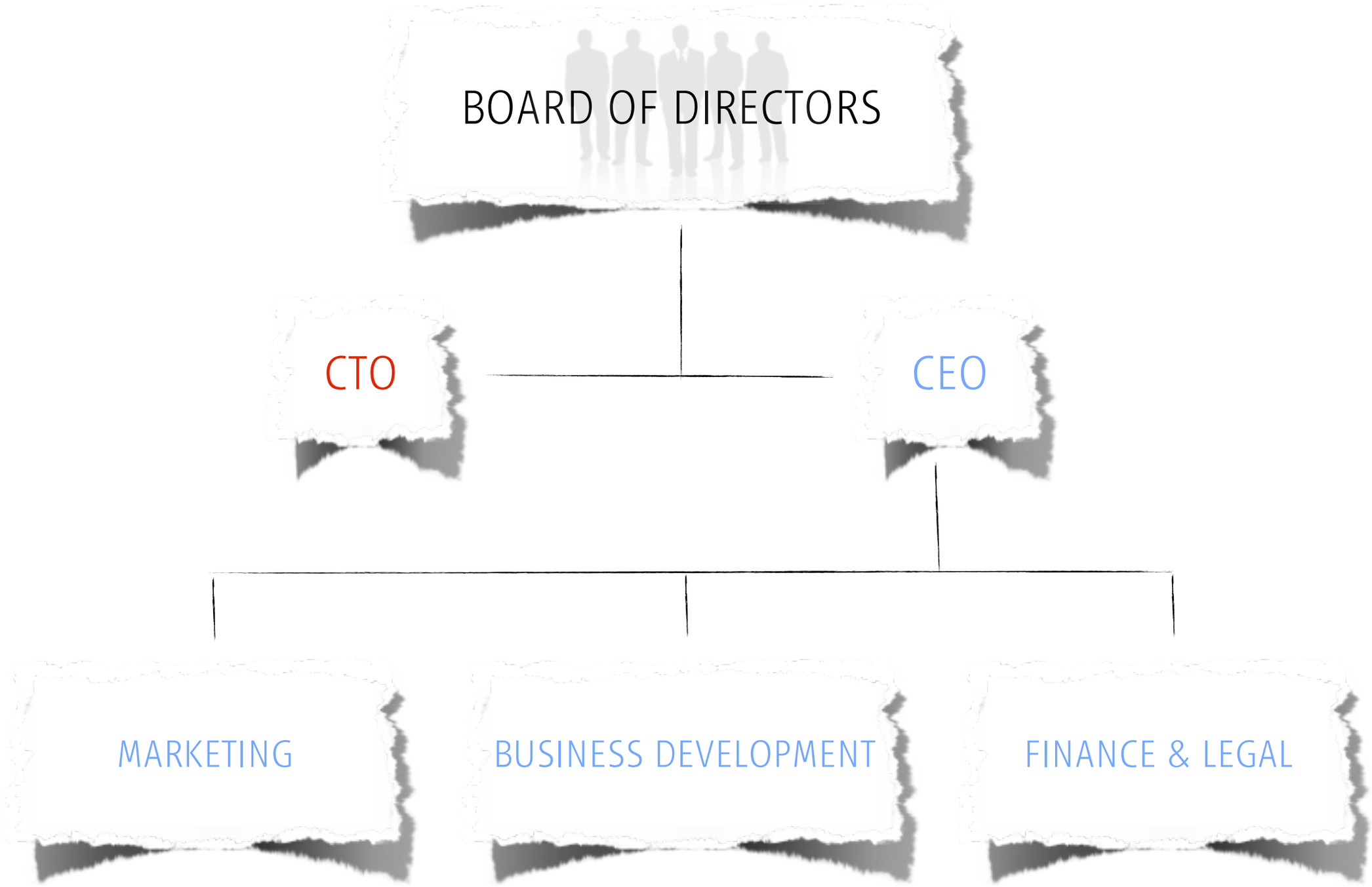
For our organizational structure we choose a traditional approach. The management team and research team will work hand in hand on this joint effort. Each with their competencies at the core of their respective competence within the organization. The board will meet on a regular basis with the management 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.

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PART 5:
IMPLEMENTATION

PART 6:
PROFITABILITY & FINANCING

PART 7:
RISK ANALYSIS

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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.

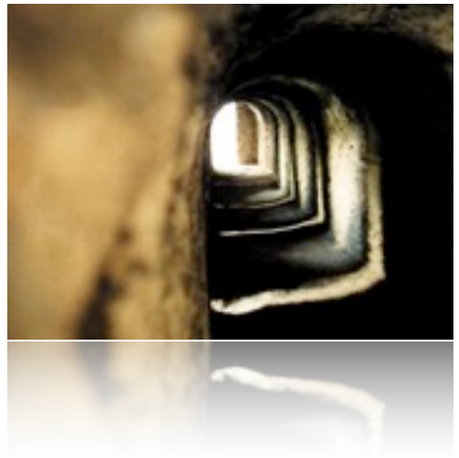
INTERNAL RISKS

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



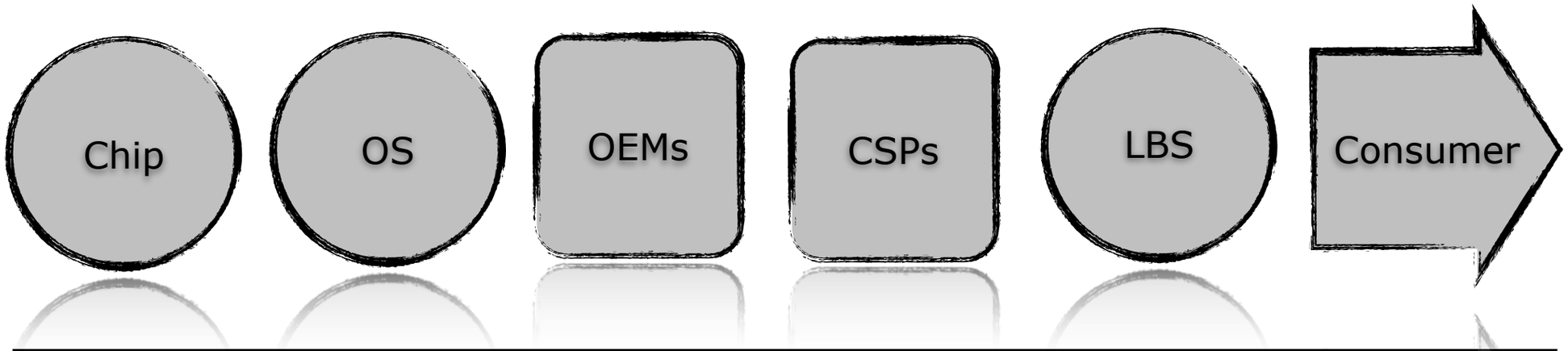
When looking at the relevant, existing market, a handful of competitors have been identified. Companies like Nokia and Google are making efforts in areas close to our target market. However, it is not just those big players that pose risks to our endeavor. As identified above, Skyhook and GloPos contribute 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	GloPos	qubulus ekahau	track it accurate mobile positioning
Accuracy	u: 5-100m su: 1-30m	u: 20-50m su: 20-50m	u: 100-500m su: 300-1000m	7.7 - 12.5m	10-40m	5-15m	5-10m
Indoor positioning	✗	✓	✓	✓	✓	✓	✓
Mapping independency	✓	✓	✓	✗	✗	✗	✓
Server independency	✓	✓	✓	✗	✗	✗	✓
Availability	medium	low	high	high	high	low	high
Battery life	low	medium	high	high	high	high	high

high — u: urban areas
medium — su: suburban areas
low

track it accurate mobile positioning

APPENDIX 3: SWOT - ANALYSIS

STRENGTHS

_core product development completed
_time already invested (3-4 years)
_internal willingness and ability to showcase product
_ability to respond very quickly
_make compatible to all OS
_strong network:
Lund University, LU Innovation,
Mobile Heights Business Center,Teknopol

OPPORTUNITIES

growing market for mobile devices and relevant application_
location based services is a booming market_
strong geographical proximity to industry players_
competitors may be slow to adapt new technology_
separate revenue streams for software embedment of original product (manufacturers) and software-based service applications_

WEAKNESSES

_no market presence or reputation
_small staff
_unreliable cash flow in early stages
_patent pending
_demonstrator not yet ready
_unresolved structure of ownership

THREATS

new developments in technology could change the market beyond our ability to adapt_
interdependency of applications and fundamental software (algorithm)_
a large competitor could wipe out our market position through just a small change in their focus_
slow decision process within OEM structure may hinder/ delay market entry_

III. REFERENCES

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LUNDS UNIVERSITET
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Theoretical Reflections

BUSP01

Motivation

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30/5/11

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Abstract:

This paper is a reflection of my time spent in the Masters in Entrepreneurship program at Lund University. Coming from the US, I had different intentions and motivations upon entering the program. This paper will analyze and discuss different entrepreneurship theory related to motivation and similar topics and in turn use it as a discussion to describe my motivations throughout the program, working with the project TrackIT, and my decision not to pursue the project after the year.

"My biggest motivation? Just to keep challenging myself. I see life almost like one long University education that I never had – everyday I'm learning something new"

– Sir Richard Branson

Introduction

Most entrepreneurs will tell you that motivation is the number one key to success behind a new venture. Without a motivated entrepreneur, a new business is very likely to fail if it gets started at all. In their book *Entrepreneurship*, Hisrich, Peters, and Shepherd (2010) describe the intention to act entrepreneurially as a process of determining the feasibility and desirability of a project. In fact, they state that "intentions capture the motivational factors that influence a behavior; they are indicators of how hard people are willing to try, of how much an effort they are planning to exert to perform the behavior" (Hisrich, et. al, 2010). Of course, the idea behind the business has to be innovative and have high market potential, but without a motivated leader, failure is inevitable.

Before I begin my analytical discussion regarding entrepreneurship theories on motivation and comparison to my time spent in the program, I feel it is appropriate to discuss my main motivations for moving to Sweden and entering this program.

Prior to knowing about the existence of the Master in Entrepreneurship program at Lund University, I was spending most of my time in a cubicle by myself working at one of the premiere law firms in San Francisco. It was a good job, as I was working on high profile cases, learning everyday and actually contributing with "important work" as my boss would tell me. However, something inside me was not satisfied. The negative

and somewhat depressing, stagnant atmosphere that law firms can cultivate was beginning to affect me. I needed a change, and luckily the change brought me to this program.

When I decided to accept my admittance into the program, I had several motivations behind this decision that can be broken down into different categories: educational motivations, business motivations, and personal motivations:

My educational background in undergraduate Economics consisted of theory after theory after theory, only very little of which could be applied to everyday happenings in business. I still remember my game theory professor instructing us "You will never use what you learn in this class ever again!" I wanted a more practical education where I could actually apply theory to work.

Business wise, I didn't expect to come out of this year with a business established which I could commit to beyond this year. However, I knew that this program would allow me to take and make entrepreneurial actions that will benefit me as I move forward with my career. I was motivated by the fact that this program was unlike any other that I had heard of because of the fact that the students actually had the responsibility of trying to start a business.

Personally, I have always thought that I learn the best from being in unfamiliar situations with unfamiliar people. Having the chance to study and try to start a business with people from around the world was my main motivation behind deciding to attend this program. Also, the chance to live in a European city with a culture the complete opposite from what I am used to in the USA was an opportunity I couldn't resist. I expected to and have learned lessons that I will carry with me the rest of my life.

As I progressed through the program, most of my motivations remained consistent from the onset. Working on a research-based project (TrackIT) was a positive experience from a broad sense, but there were a lot of little things that affected my personal motivations towards ultimately establishing it as a business and continuing the project after the program is completed. Throughout this autoethnography, I will discuss and analyze my personal motivations relating them to my project work and to entrepreneurial literature on motivation.

Purpose

The purpose of this autoethnographic paper is to highlight and examine relative theory on entrepreneurial motivation and topics related to motivation and compare it to my experience in the program and working on the project TrackIT[1]. This paper will examine personal intentions to become an entrepreneur and types of entrepreneurs along with impacts of working on a personally generated idea versus working on projects that are based around others ideas (i.e. TrackIT). It will examine our teams relationship with the researchers who created the technology behind TrackIT and the effect this relationship had on our decision not to pursue the project after the program. I will also analyze my relationship with my teammates, whom I did not know before entering this program and how this relationship with my teammates affected my decision to not pursue TrackIT.

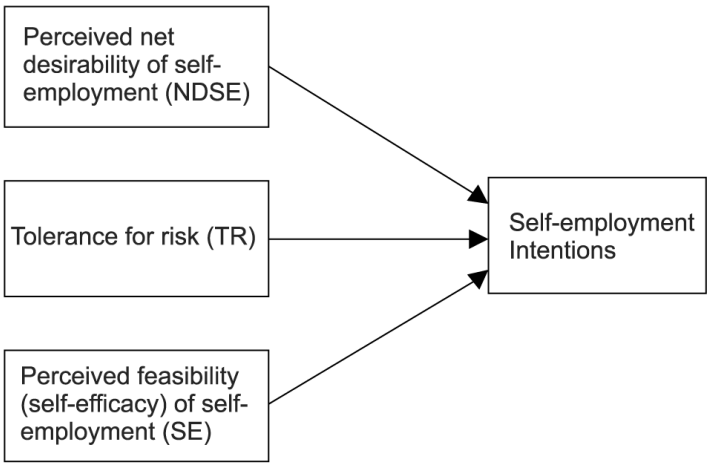
Theory

Why do people become entrepreneurs?

There are many different theories as to why people desire to become entrepreneurs. In this paper, I will use the model Segal et. al describe as intentions to become entrepreneurs. In their article *The motivation to become an entrepreneur*, Segal et. al (2005) discuss two different theories as to why people become entrepreneurs. Specifically, they state that "The "push" theory argues that individuals are pushed into entrepreneurship by negative external forces, such as job dissatisfaction, difficulty finding employment, insufficient salary, or inflexible work schedule. The "pull" theory contends that individuals are attracted into entrepreneurial activities seeking independence, self-fulfillment, wealth, and other desirable outcomes. Research (Keeble et al., 1992; Orhan and Scott, 2001) indicates that individuals become entrepreneurs primarily due to "pull" factors, rather than "push" factors" (Segal, et. al, 2005).

In the figure below, Segal et. al show the three part process in which people make the decision between working for others or self-employment.

[1] TrackIT is the name of a cutting-edge technology, which will enable mobile phones to determine their geographical location. At the core of the technology is a unique algorithm, which will be embedded in the phones signal processing unit. Using the accelerometer and gyroscope in the mobile phone, the existing single radio antenna is used to form a virtual multi-antenna-array. This in turn makes it possible to find directions to base stations and Wi-Fi access points and thereby its own location with high accuracy. This technique dramatically increases accuracy compared to current solutions without the need for additional hardware. As the technology does not depend on any satellite signals (as is the case for GPS), it can virtually be operated anywhere, even indoors or underground, as long as there is reception of at least two radio base stations or access points.



Types of Entrepreneurs

In their article *Interaction between feasibility and desirability in the formation of entrepreneurial intentions,* Fitzsimmons and Douglas (2010) introduce a theory that basis types of entrepreneurs relative to their interaction between perceived feasibility and perceived desirability. They introduce a model that categorizes entrepreneurs based upon their level of perceived feasibility and perceived desirability (Fitzsimmons & Douglas, 2010).

Perceived Feasibility	Low Perceived Desirability	High Perceived Desirability
High	**Accidental entrepreneur** (sufficiently high intention)	**Natural entrepreneur** (very high intention)
Low	**Non-entrepreneur** (low intention)	**Inevitable entrepreneur** (sufficiently high intention)

Based upon this model and the following definition the authors give of an inevitable entrepreneur, "this person typically may not have the self-efficacy (nor the underlying skills, education and experience) that will ensure successful entrepreneurial

action, but is very highly motivated to be one's own boss and subsequently forms the (potentially ill-fated) intention to become an entrepreneur" (Fitzsimmons & Douglas, 2010), I can classify myself as one.

More specifically, I can go into detail on my perceived desirability and perceived feasibility. Fitzsimmons and Douglas mention "we also find empirical evidence that individuals with strong perceptions of desirability may form the intention to act entrepreneurially even when they perceive themselves as not having the perceived feasibility (self-efficacy) to do so" (Fitzsimmons & Douglas, 2010). My desirability to become an entrepreneur is high based on the fact that I left my stable job and took a risk in losing a year of work experience to come to Lund. I have also desired for a long time to take entrepreneurial action and this program provided me with the opportunity to do just that with the project TrackIT. As stated in the definition of an inevitable entrepreneur above, I came into this program knowing that I did not have the underlying skills, education, or experience to come out of this year with a business. My intention was to gain valuable experience while working on a project with fellow international students. The authors also state that people "may explore many entrepreneurial opportunities before ultimately forming the intention to act entrepreneurially (McMullen and Shepherd, 2006; Choi et al., 2008) when a sufficiently attractive opportunity presents itself" (Fitzsimmons & Douglas, 2010). The entrepreneurship program at Lund University presented exactly this type of opportunity that Fitzsimmons and Douglas discuss. I will continue to take advantage of entrepreneurial activities until I hopefully start my own business. Based on this analysis, I can conclude that my perceived feasibility is low.

"Success is liking yourself, liking what you do, and liking how you do it."

– ***Maya Angelou***

Entrepreneurial Passion

In just about every guest lecture we've had from a current or former entrepreneur, each lecturer repeated one key ingredient to his/her success. It was not just being smart, business savvy, or even lucky as one might expect. Each individual indicated that as an entrepreneur, you must have an unmatched passion for what you are doing and what your business is about. Without this passion they say, it is extremely difficult to sustain

success in the long run and build an established organization. From my experience working on the TrackIT project, I consider these statements by the entrepreneurs to be of absolute fact. Without passion and a real enjoyment for the product you are working on, there will be no future and in TrackIT's case, this is what happened. In the analysis section, I will explain the reasons behind our teams and my decision not to pursue TrackIT.

Entrepreneurship theory agrees with what most of our guest lecturers have been saying about passion for ones ideas and business. In their article *The Relationship of Entrepreneurial Traits, Skill, and Motivation to Subsequent Venture Growth*, Baum and Locke (2004) state "Passion for work, or love of one's work, has been identified in a qualitative analysis by Locke (2000) as a core characteristic of great wealth creators" (Baum and Locke, 2004). It is not surprising to see that the authors go on to mention names such as Michael Bloomberg and Bill Gates as examples of those whose passion for their work has led to substantial wealth. Baum and Locke also state, "that passion for work is a characteristic of successful business leaders, and passion is relevant in the entrepreneurship setting because it drives entrepreneurs to face extreme uncertainty and resource shortages (Timmons, 2000)" (Baum and Locke, 2004). This further adds to that fact that passion is a key determinant of success in a new venture because most of the time entrepreneurs have to use bootstrapping techniques to make sure their business gets the necessary resources it needs. Having passion for your work will only make the determination to get the necessary resources in anyway possible higher.

Working with researchers

My thoughts about working with researchers on TrackIT flip-flopped quite a bit early in the process of our project. Initially, I was hesitant to work with researchers because I thought that they would want too much of a percentage of ownership of the project, without putting in much effort in the day-to-day business. However, the more I thought about it, I believed it would be a positive collaboration because they would not be involved in the daily operations, which would allow us as a team to work independently from them without much interference. The researchers would also provide all the technical and scientific background that none of us in the team had. The figure

below from Andrew Nelson and Thomas Byers (2005) article *Organizational Modularity and Intra-University Relationships Between Entrepreneurship Education and Technology Transfer*, describes effects of research collaborations on both students and researchers. Based on this table, one can see that collaborations between university and students has many positives including effectively accomplishing both the goals and missions of the technology transfer and entrepreneurship education. Aligned with my goals during the program, I came to the decision that working with a research project was my best option.

	Technology Transfer	**Entrepreneurship Education**
Goals and Mission	Commercialize inventions; generate income	Develop leadership skills; integrate courses and disciplines; provide the foundation for new businesses; forge links between academic and business communities; promote university technology transfer
Influence of Market Conditions	Significant	Less
Time Horizon	0-10 years	0-40 years
Assessment	Straightforward: Inventions commercialized; licenses executed; revenue	Difficult – student enrollment and evaluations; correlations with later behavior
Providers and Constituency	Administrators and firms (that may involve faculty and/or students)	Faculty and students

Table 2: Distinctions Between University Technology Transfer and Entrepreneurship Education

Due to various scheduling conflicts among the business and technology side, we were not able to meet regularly during the past months. As one can imagine, not meeting frequently is not very healthy for a start up business and as a result, our teams motivation dwindled as the year went on. Although this independency is common among technology transfer offices and entrepreneurship program as Byers and Nelson describe, in our case I thought it had a significant impact on our teams performance and decision not to pursue the project.

The authors also find that "Entrepreneurship education, such as that highlighted in the Voltage and Picarro cases, helped the inventors create the viable business plan that was presented to the OTL" (Byers and Nelson, 2005). This was essentially the case for our project as most of our efforts were put into developing a business plan for TrackIT.

Working with unfamiliar teammates

One of my main goals coming into this program was to work with strangers from different countries on the business project. I believed that I could learn a lot from this experience and also enhance my communication and leadership skills. Reflecting on the last year, this proved to be true although my three teammates ended up being from the same country. Each teammate had their own unique characteristics that made them a joy to work with, but also sometimes a pain. Our team had many arguments and disagreements over the course of the project in which we had to discuss as a group what was best for the team and the project. In this section, I will discuss entrepreneurship theory related to working with friends and unfamiliar teammates.

One would imagine that four people from diverse academic backgrounds coming together to work on a project would have all sorts of difficulties in cooperating and making decisions together. Entrepreneurship theory backs up this claim. In their article *Friendship Within Entrepreneurial Teams and its Association with Team and Venture Performance*, Francis and Sanberg (2000) come to a similar conclusion. In one of their propositions, they state "higher levels of friendship within a venture team at the outset of a strategic decision will promote a more effective decision-making process, thus resulting in a higher quality decision, greater commitment to it, greater understanding of it, and greater affective acceptance of fellow team members and the team's processes" (Francis and Sanberg, 2000). I did not find this to be the case most of the time within our project team. As a group, we always had a sound decision making process and talked things through encompassing all possibilities and options.

Working with people whom I had no connection with prior to this year also had an affect on my decision to not pursue this project after the program, although I have grown a bond and friendship with my teammates that I hope will continue on for years. Francis and Sanberg argue that friendship leads to lower turnover among teams and a lower propensity to leave the team. They state, "In the case of a team characterized by a high level of friendship, these costs will include the psychic costs of leaving friends as well as the usual economic costs and considerations of personal risk. By imposing

additional costs on departure, friendship will reduce turnover among the entrepreneurial team" (Francis & Sanberg, 2000).

Methodology

This paper will be written and structured as an autoethnography. Contrary to most standard research articles, autoethnographies are written from ones own perspective based on their own experiences. In his article *Analytic Autoethnography*, Leon Anderson (2006) defines five key features in analytic autoethnography: "(1) complete member researcher (CMR) status, (2) analytic reflexivity, (3) narrative visibility of the researcher's self, (4) dialogue with informants beyond the self, and (5) commitment to theoretical analysis" (Anderson, 2006). Throughout this paper, I will touch on different parts of Anderson's features while also including my own personal observations.

Autoethnographrical writing style has seen an impressive growth during the last fifteen years (Anderson, 2006). Its' roots can be traced back to the early 1900's when Professor Robert Park encouraged his students to identify with themselves in their school work (Anderson, 2006). Throughout the century, autoethnographies were used for different purposes from studies of homeless men, research on factory workers, and reflections on military experiences (Anderson, 2006). The practice developed throughout the 21st century and is now a widely used for research purposes.

The data collection method I will use in this paper is self-observation through my own experiences working on the project TrackIT the last months. I will include and reflect on experiences based on team projects, internal and external meetings, and school assignments. I will also consider any other experience that I have participated in during my work on TrackIT. A potential downsides of using an autoethnographic writing style is that there is no data sample taken from others. All of the "data" is based upon my experience in the entrepreneurship program and therefore no real data analysis was done.

The following quote from Margot Duncan's (2004) article *Autoethonography: Critical Appreciation of an Emerging Art* describes in essence what an autoethnography tries to accomplish:

"The essential difference between ethnography and autoethnography is that in an autoethnography, the researcher is not trying to become an insider in the research setting. He or she, in fact, is the insider. The context is his or her own" (Duncan, 2004).

Analysis

Why do people become entrepreneurs?

Comparing myself to the model of Segal et. al, I find that I was motivated to become an entrepreneur mainly, but not specifically because of the "push" theory. I was dissatisfied with my job and did not think my salary was sufficient to my capabilities and the work I was producing. However, I have also had a long lasting desire to "start my own thing" and have the independency to make decisions on my own without having to worry about my job status. Therefore, I can also say that I came to this program because of several "pull" factors. It is not surprising to see that "pull" theory is the main reason that people become entrepreneurs, but it is somewhat surprising to see that people who are not happy with their jobs not do something about it.

The combination of desirability, feasibility, and tolerance for risk is something that every person has to think about individually before making the decision to become an entrepreneur. In my case, I have a strong desirability of self-employment (NDSE). I want to be my own boss and this was also one of my main motivations for entering this program. At this stage in my life and career, my tolerance for risk (TR) is high as well. I am willing to forgo a substantial income for several years if success is feasible in the long run. Where I lack is in feasibility of self-employment (SE). I do not think I have to necessary background, work experience, or educational knowledge to really start my own business yet. I still have a lot to learn about all aspects of business and will like to work in established businesses before I venture off on my own.

Types of Entrepreneurs

Perceived feasibility and perceived desirability had an effect on my business project TrackIT. TrackIT had a lot of momentum going for it early on as we progressed on the project. We met with industry experts not only in Sweden, but in the USA as well and everyone expressed intrigue in the technology. During the early stages of TrackIT, our team was very motivated to succeed and move along with the business. At the same time, we were also participating in the business plan competition Venture Cup. The technology had won a prize in the first round so we knew it had potential to win or place in the competition. After we submitted our second round plan and participated in the

expert evening, we received very positive feedback from all involved. In my learning journal dated 18/3/11 I wrote, “We attended the expert evening Tuesday and got a lot of great feedback that we will implement into our plan. We also had a nice conversation with Nocturnal Vision about different things we can improve on for our final draft. I also got into contact with a partner at a Venture Capital firm in California who has over 20 years experience in telecom and will review our business plan with us tonight and give us extremely valuable feedback” (Learning Journal, 18/3/11). For our final round submission, we took the suggestions for improvement and implemented them into our plan. At that stage, as a team we were very motivated and put a lot of effort into our plan. Our passion for the project was high because of the success we perceived to have. The feasibility of our project was becoming more and more clear as we established an implementation plan for our business. Our desirability was also increasing because we saw a future in the project that could potentially reward us down the road. Our team was moving toward becoming natural entrepreneurs, which is what I hoped would happen when I entered this program. However, all this motivation and hope changed when we found out that we were not finalists for the final round of Venture Cup. On 22/4/11, I cited in my learning journal “As a group, we are still very disappointed that we did not make at least make the presentation round of venture cup. After all the hard work we put into our business plan and very positive feedback we received from VC, we thought we would at least make the presentation round. We thought we had a good chance to win, especially considering our research backed idea and completeness of our business plan” (Learning Journal, 22/4/11). As a team, we were all extremely disappointed because we thought, based on the quality of our plan and the feedback we received in round two, that we had a more than high chance of being nominated to be among the finalists. After we received the news, our teams’ motivation dwindled quite a bit and for me personally, it was a final blow that the project would not move on beyond this year. We realized the technology was just too far from the market and the risk of it not being implemented on mobile phones was quite high. Although I still had ambitions to become a natural entrepreneur, the feasibility of this project fell and I could again classify myself as an inevitable entrepreneur.

Entrepreneurial Passion

In my personal life, I have met or observed many people who dislike their careers, yet have had an extreme amount of success. Results of Baume and Locke's research tend to agree with this. They found "the finding that passion and tenacity had no direct effect on venture performance suggests that the weak results of previous studies of entrepreneurial traits may not have been caused by studying the wrong traits but by the fact that the traits have indirect rather than direct effects" (Baum and Locke, 2004). These results are not surprising to me because most people want success and will do anything to achieve it, regardless if it is their passion or not.

I came to the decision to work on the research collaboration project "TrackIT" because of several factors. It became more and more apparent that the way to get the most out of this program and in turn have success in it was to work with a research project. On 17/12/10, I wrote in my learning journal "We decided to drop our project with Functional Aesthetics and proceed with the project on mobile positioning with the researchers at Lund University. We did this for several reasons because of the lack of progress and communication with Functional Aesthetics. Although this is a deterrent in our progress with the project, we feel as though this is in the best interest of the team now and for the future" (Learning Journal, 17/12/10). The resources and support the students received from the university, along with the connections and legitimacy of the ideas made it the obvious choice to work on as my business project work (although it took our team a while to come to this conclusion after bouncing back and forth between business ideas). I had worked on TrackIT during the preliminary business plan in the first course so I had some background as to what the project was and what the researchers wanted to accomplish. I was initially attracted to this project because I am interested in technology and smartphones. After hearing the researchers give their presentation on the technology and writing a preliminary business plan I was intrigued, but skeptical of the idea. When my teammate was offered the project by researchers, our current team came together and decided as a group to pursue the project.

My passion when starting the project was at a moderate level. Whenever I participate in something, whether it be academic work, project work, and extracurricular activities, I am always motivated to succeed and do my best. Beginning the project

TrackIT was an exciting time for me because I had never been involved with something like that before. The opportunity to work on starting a business is something I have always wanted to do. Although I wasn't working with an original idea, I thought the project had potential and that this would be a great learning experience for myself. However, the burning passion that most entrepreneurs describe as something that is "deep down inside of you" was just not there. I had no background in electrical engineering so I did not know exactly how TrackIT technology works. For me, it is very hard to relate to something if you are not an expert in the topic and don't know how it works. Also, although I have an interest in technology, I don't have much of a desire to learn and understand the core technologies behind mobile phones for example. This moderate level of passion, coupled with the fact that I almost certainly knew that I was not going to stay in Lund beyond this year, never allowed me to get fully into the project like most entrepreneurs would.

Working with researchers

The first six to eight weeks of the project went well. We were making progress in conducting market research, identifying potential customers, and talking with industry experts. Although we were making progress on our end, communication with our researchers was never fluid. On 22/4/11, I wrote "We also got in touch with Fredrik, our lead research whom we have trying to get in touch with the last couple weeks. He informed us that he was very busy lately and apologized for not getting back to us earlier" (Learning Journal, 22/4/11). This highlights some of the inconsistencies in our communication. It seemed as the researchers were not so much interested in what we were doing and did not want to be constantly updated on our progress. When working with partners on a project, I believe it is necessary for all parties to be involved and engaged in constant conversations. Without proper communication channels, there was disconnect between the business side and the technology side in TrackIT. As a group, we had a feeling that the research team did not really care what we did and that they did not have the same ambitions as a business.

Reflecting back on our work, we never really made any serious business development other than writing a business plan. Analyzing why this happened is not

necessary in this paper, however it does reflect somewhat on our relationship with the researchers and is a significant reason why this project is not being pursued. There was little motivation on my behalf, and on my teams behalf to continue because of the little progress made on the business side. The researchers are still working on their demonstrator and testing of the technology so it is still far away from being ready to introduce to companies.

Looking back, our teams relationship with our researchers never got going as a true business team should. There was poor communication from the beginning and the goals/ambitions of the management team and the research team were never fully aligned. Coupled with the fact that we had seldom met and that the research is still ongoing and a ways away from being ready, my motivation toward the project diminished as the year went on. I learned a lot through working on this project, but in our case, the collaboration just did not work out in the end.

Working with unfamiliar teammates

Working with unfamiliar teammates was an experience that I was looking forward to before entering the program and an experience that I learned a lot from. We did have some instances where not all of us were on the same page regarding a specific decision. For example, after a key meeting we had with members of Mobile Heights, it was suggested to us that we explore other possibilities for implementing our technology. The mobile heights team was skeptical that mobile phones was the best application for our technology because of the timing to get into market and the stinginess of chip manufacturers to change their processes. In our post-meeting discussion, our group was divided where two of the members thought that we should take the advice of mobile heights and concentrate more on different applications rather than mobile phones, while the other two members thought we should continue with the mobile phone market. After a long, somewhat hostile discussion we came to the conclusion that we should continue concentrating on the mobile phone market. Although we were not friends when we started the venture, our team still had a thoughtful, thorough decision making process in which we made decisions which we assumed to be in the best interest of our project and our team.

In my own experience, the weight of friendship only had a little effect on my decision to leave the project. Personal costs, economic costs, and risk had the most effect on my decision. If I decided to continue with this project, I would do so know that there was a great risk that I would work for another year or two with no possible reward at the end. Although it would not be a completely wasted year based on the experience I would gain, financially it would be a significant setback that I couldn't risk. Also, as previously mentioned, at this point in my career I want to gain more corporate experience learning from others who have had success in their careers. More significantly, I had to weigh the costs of living in Lund another year away from friends and family and this ultimately was the reason I am choosing to leave Lund. Theoretically, I would tend to agree with the authors finding that friendship does lead to harder decisions and less turnover among entrepreneurial teams. I developed a friendship with my team that in other circumstances would have led me to continue working with them. However, relating it to my current situation, I would have to argue that friendship played less of a factor in my decision than personal, risk, and economic factors.

Conclusion

Reflecting back on my motivations I stated in the introduction, there is no doubt that this year has been a success for me in all three phases: business, education, and personal growth. I am leaving this program a smarter and more well rounded person. I have no doubt that this program will help me in one-way or another the rest of my career and life. The contacts I have made, not only personally through the program, but also business contacts will stay with me for a long time and will be there for help and support if I ever need it. Educationally, I have learned a lot about entrepreneurship theory and practices that will help me in the future as I look to one day start my own business.

Working on the project TrackIT has been not only a wonderful experience, but an inspiration to go after it and pursue a project in which I have an extreme passion for. Without passion and doing what you love to do, there is no sense in starting a business in the first place. If I leave with nothing else from this program, I can leave with this. TrackIT is a technology that is developed and owned by researchers and because of this, it was hard to develop a passion for it. Although I never had the intention to work on it

beyond this year, the de-motivation I experienced during the end of the year played an important factor in my decision.

Working with researchers has given me invaluable experience that I will take with me as I move forward with my career. I have learned that there must be a constant, clear communication channel between all members of the team in order to maintain a positive working relationship on both ends. There must also be certain goals and expectations from both the research side and the management side in order to have some sort of structure and common goals between the team. Our teams' volatile relationship with the researchers certainly played a role in my decision not to pursue the project.

Working with unfamiliar teammates was an experience that I have learned a great deal from. Although there were times where we had disagreements with each other, sometimes leading to strenuous relations amongst ourselves, we always thought items through to ensure that we make the right decision for the team. This is something that I will take with me as I move forward with my career and will help me when I am encountered with similar situations. However, there were more good times than bad and we ended up really bonding as a team. The relationships I have developed with my teammates might be more important than anything else I can take out of this program, and this was my original motivation when I entered the program.

Suggestions for future research

I suggest more research to be done regarding the topic of research collaborations. More so, with respect to entrepreneurs working with ideas that are not their own is a topic that has not been researched much and could use some studies. Specifically, it will be interesting to read articles on motivation and how entrepreneurs deal with the fact that a product they are working on is owned by someone else, whether it be by intellectual property or any other form of ownership. Also, I would suggest further research to see how entrepreneurs motivation increased or decreased as the project went on, especially because they don't own the product they are selling. Entrepreneurship is a developing research field and there are not many programs like the one at Lund University. The research is just taking off and collaborations between university science and business should increase in the coming years. It would be interesting for someone to compare different entrepreneurship programs around the world and their collaborations with university innovations.

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