Péter KRISTÓF

HOW ESTABLISHED COMPANIES CAN MASTER DISRUPTIVE INNOVATION LIKE STARTUPS?

Achieving innovation excellence and disruptive ability

PhD dissertation

Department of Computer Science

Supervisor:

Dr Péter FEHÉR PhD

CORVINUS UNIVERSITY OF BUDAPEST

Doctoral School of Business Informatics

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“There is surely nothing quite so useless as doing with great efficiency what should not be done at all.”

Peter Drucker, 1963

1 Introduction

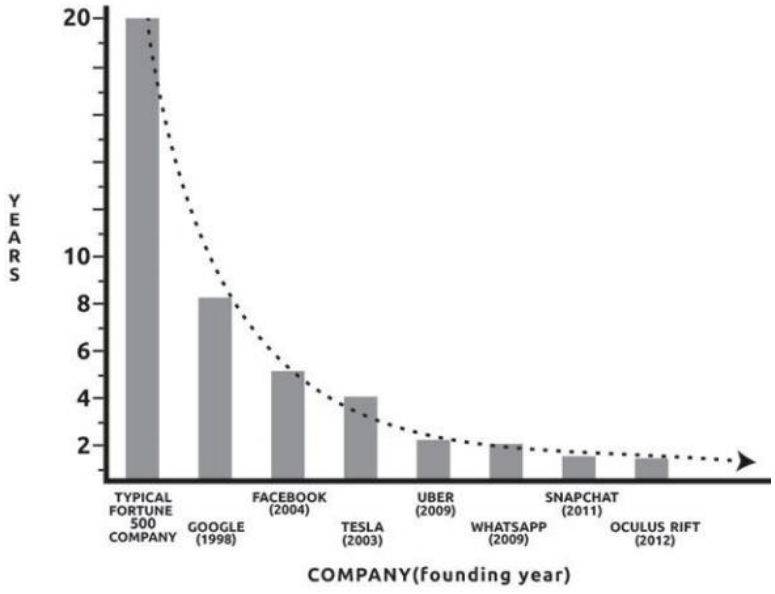
"I frankly didn't expect it to be at all precise."

Gordon Moore, 2005

Emerging **exponential technologies** empower entrepreneurs to create a **world of abundance**. For established companies it implicates that if they are not the ones creating this abundance, somebody else will, by disrupting their technology and market. In order to keep pace they have to learn how to pick up and apply exponential mindset and **master disruptive innovation like startups** – even within their established organizations.

The dynamisms of such changes can already be experienced: in 10 years 50 % of the today Fortune 500 companies will no longer exist, while the average lifespan of an S&P 500 company decreased from 67 years (measured in the 1960s) to 15 years as of today (see Figure 12 on page 44). Exceeding 1 billion market capitalization can be achieved only in some years (see Figure 1) and the cost of launching an internet startup has dropped from $5,000,000 in 2000 to $5,000 in 2011 – that is a **1000-fold price-performance improvement in just 11 years**! That was relevant in the past and is expected to be valid in the future for all information enabled technologies: trains, manufacturing, planes, medicals, cars, 3D printing, digital imaging, smart data, wireless sensing, artificial intelligence, advanced materials, robotics, genomics, and energy storage amongst others.

Figure 1: Years to market capitalization of a billion USD



Source: Ismail, 2014

That kind of exponential progress of technology quickly turns into **exponential business growth**. Giant corporations are not just forced to compete with, but are annihilated – seemingly

overnight – by a new breed of companies that harnesses the power of exponential technologies, from groupware and data mining to synthetic biology and robotics. And the founders of those new companies will become the leaders of the world's economy for the foreseeable future.

What is happening today is just the opposite of what happened in the last 100 years of entrepreneurship and innovation management. Business leaders of the last century grew up in a **linear world** where progress, improvements, technologies all increased in small increments. During this time they learned to succeed by focusing on improvement, ensuring control, avoiding uncertainty, managing by hierarchy, to name a few. That linear experience shaped their beliefs about how to be successful, dictated their approach to growth, formed the management systems they put into place to lead and manage their businesses, and influenced how they structured their organizations. Ultimately, linear thinking became the generally accepted mindset, the hidden attitudes and inclinations upon which entrepreneurs of the last century depend when making decisions. [Sutherland, 2013]

Entering the **age of disruption** and the **world of billion-dollar startups** (the so-called unicorns), neither age nor size nor reputation nor even current sales guarantee that established companies will be around tomorrow. It is also a place where anyone can build an organization that is sufficiently scalable, fast moving, smart and global by default. They may enjoy exponential success never seen before, with a minimum of resources and time. This is what startups are doing best: unlocking potential from exponential technologies with a speed of light, building global businesses in a short period of time never seen before and disrupting existing markets and its incumbents.

For established companies it is time to **learn from startups** about mastering disruptive innovation and dealing with exponential changes in the fields of innovation management.

My dissertation is about **how**.

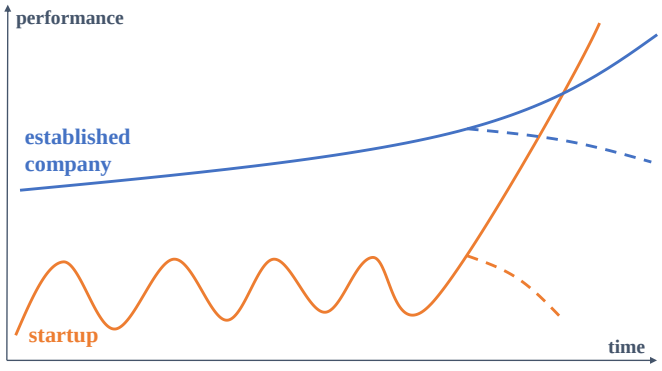
1.1 Why this topic?

The Dutch East India Company is regarded as the first "modern company" since it issued its first stock certificates in 1602. In the upcoming 300 years companies managed to start, build and grow without formally trained executives. The 20th century brought a blossom for enterprises which demanded well-trained managers. The first MBA degree ever was issued by Harvard University to fill this need and bring repeatability into education while creating standards in the curriculum: accounting, finance, strategy, operations, HR, law. It also means that **formal management tools are about 100 years old**. [Blank – Dorf, 2012]

The today practice of pairing venture capital[1] and startup entrepreneurship arose in its modern form only some decades ago, and the startup industry they fostered has been exploding ever since. As the development has happened exponentially, **no success formula for the repeatable startup success has emerged**. That is why founders of new ventures had to continually adapt the "big business" tools, procedures and methods – taught in business schools, suggested by their consultants and expected by their investors. The result is that in case the startup fails to execute "the plan", investors are shocked but they usually forget that no startup executes its business plan. It also means that the today general knowledge and curriculum about running large companies do not work for startups, neither in times when the pace of advancement and change is accelerating. More and more experts, entrepreneurs and investors are learning the lesson that startups are not simply smaller versions of large companies. [Blank – Dorf, 2012]

Established companies execute business models where customers, their problems, necessary product features, the market and the competitors are all evidences. To the contrary, startups operate in search mode, seeking their scalable, repeatable and profitable business model – and this activity requires **dramatically different tools**, methods, rules, skills and roadmaps for minimizing risk and optimizing the chances for success. And to the contrary: big companies are not larger versions of startups. **A company is a permanent organization to execute a repeatable and profitable business model.**

Figure 2: Companies and startups – at a glance



Source: own design, based on Vitanov, 2015

There has been a lot written about that these (large and established) organizations need to be more innovative and monetize the development of technology, but very little about what stops them doing so. By definition companies trying to do so are facing a **riddle**: every internal plan, policy or procedure that makes them efficient in execution, stifles innovation. [Blank, 2014a]

The processes by which an organization transforms labour, capital, materials, and information into products and services of greater value are called **technology**. The advancement of

[1] The very first venture capital-backed company was Fairchild Semiconductor in 1959.

technology follows an **exponential** curve, which implies that companies need continuously to pay attention to it. A **paradox** is that at first glance, there seems to be no pattern in that when disruptive changes overtook established and well-managed companies. An explanation is that once great but failed firms were as well-run as one could expect a firm managed by mortals to be – but that there is something about the way decisions get made in successful organizations that sows the seeds of eventual failure. [Christensen, 1997]

The fierce and global competition makes enterprises deal with innovations. As they are feeling their competitors' breath on their necks they want innovation to happen inside their organizations. As they see that startups are successful on this field, they want themselves to be like them. But paradoxically, despite their seemingly endless resources, they experience that **innovating inside an existing company is much harder than inside a startup**. Most of them feel that innovation can only happen by exception and not by design. The question is: **why**? [Blank, 2014a]

A general **answer** could be that established companies are designed for **executing** a proven business model. Their employees are also acting in execution mode. They take the business model as a given and they measure their success on metrics that reflect success in execution. And so, what is rewarded is also efficient execution. Another question could be, why execution policies and processes have become impediments of and are antithetical to continuous innovation.

The past 100 years of management practice and science have elaborated tremendous numbers of tools to assist companies to execute. These tools brought clarity to corporate strategy, operations management, finance. Examples could be BCG-matrix, strategy maps, or the Stage-Gate method. But all these tools have an **underlying assumption that the business model is known** and the only task is to execute it.

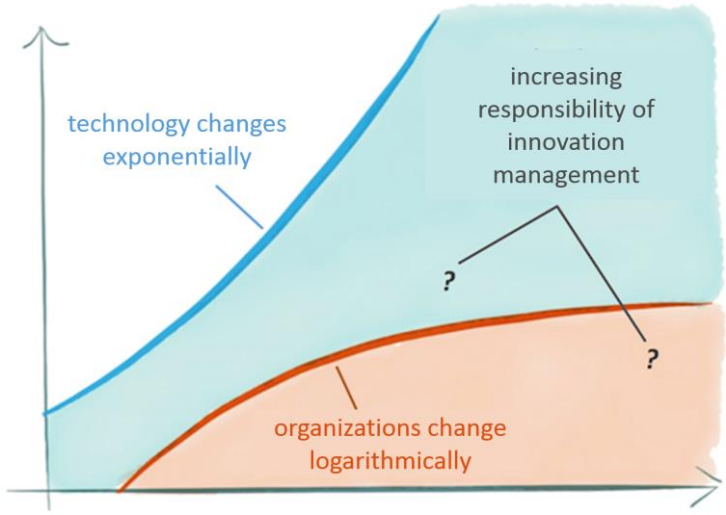
As the systematic process of execution needs to be repeatable and scalable, staff functions developed Key Performance Indicators (KPIs) and business processes to plan, measure and control execution. These KPIs and processes make companies efficient in execution, but paradoxically they are the **root cause** of corporations' inability to be agile and responsive innovators and every time a new execution process is introduced innovation dies a little more. *"The conundrum is that every policy and procedure that makes a company an efficient execution machine stifles innovation."* [Blank, 2014a, w/p[2]]

[2] w/p means: without page number – the reference does not have page numbers (e.g. it is a webpage), so it cannot be given.

Since technology is advancing exponentially, the organizations absorbing these changes logarithmically, need new approaches, tools and mindset to keep themselves in the race in the fields of profitability and growth.

According to **Moore's Law** (the exponential growth of computing power, see chapter 3.1) and **Metcalfe's Law** (exponential value of interconnections on expanding networks, see chapter 3.2.5) the exponential advancement of technology has become a generally accepted phenomenon in the last decades. Futurist Ray Kurzweil has identified this exponential technological progress on many fronts as part of a **law of accelerating returns** (see chapter 3.2.2). The driver fuelling this phenomenon is information. Once a domain, discipline, technology or industry becomes **information-enabled** and powered by information flows, its price/performance begins doubling approximately annually. [Ismail, 2014] This is shown with a sharply rising blue curve on Figure 3.

Figure 3: The change of technology and organizations



Source: Brinker, 2013

But organizations and companies absorb changes logarithmically – shown with a much slower rising red curve. It takes time for people to alter their thinking and their behaviour. With groups of people, where there are existing structures, processes, incentives, and cultural momentum, it takes even more effort to turn the ship. The larger the group, the greater the institutional resistance.

The great **management dilemma** of the 21st century is the relationship between these two curves: **technology is changing faster than organizations can absorb change**. Providing appropriate answer is the crux of innovation management.

Innovation management must explicitly address how these technologies will be absorbed into the operations of established companies. The **goal** of this dissertation is to give a **deep insight** into this phenomenon and to provide **appropriate answers** on the attending problems by

comparing traditional and lean innovation methods, analysing the innovation performance of various companies and elaborating a **roadmap for a successful transition**.

1.2 Research focus

Never in human history have we seen so many disruptive and breakthrough technological novelties (for definition see chapter 1.4.2) moving at such a speed. What is more, as these novelties **intersect** (e.g. using deep-learning artificial intelligence algorithms to analyse cancer trials), the pace of innovation accelerates even further. Each intersection adds another multiplier to the equation – and increases the exhibitor of the unknown parameter in the equation to be solved.

Corporate innovation initiatives have spent decades looking at other corporate structures as samples for innovation when in fact they should have been looking at startups for innovation models – and adapting and adopting them for corporate use. Startups are the type of organizations which are **searching** for a repeatable and scalable way of profiting from innovation. Since such organizations function as hatcheries of breakthrough novelties, their way of creating and managing innovation should be the best examples to follow.

The research in behind this dissertation was **focusing** on finding and introducing such examples and identifying the most significant factors which make innovation happen by intention (and not by exception).

While companies intellectually understand innovation, they do not really know how to build it into their culture, what success on this field really means or how to measure its progress. The reason is that innovation is **chaotic, messy and uncertain**, and so it needs radically different tools for management, measurement, control and accountability. But what is also characterized by chaos, mess and uncertainty is the way startups are searching for their repeatable, scalable and profitable business models, which make them survival and learning machines. These kind of temporary human institutions have elaborated a series of new approaches, methods, tools and processes, which have been well documented in the last decade and are referred as **lean startup**, which might be needed for established companies to fight the ever increasing chaos, mess and uncertainty around their businesses, caused by disruptive innovations and exponential technologies.

Based upon my **own experiences** (gained as an information technology consultant and innovation expert), both good and bad, I believe I can offer management teams critical insight into this era of hyper-accelerated innovation and competition, as well as into the new opportunities (and responsibilities) presented by this new world. These insights cannot guarantee success, but can at least put companies and managers on the right playing field and

show them the rules of the new game. These two advantages, extended with their own initiatives, offer good odds for being a winner in the new world of innovation management.

1.3 Research objective and question

Innovation management techniques pioneered by startups were originally designed to create fast-growing tech ventures. But as more established and even large or multinational companies (e.g. General Electric, Procter&Gamble, Intuit) invite successful **startup founders** to talk about their methods and as more renowned business schools (Harvard, Stanford, Berkeley, Columbia) introduce these techniques into their curricula, it is becoming clear that those innovation management and lean startup practices are not just for startups.

In the last decades, increasing **corporate efficiency** was achieved by driving down costs. But aiming on introducing **incremental improvements** into existing business is not enough anymore. Established companies need to deal with ever-increasing external threats by continually innovating. To ensure their survival and growth, they need to keep inventing new business models and introduce breakthrough novelties. [Blank, 2013]

The first hundred years of management education focused on building strategies and tools that **formalized execution** and efficiency for existing businesses. In the last decade, fast-growing tech entrepreneurs elaborated **new set of tools** for searching for new business models, launching startup ventures and managing exponential technologies – just in time to help established companies to deal with the forces of continual disruption. [Blank, 2013]

Built on these early and immature results, I set the **objective** of this dissertation (and the qualitative and explorative research in behind) as follows:

To generate for established companies new in-depth, context specific insight into dealing with the challenges brought by emerging exponential technologies and to arm and equip them with appropriate tools and methods to be excellent and eventually disruptive innovators.

This had been planned to be achieved by answering the **research question**:

How established companies can master disruptive innovation like startups?

Unfolding a research question into **sub-questions** helps not only to understand the phenomenon but supports to translate theory into practice and fosters managerial implication. Therefore, my research question was split into **three categories**.

Since the research objective was similarly complex and holistic as the research question, setting **research sub-objectives** seemed to be appropriate. The consequent following of these sub-objectives also supported holding the focus of the research. Table 1 gives a summary of the

research sub-questions, the research sub-objectives and contains a reference to the chapter in which their explications happen.

Table 1: Sub-questions and sub-objectives of the research

Sub-question	Sub-objective	Chapter
A) Theoretical foundation	**To build a deep and wide foundation from already researched, documented and validated sources which serve as pillars of new findings and insights.**	**3 Understanding singularity**
A1) Why is it important (for an established company) to be innovative?	To have an overview about the development of exponential technologies and disruptive innovations, their effects on the global economy and the nature of innovation management.	3.2 Declining old rules, penetration of new ones
A2) How established companies are trying to be innovative?	To explore the innovation conundrums of established companies in order to identify focus areas of management cognition and action to which the delivery of top or potentially disruptive innovations are highly dependent.	3.3 Frustrations with innovation at established companies
A3) How startups are making innovation happen intentionally and not exceptionally?	To show the main characteristics of startups and to bring a preliminary insight into the lean startup method used by them.	3.4 Lean startup in theory
B) Practical establishment	**To bring together relevant practices about innovation-related activities of startups and established companies.**	**4 Startup lessons for established companies**
B1) What established companies can learn from startups in the fields of innovation management?	To provide practical distinction between startups and established companies, and a detailed description about their innovation management practices and strategies.	4.2 Startups vs. established companies
B2) Are lean startup methods appropriate for unlocking innovation potential?	To present lean startup principles and methods from the specific perspective of getting them used and applied at established organizations.	4.3 Using lean startup principles at established companies 4.4 Applying lean startup methods at established companies
C) Managerial implication	**To create a conceptual roadmap which shows the way towards innovation excellence and disruptive ability.**	**5 Towards innovation excellence and disruption**
C1) How top and moderate innovators are different from innovation management point of view?	To specify the significant differences between top and moderate innovators and their innovation performance.	5.2.4 Innovation leaders and laggards
C2) How startups and established companies	To specify the significant differences between startups and established	5.2.4 Innovation leaders and laggards

Sub-question	Sub-objective	Chapter
are different from innovation management point of view?	companies and their innovation performance.	
C3) What are the enabling factors of being a disruptive innovator?	To deliver a holistic understanding of the key facilitators (factors) enabling the capacity and capability to pursue potentially disruptive innovations.	5.2.5 Different to be
C4) What are the enabling factors of being a top innovator?	To identify the most important capabilities that spur innovation performance and lead to excellence.	5.2.5 Different to be
C5) What actions to take on strategic and operational level to be a successful and disruptive innovator?	To convert the knowledge (gained during this research) into systematic management actions on strategic and operative level to reach innovation excellence and enhance disruptive ability.	5.2.6 Innovation excellence and disruptive ability

Source: own design

While summarizing the underlying terms and definitions in chapter 1.4, chapter 2 (Research methodology) introduces the applied research methodologies and the research plan.

Chapters 3, 4, 5 deliver the answers on research sub-questions A), B) and C), and follow the structure of introduction, negotiation and conclusion.

The last chapter (number 6) summarizes the findings and the contributions achieved during the research introduced in this thesis.

1.4 Terms and definitions

Throughout this dissertation several such terms and definitions are used which have a broad understanding. To **bring clarity** into the discussion it is important to draw the frames and give the straight meaning of the vocabulary used. Furthermore, having a common understanding helps to follow the logical threads within this work and serves as a basis of having own epiphanies.

1.4.1 Innovation

Defining innovation itself is a challenging task. As later[3] I will show, the root cause for this is its ever changing nature. This section gives a definition for innovation and provides a typology of its **different forms and occurrences**.

The basics of defining innovation were laid down by the Organization for Economic Co-operation and Development (OECD) in the so-called Oslo Manual [OECD, 2005, w/p]: *"The implementation of a new or significantly improved product (good or service), or process, a new*

[3] Chapter 4.4.2 Measuring innovation.

marketing method, or a new organizational method in business practices, workplace organization or external relations." In this means, innovation has a lot to do with invention, but requires many other things: inventing something new but additionally including a deep understanding of whether customers need or desire that invention, how the company can work with others to deliver it, and how it will pay off over time [Keeley, 2013].

It is also important to note that an invention will only turn to innovation when it has processed through production and marketing tasks and is diffused into the marketplace [Layton, 1977]. It means that if an invention makes a positive economic contribution to the firm, it can be called innovation, which includes not only basic research but also product and business development, manufacturing, marketing, sales, service, business modelling, and later product upgrading [Smith – Barfield, 1996].

A difficulty is that the word innovation is understood broadly and is **often misused**. Usually it is treated as a monolith: as if every innovation is the same and one approach fits all. This is the root cause of its misunderstanding and mismanagement.

Startups defined for themselves many kinds of innovation: novel scientific discoveries, repurposing an existing technology for a new use, devising a new business model that unlocks value that was hidden, or simply bringing a product or service to a new location or a previously underserved set of customers. For established companies it is a **diverse activity**. But they need to be careful because there is a big difference between a random brainstorm and a concerted effort.

In all these cases, innovation is at the heart of the company's success. [Ries, 2011]. As an organized practice it falls into **four categories**, depending on how well the problem and the domain is defined:

Table 2: Types of innovation

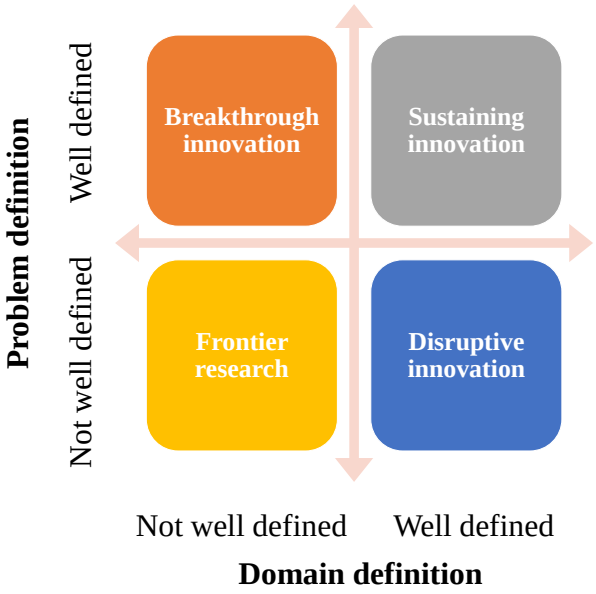
Type	Definition	Example	How to deal with?
Frontier research	A new understanding of basic research. On one hand it denotes that basic research in science and technology is of critical importance to economic and social welfare. And on the other that research at and beyond the frontiers of understanding is an intrinsically risky venture, progressing in new and the most exciting research areas and is characterised by the absence of disciplinary boundaries [definition by European Research Council]. There is no clearly defined outcome for frontier research, but it is expected to	Results achieved by famous scientist like Albert Einstein, James Watson and Francis Crick, John Bardeen – the list is long.	Despite rarely leads directly to new products or services, many corporations invest serious money into it. Some companies, like IBM or Intel, have internal labs doing primary research, while others invest by way of research grants to outside scientists and academic affiliations.

Type	Definition	Example	How to deal with?
	pay huge dividends in the long run with the aim of discovering something truly new.		
Sustaining innovation	There is a clearly defined problem and a reasonably good understanding of how to solve it. It does not affect existing markets. Established companies tend to be very good in it. There are two types of sustaining innovation: a. Evolutionary (incremental): leads to small improvements to existing products and business processes. b. Revolutionary (discontinuous or radical): results in new products or services delivered in entirely new ways.	Refrigera-tors instead of ice harvesting. Steam engine boats instead of sailing boats.	Probably the most common in the corporate world and is often referred to as engineering rather than science. Like frontier research, much of this is done by internal R&D labs, but many firms outsource it as well – as Apple did it in 1980 with its mouse, which was designed by IDEO.
Disruptive innovation	Creates a new market by applying a different set of values, which ultimately (and unexpectedly) overtakes an existing market. It can be a key source of growth, and CEOs widely seek it. Detailed in chapter 1.4.3.	Digital camera, Google search, Facebook, Uber, Airbnb.	Particularly tricky because it is not known until it is not seen and sometimes its value is not immediately clear. That is why venture capital firms expect the vast majority of their investments to fail.
Break-through innovation	The problem is well defined, but the path to the solution is unclear, usually because those involved in the domain have hit a wall. Usually, these types of problems are solved through synthesising across domains.	Transistor, post-it, penicillin.	Often, a particular field has trouble moving forward because they need a new approach. That is why breakthroughs often come from newcomers. Companies have started to attack the problem with open innovation (Procter & Gamble: Innocentive), putting professionals outside their field or building multidisciplinary teams (IBM).

Source: Christensen, 1997; Garcia – Calatone, 2002; Satell, 2013; Davila et al., 2013

Defining a managerial approach to innovation starts with developing a better understanding of the problem to be solved – by answering the two questions: How well is the problem defined? Who is best-placed to solve it? The answers – the type of innovation – can be organized into a 2x2 matrix.

Figure 4: Innovation matrix and the 4 types of innovation



Source: own design, based on Satell, 2013

For established companies, finding a focus is important, but they should find a balance between dealing with other quadrants as well. An example could be Apple, which is mainly a sustaining innovator, but from time to time it comes up with some disruptive, like iTunes. Google might be the greatest disruptor on Earth, but it spends considerable efforts on improving existing products.

All innovations begin with a **vision**, but at the end of the day, it is about venturing into the unknown and developing new solutions that solve customers' problems in a better way than the competitors, requiring a certain level of risk acceptance. [Johansson – Axling, 2014]

1.4.2 Technology

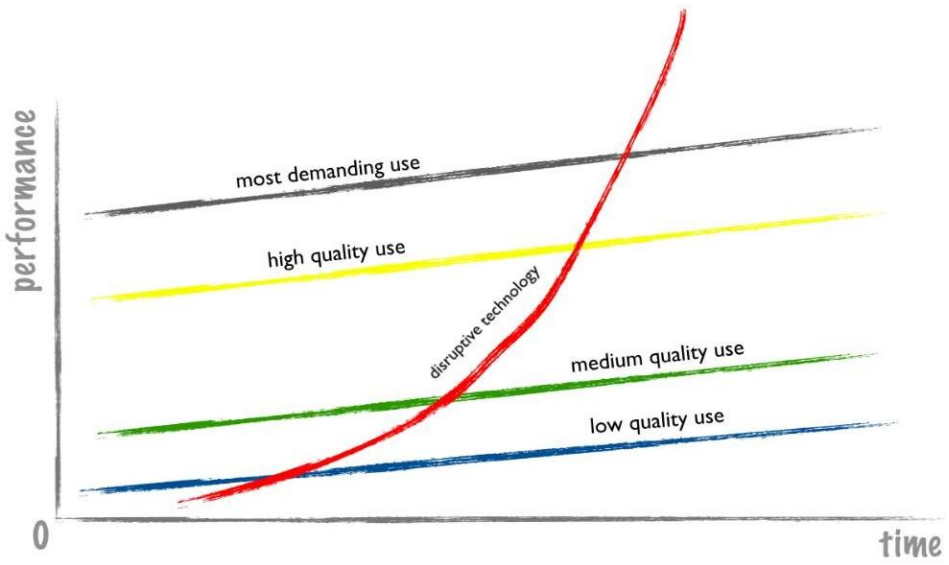
Technology enables to do more with less, ratcheting up fundamental capabilities to a higher level. While animals are instinctively driven to build things like dams or honeycombs, humans are the only ones that can invent new things and better ways of making them. Humans do not decide what to build by making choices from some cosmic catalogue of options given in advance; instead, by creating new technologies, they rewrite the plan of the world. These are the kind of elementary truths that are being thought to second graders, but they are easy to forget in a world where so much of what is done is repeated what has been done before. [Thiel, 2014] This dissertation gives useful insight into **building companies that create new things** – by applying the latest tools and techniques of and for innovation.

1.4.3 Disruptive innovations and technologies

Disruptive innovations are such novelties which usually result in worse product performance in the near term, but that performance develops quickly, following an exponential curve. Initially,

this curve runs under the incumbents' but after break-even it drastically outperforms the old players' (even the most demanding ones) value proposition.

Figure 5: Time-Performance curve of sustaining and disruptive innovations



Source: Christensen, 1997

Furthermore, disruptive innovations bring to the market a **very different value proposition** that had been available previously. Usually, disruptive technologies underperform established products in mainstream markets (as mentioned above). This is where a different mindset turns to be important: disruptive innovations improve a product or service in ways that the market does not expect, typically first by designing for a different set of consumers in a new market and later by lowering prices in the existing market. In contrast to disruptive innovation, a sustaining innovation does not create new markets or value propositions but rather only evolves existing ones with better value, allowing the firms within to compete against each other's sustaining improvements. The following table summarizes the differences between these two types of innovation.

Table 3: Differences between sustaining and disruptive innovation

Sustaining innovation	Disruptive innovation
Problem is well understood	Problem is not well understood
Existing market	New market
Innovation improves performance, lowers cost, incremental changes	Innovation is dramatic and game changing
Customer is believable	Customer doesn't know
Market is predictable	Market is unpredictable
Traditional business methods are sufficient	Traditional business methods fail
Executing organization	Learning and searching organization
Talk to mainstream	Talk to early adopters
Market research	Customer development
Test for process optimization	Test for learning

Source: Cooper – Vlaskovits, 2013

Products based on disruptive technologies are typically cheaper, simplier, smaller and more convenient to use. This is why incumbent firms' existing value chains place insufficient efforts on disruptive innovation to allow its pursuit and quick evolution. Furthermore, these companies focus on improving their products and services for their most demanding customers. Meanwhile, startups inhabit different value chains, at least until their disruptive innovation is able to invade the older value chain: they target overlooked segments, gaining a foothold by delivering more suitable functionality. At that time, the established firm in that network can at best only fend off the market share attack with a me-too entry, for which survival (not thriving) is the only reward. [Christensen, 1997; 2015]

As a consequence, the nature of innovation is changing: it is turning to be faster, more open and more disruptive than ever. To succeed, companies must reinvent themselves into innovators that can thrive at every stage of their lifecycle, repeatedly and continuously.

Being successful in innovation is not any longer about doing things just faster. It is the minimum. Reaching disruption demands a **radically different approach** to competition, planning and execution – and not by degree but in kind from the conventional mindset. Under such conditions the interactions with competitors, customers, suppliers and investors will be drastically altered, and thus, every part of the business is affected, from research and development, to manufacturing, marketing and finance. [Downes – Nunes, 2014]

In a universe of disruptive innovation fuelled by exponential technologies and dropping transaction costs the lines between startups and established companies are blurring and everyone gets involved into a global ecosystem where success is measured by the **speed of learning**.

1.4.4 Startup

Being newly launched or being small does not in itself make a company a startup [Graham, 2012]. And the flip side: being old and large does not mean that the organization cannot be a startup. Taking risk, searching for a new business model, diving into the unknown and growing fast do matter. These aspects are mirroring back in the **definitions** of the most well-known startup pioneers, practitioners and theorists:

- Definition of **Steve Blank** (entrepreneur, investor and senior lecturer at Stanford and UC Berkeley): A startup is a temporary organization in search of a scalable, repeatable, and profitable business model. [Blank – Dorf, 2012]
- Definition of **Eric Ries** (author of the Lean Startup book): A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty. [Ries, 2011]

- Definition of **Paul Graham** (founder of Y Combinator): A startup is a company designed to grow fast. Being newly founded does not in itself make a company a startup. Nor is it necessary for a startup to work on technology, or take venture funding, or have some sort of "exit". The only essential thing is growth. Everything else we associate with startups follows from growth. [Graham, 2012]
- Definition of **Peter Thiel** (co-founder of PayPal and Palantir, venture capitalist): A startup is the largest group of people you can convince of a plan to build a different future. [Thiel, 2014]
- The definition of **Aswath Damodaran** (professor at Stern School of Business) stated that the value of a startup firm rests entirely on its future growth potential. His definition emphasizes the stage of development rather than the structure of the company or its respective industry. [Damodaran, 2012]
- Definition of **Dave McClure** (entrepreneur, angel investor and founder of 500 Startups): A startup is a company that is confused about (1) what its product is, (2) who its customers are, (3) how to make money. As soon as it figures out all 3 things, it ceases being a startup and becomes a real business.

In these definitions most of the words have **significant meaning** and a message:

- Temporary: startups are not forever. Their aim is to find a scalable, repeatable and profitable business model. During this trip they are measured based on learning.
- Search: startups are operating in search mode, which means continuously testing business hypotheses. Their way is paved with invalidated assumptions and the outcome is validated learning and experience. They go from failure to failure in an effort to learn from each and to discover what does not work. The focus is on validation: they have to work hard to validate their guesses. If they can do that, they have reached problem/solution fit: they found a validated solution (product or service) for a valid problem.
- Scalable: a startup has the possibility from its inception to grow global. It requires the founders' strong vision and motivation, large enough target market, passionate belief and a reality distortion field (to convince venture capitalists to invest, team members to join and customers to pay).
- Repeatable: building a company and reaching global presence requires repeatable activities like acquisition, sales, registration, marketing and payment, ideally with zero marginal cost.

- Profitable: profit is required to spur growth, and make businesses operate smoothly. Furthermore, profit is the quintessence of running businesses and is also expected by investors.
- Business model: tells entrepreneurs who the customers are, what the product features should be, and how this scales into a hugely successful company. It describes and details the rationale how an organization creates, delivers and captures value.
- Human institution: a startup is put together of humans, having the same aim and sharing the same vision. Building a successful startup is full of activities that can be called institution-building (e.g. hiring, coordinating and managing).
- New: in every case, the organization is dedicated to uncovering a new source of value for customers, and cares about the actual impact of its work on those customers.
- Extreme uncertainty: the land of startups is a unique place, where the risks are unknown (when the "risk premium" is known, we are not in startup land). Startups are designed for the situations that cannot be modelled, are not clear-cut, and where the risk is not necessarily large – it is just not yet known. [Ries, 2010]

It is important that these definitions are not saying anything about **age or size**. It is because being a startup is **not dependent** on such factors. A startup can be a new venture or it can be a new division or business unit in an existing company. **Search versus execution** is what differentiates a new venture from an existing business unit. The primary objective of a startup is to validate its business model hypotheses, then it shifts into execution mode and transits to an established company.

The success of a startup is not gauged by earnings or quarterly results. It is measured by how well it identifies a market problem and matches it to a solution (problem/solution fit). Furthermore, it is measured by how the solution (a product or a service) satisfies the market demand: product/market fit is the first step to gain early traction. Successfully fulfilling customer needs results growth in revenues, and ultimately, profitability.

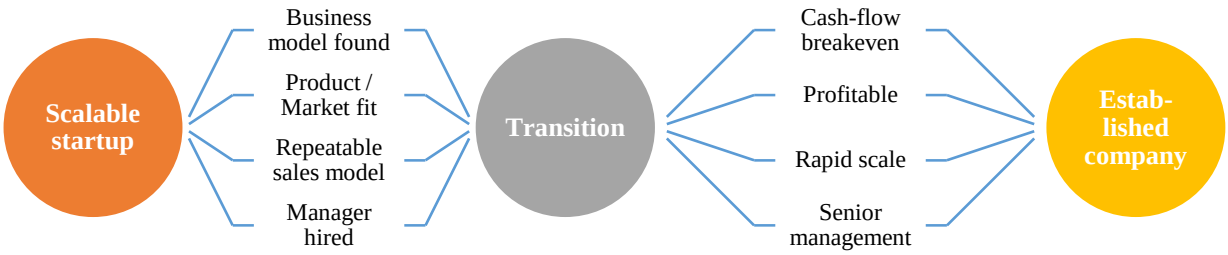
Referring to a startup is not equal to referring to a new or small company. A startup can be any temporary organization which is searching for a new business model and creating something new, under extreme uncertainty. This definition is used throughout the dissertation.

1.4.5 Established company

Levie and Lichtenstein [2010] identified 104 different types of growth models, which divide the growth process into 3-15 stages. Despite the considerable differences, early (startup) and mature (established) stages are similarly separated, where the most challenging management issue is the transition between these two stages. [Dobák, 2011]

Established companies are **not larger or older versions** of startups. As learned in the previous section, a startup is a temporary organization designed to search for a repeatable and scalable business model. The corollary for an enterprise is: *"a company is a permanent organization designed to execute a repeatable and scalable business model."* A business model guides an organization to create and deliver value (to customers) and make money from it [Blank, 2014a, w/p]. From this dissertation's point of view, what matters is to understand that established companies are (or should be) designed for execution – and this is what makes difficult for them to come up with disruptive innovations. As they are maturing from a startup, their focus shifts from searching a business model to execute it.

Figure 6: A startup's transition to an established company



Source: own design, based on Blank – Dorf, 2012

In execution mode they measure business success on metrics that reflect success in execution. Since Peter Drucker we know: *"What gets measured, gets managed"*. This means that at established companies execution gets managed – which is not about disruption.

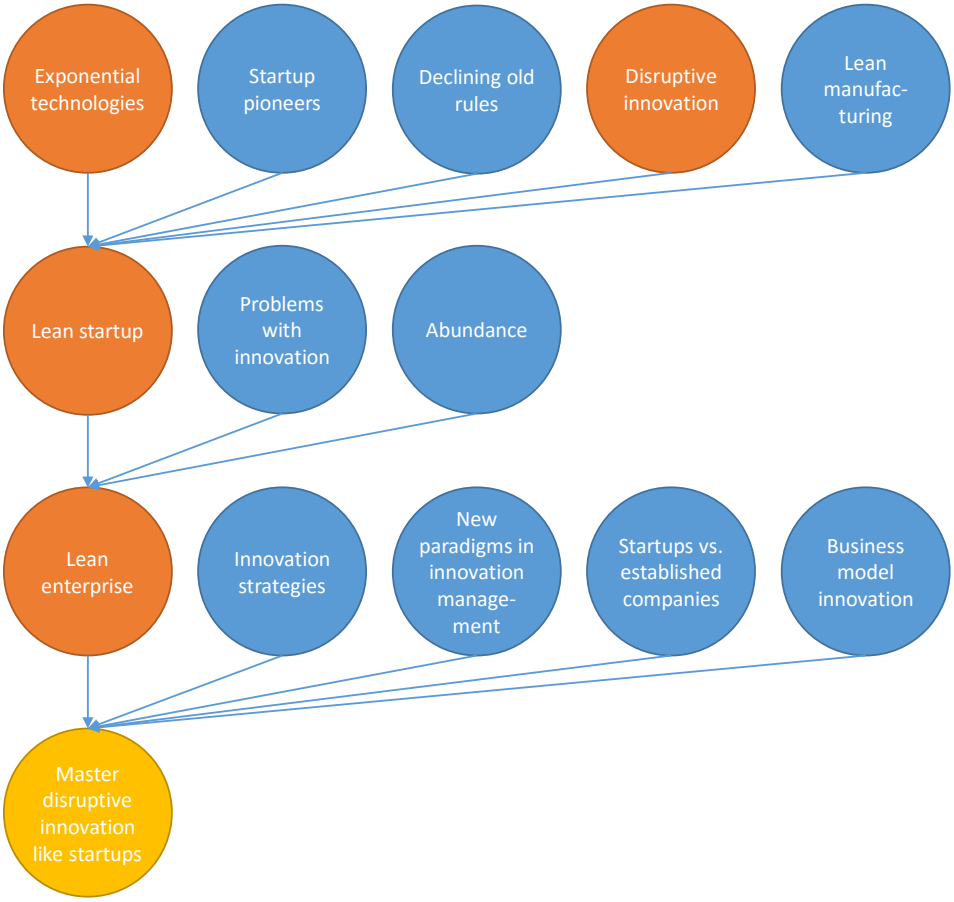
Search versus execution is what differentiates a new venture (a startup) from an existing business unit (a company). After a startup has found the scalable, repeatable and profitable business model, it moves into execution mode. At this point the business needs an operating plan, financial forecasts and other well-understood management tools and even a professional and senior management [Mintzberg et al., 2005]. Execution is the job of the product management and engineering units. Usually it results in linear processes, run according business plans. The more granular these plans are, the better people can execute it. The aim is efficient operation and delivery, and this attitude sneaks into the corporate culture, ensuring that executives can deliver meaningful earnings. While placating shareholders, they do not recognize that the types and scale of innovation that can be pursued successfully within their organizations, gets minimized. Disruptive innovation is not about doing things a tiny bit better and a tiny bit cheaper. [Wessel, 2012]

My dissertation, analysing the causes of this phenomenon, gives some appropriate answers about how established companies can master disruptive innovation like startups. The answer lies in **recognizing the limits** of the organization and empowering groups to function with very different goals and operational metrics.

1.5 Building blocks and structure

The following figure gives a quick overview of the **primary building blocks** of the research – the main fields to be covered. Blue refers to general, orange to distinguished and yellow to the final topic of the dissertation.

Figure 7: Building blocks of the research



Source: own design

The introduction part gave an insight into the topic and my approach, with answering the three most important and **basic questions** of any research:

- Why I was doing the research?
- How I was elaborating the details?
- What I was planning to reach?

The upcoming chapters will provide a more **detailed look** into

- the theoretical and methodological foundations: how I was implementing the research;
- the literature: how I was approaching and handling the so-called singularity;
- the startup lessons in innovation management for established companies: how the analysed lean startup tools, methods and techniques are and could be applied within established companies;

- the characteristics of innovation excellence and the disruptive ability – and the possibilities of achieving them.

1.6 Acknowledgements

First of all, I owe my thanks to my dissertation supervisor, **Dr Péter Fehér** (associate professor, associate dean, director and chair at CUB)[4], who encouraged me to dive into the deep of unknown waters and build a theoretical and scientific basis for such a topic which is mainly rooted in the practice. His advice and support made a significant impact on the final version of this dissertation.

Many more people have contributed to this work. In particular, I am grateful to them: **Csaba Szabó** (Singularity University & Stanford University graduate), **Francisco Palao Reinés** (PhD, CEO & co-founder, IActive), **Jesús Candon** (CEO & co-founder, LeanMonitor), **János Vecsenyi** (professor emeritus, CUB), **Anton Kovach** (CEO & founder, ShiwaForce), **András Vicsek** (CEO & co-founder, Maven7), **Márta Aranyossy** (assistant professor, CUB), **Attila Cosovan** (associate professor, CUB), **Norbert Sipos** (PhD candidate, University of Pécs).

Furthermore, the Hungarian Association for Innovation (MISZ), the Hungarian Association of IT Companies (IVSZ) and the Albert Szent-Györgyi Society helped me in having my questionnaire presented in the right way to the right companies. The list of **strategic partner companies** can be found in the appendix, chapter 8.3 – they were the companies, which filled out my questionnaire also giving their names and contact data.

Finally, I express my gratitude to my wife, **Rita**, who supported me every time – not only by accepting my absence when I was working on my dissertation, but also with many useful advise; towards my daughter, **Jázmin**, who just loves; and towards my **Parents and Grandparents**, who always encouraged me achieving my goals.

[4] CUB: Corvinus University of Budapest.

2 Research methodology

"In the fields of observation chance favours only the prepared mind"

Louis Pasteur, 1854

Posing problems correctly is often more **difficult** than answering them. Indeed, a properly phrased question often seems to answer itself. One might have discovered the answer to a question just in the process of making the question clear to someone else. [Babbie, 2010]

This chapter is about **operationalizing**[5] the problem conceptualized in chapter 1.1 (Why this topic?): a problem in the fields of innovation management intersecting with the exponential technologies, the startup movement and the disruption caused by them. After having formulated the research question with the sub-questions, and framing them with the most important terms and definitions, the introduction of the research design will follow. I will introduce the research methods and the research activities after having shown the metamorphosis of innovation management in the last century.

2.1 The metamorphosis of innovation management

In 1911 Frederick Winslow **Taylor**, with his noticeable book, The Principles of Scientific Management, started a movement which changed the course of the twentieth century by making possible the prosperity of the 20th century, by inventing modern white-collar work that sees companies as systems that must be managed at more than the level of the individual. He wrote that *"In the past, the man has been first; in the future, the system must be first."* [Taylor, 1911, w/p]

Several decades later, **lean manufacturing** rediscovered the wisdom and initiative hidden in every factory worker and redirected Taylor's concept of efficiency toward the enterprise as a whole. But it has similarly embraced Taylor's core idea that work can be studied scientifically and can be improved through a rigorous experimental approach.

In the twenty-first century, production and modern management face a new set of problems. The tremendous amount of invention and innovation of the previous century were mostly devoted to increase the productivity of men and machine in order to feed, clothe and house the exponentially increasing population. Today, this culminated into a situation where the productive capacity greatly exceeds the ability to know what to build. The big question of our time is not "Can it be built?" but "**Should it be built?**". Despite reaching supreme efficiency,

[5] The process of devising steps or operations for measuring what we want to study. [Babbie, 2010]

we experience the economy incredibly wasteful because of **building products nobody wants** and so **wasting human creativity and potential**. [Ries, 2011]

Since the field of innovation management is also affected, in the last three decades, researching and practicing innovation management showed an ever-increasing interest [Kumar – Kim, 2012; Gatignon et al., 2002; Damanpour, 1987]. To cope with exponential technologies, disruptive innovation and global competition, today businesses need to quickly learn the new rules, understand the new paradigm and apply new management tools and techniques.

As innovation management continuously needs to give answers for previously unknown questions, the lean philosophy has gained significant attention. In spite of these facts, lean management and innovation are such fields, which were rarely discussed together until the beginning of the 2010's [Srinivasan, 2010].

As innovation plays a significant role in providing breakthrough products and services for customers by creating much greater value than was previously recognized [Lloréns et al., 2005], top managers of established companies make major operational changes, and even redesign their business models [Byrne et al., 2007]. Parallel, every entrepreneur is certain of his or her journey is unique. Each travels down the path without a roadmap and believes that no model or template could possibly help them. However, as Joseph Campbell described [Campbell, 1949], the path to entrepreneurial success is well-travelled and well-understood, and therefore, repeatable.

Furthermore, lean management aims at preventing waste by understanding its causes: **by focusing on efficiency, sight of the real goal of innovation gets lost** – to gain insight into unknowns. As an innovation management tool, lean startup stands for the principle that the scientific method can be brought to bear to answer the most pressing innovation management question: *"How can we build a sustainable organization around a new set of products or services?"* [Ries, 2011, p. 265.]

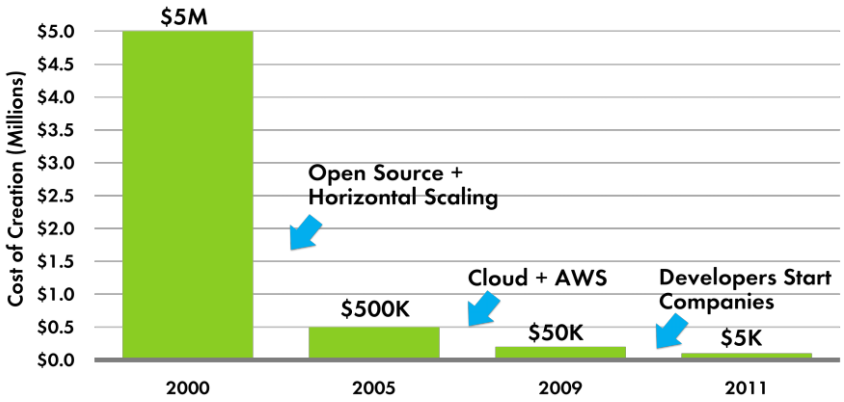
In my thesis this question is translated into the supposition that introducing lean startup methods at established companies significantly increases innovation performance and supports coming up with disruptive innovations.

2.2 Research methods

The innovation management and entrepreneurship-focused research about how newly started and fast growing companies are managing their innovation-related activities goes back only several years. The first methods which documented and provided a structured view about the way startups are creating innovations, showed up in the last decade. [Ries, 2011; Blank, 2007, 2012, 2013]

There seems to be a **common understanding** between professionals, practitioners and academics that the dramatic change in the field of innovation management is spurred by the **exponential advancement of technology** which also resulted in plummeting costs of starting a new business, where cloud computing and the open source movements have brought down the required expenditures by more than 90%. [Suster, 2012]

Figure 8: Cost to launch an internet startup



Source: Suster, 2012

Today, an **emerging topic** within innovation management is **how companies can deal with the exponential advancement of technology and the disruption** caused by them. Scholars and researchers found that managers who help their firms create and maintain an innovation advantage use different tools than their more traditional counterparts – tools honed in startups and specifically designed to manage uncertainty [Furr – Dyer, 2014b].

Although these tools come by many different names (e.g. lean startup, design thinking, discovery-driven planning, customer development, agile management) they actually have a remarkable commonality. They all neglect a linear approach and support a more **holistic view** mixed with incremental, iterative and repeating activities, centring customer needs. For example, **design thinking** emphasizes understanding customer problems, whereas **lean** emphasizes solution experiments, and **customer development** accentuates learning and discovery before execution. Another important difference: they tend to be tools that startups easily adopt, but that managers wrestling with day-to-day execution struggle to incorporate. [Furr – Dyer, 2014b]

Forasmuch as startups are very good and successful in creating disruptive innovations by interiorizing and applying exponential mindset, the attention of established companies turned towards them. As a consequence, in the last years the number of related researches, papers and conferences show a sharp increase.

2.2.1 Research character

Since my research is conducted and carried out in a field which existed only in its embryonal form a decade ago, the required knowledge, experience and literature for setting **hypotheses are absent**. Therefore, this research has an **exploratory and qualitative character**, where the **aim** is to **deepen and widen the general understanding** by uncovering previously unknown fields and nexuses, and answering the research question: **How established companies can master disruptive innovation like startups?**

The exploratory and qualitative nature of the research also means that **there are no hypotheses set**, and rather more research sub-questions are stated which give a clear orientation. Furthermore, the formalization of the research objective and the underlying sub-objectives also helped to hold the **focus** on the results concluded from the available resources. What really matters is the **new knowledge** gained during the research.

This part describes the methods undertaken in relation to justification of the research paradigm, research design, questionnaire workout, sampling process and data collection and administration.

2.2.2 Research techniques

The research is **about** giving new **insights** into and providing new **approaches** for established companies to deal with innovations in general and disruptive innovations in particular. The applied research techniques **aim** at providing an overview of this field, summing up available experience and best practices to support organizations understand exponential technologies and harnessing the entailing opportunities. An important and practical **outcome** is the answer to the question whether (it is possible than) it is rewarding to apply startup techniques inside established companies to excel innovation and create disruptive novelties.

Researching such a phenomenon can be conducted following various **techniques** and using different **tools**. The qualitative and quantitative modes of observation can be [Babbie, 2010]:

- **Survey research:** this type of research involves collecting data by asking people questions – either in self-administered questionnaires or through interviews, which, in turn, can be conducted face-to-face, over telephone, or using online surveys.
- **Experiment:** usually thought of in connection with the physical sciences. This is the most rigorously controllable of the techniques. Understanding experiments is also a useful way to enhance understanding of the general logic of the research topic and the phenomenon in behind.
- **Unobtrusive inspection:** there are three forms of data collection that take advantage of some of the data available around us. Content analysis is a technique of collecting social data through carefully specifying and counting social artefacts without making any

personal contact with people. The analysis of existing statistics offers another way of studying people without having to talk to them. Historical documents are a valuable resource for social science analysis.

- **Qualitative field research:** examines perhaps the most natural form of data collection used by social scientists – the direct observation of social phenomena in natural settings. Some researchers go beyond mere observation to participate in what they are studying, because they want a more intimate view and a full understanding of it.
- **Evaluation research:** looks at a rapidly growing subfield in social science involving the application of experimental and quasi-experimental models to the testing of social interventions in real life. Using evaluation research it is possible to judge whether social programs have succeeded or failed.
- **Case study:** a research technique *"that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident"*. [Yin, 2014, p. 18.]

While consciously using these techniques help in avoiding **pitfalls**, tailoring them to the specific needs of this particular research assist finding the **optimum** between the resources needed and the yield achieved.

Research conducted in the field of innovation management and lean startup is typically based on surveys, experiments and qualitative field research. These techniques mean the **most appropriate tools** for exploring a new ground, uncovering previously unknown correlations, clarifying causes and effects and giving novel insight into the consequences of exponential changes caused by the rapid development of technology.

My research in the background of this dissertation was mainly based on **surveys**: personal interviews and online questionnaires. As a practice-oriented researcher I had the opportunity to see different companies and carry out **qualitative field research** by observing their day-to-day innovation management activities. After gaining a deep understanding of their mission, vision, strategy, operation, culture and the applied innovation management tools and techniques, their industry and the results achieved, I also could carry out some experiments by suggesting them to introduce some of the methods proposed by the lean startup movement.

Furthermore, this research has an **explorative character**. Explorative studies are essential whenever a researcher is breaking new ground, and they almost always yield new insights into the topic of the research. But on the other side, such type of studies seldom provide satisfactory answers on research questions (because they lack representativeness), though they can hint at the answers and can suggest which research methods could provide definitive ones [Babbie, 2010].

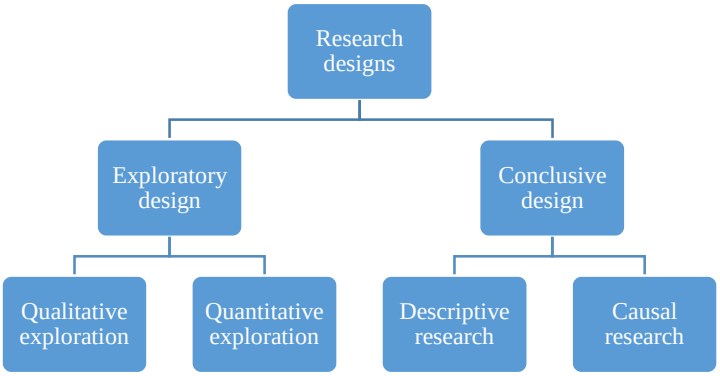
Descriptive studies answer questions of what, where, when, and how; explanatory questions, of **why**. Research techniques help in moving from a general idea about what to study to effective and well-defined measures in the reality. **This dissertation describes a new phenomenon arose only in the last decade. By understanding the roots, gives an explanation about the details and tries to forecast some future trends.**

2.2.2.1 Research design

A research design, which is a **function** of the research objectives, is defined as *"… a set of advance decisions that makes up the master plan specifying the methods and procedures for collecting and analysing the needed information"* [Burns – Bush 2002, p. 120.]. An appropriate research design is essential as it determines the type of data, data collection technique, the sampling methodology and the schedule [Hair et al., 2003].

There are many pre-defined research design frameworks and they can be **classified** into two traditional categories: exploratory and conclusive.

Figure 9: Classification of research designs



Source: Malhotra, 2007

While the primary **objective of the exploratory research is to provide insights into and comprehension of the problem situation confronting the researcher**, the goal of a conclusive research is to verify already existing insights. The table below summarizes and compares the two approaches.

Table 4: Differences between exploratory and conclusive research

	Exploratory	Conclusive
Objective	To provide insights and understanding of the nature of the researched phenomena. To understand.	To test specific hypotheses and examine relationships. To measure.
Characteristics	Information needed is loosely defined. Research process is flexible and unstructured. Sample is small and non-representative. Analysis of primary data is qualitative.	Information needed is clearly defined. Research process is formal and structured. Sample is large and representative. Data analysis is quantitative.

	Exploratory	Conclusive
Findings/Results	Can be used in their own right. May feed into conclusive research. May illuminate specific conclusive findings.	Can be used in their own right. May feed into exploratory research. May set a context to exploratory finding.
Methods	Expert surveys, pilot surveys, secondary data, qualitative interview, unstructured observations, quantitative exploratory multivariate methods.	Surveys, secondary data, databases, panels, structured observations, experiments.

Source: Malhotra, 2007

Exploratory research is used in instances where the subject of the study cannot be measured in a quantitative manner or where the process of measurement cannot realistically represent particular qualities [Malhotra, 2007]. In its nature, exploratory research is the foundation of a good study [Churchill – Iacobuci, 2004] and it is normally flexible, unstructured and qualitative [Aaker et al., 2000; Burns – Bush, 2002]. Furthermore, Stebbins [2001] states that exploratory research can lead to the discovery of generalizations and the understanding of the researched phenomena which have received little (or no) scientific attention so far.

As my **research question** is **barely researched** and **lacks empirical evidence**, **an exploratory research had to be conducted** in order to gain novel insights and uncover previously unknown correlations. Furthermore, exploration was **inevitable**, since the required information was loosely defined, which resulted in an unstructured working format: identifying and specifying objectives, providing directions for future research and gaining necessary background information. Moreover, since this field lacks a strong theoretical foundation, operating with **research questions** proved to be the proper methodological approach, instead of formulating hypotheses.

The explorative character meant that the **goal of the literature analysis** was **to build solid theoretical foundation and practical establishment** for exploring unknown fields about and providing new insights into the topic, and thereby contributing to theory and practice.

2.2.2.2 Quantitative and qualitative approach

Data collection techniques can be classified into quantitative and qualitative techniques. A useful way to distinguish between the two is to think of qualitative techniques as providing data in the form of **words** or observations (of course which can be quantified), and quantitative techniques as generating **numerical** data.

So, the starting point for quantitative research is a bunch of data. But when exploring the field of innovation management, it is very difficult to extract any numerical data from innovation management activities (not from the result, but from the activity itself) [Punch, 1998]. The basis for such qualitative research are data gained by **surveys**, which help to count occurrences (e.g.

having an innovation strategy, using methods pioneered by startups etc.), or grab the general opinion about a specific topic or question – usually on a scale of 1-5.

Quantitative research is focusing on processing large datasets and analysing those using multivariate statistics [Füstös, 1986]. This approach enables testing research hypotheses on a representative basis. Furthermore, conducting quantitative research on previously uncovered fields can result in plenty of new information, which can be used for elaborating **novel theories** [Fehér, 2004].

In his book, Social research methods gives Neuman [Neuman, 1994] a clear summary about the **two general types of research**.

Table 5: Summary of quantitative and qualitative research

	Quantitative research	Qualitative research
Objective	Objective is to test hypotheses that the researcher generates.	Objective is to discover and encapsulate meanings once the researcher becomes immersed in the data.
Concepts	Concepts are in the form of distinct variables.	Concepts tend to be in the form of themes, motifs, generalizations and taxonomies. However, the objective is still to generate concepts.
Measures	Measures are systematically created before data collection and are standardized as far as possible; e.g. measures of job satisfaction. We know what and how to measure.	Measures are more specific and may be specific to the individual setting or researcher; e.g. a specific scheme of values. We do not know what and how to measure.
Data	Data are in the form of numbers from precise measurement.	Data are in the form of words from documents, observations and transcripts. However, quantification is still used in qualitative research.
Theory	Theory is largely causal and is deductive.	Theory can be causal or non-causal and is often inductive.
Procedures	Procedures are standard and replication is assumed.	Research procedures are particular and replication is difficult.
Meanings	Oppose and collide meanings drawn by known theories.	Conceptualize and interpret new meanings.
Analysis	Analysis proceeds by using statistics, tables or charts and discussing how they relate to **hypotheses**.	Analysis proceeds by extracting themes or generalisations from evidence and organizing data to present a coherent, consistent picture. These generalisations can then be used to ask **questions**.

Source: own design, based on Neuman, 1994

The **distinction** between qualitative and quantitative research can be in the context of research designs as discussed in chapter 2.2.2.1. There is a close parallel in the distinctions between exploratory and conclusive research and qualitative and quantitative research. There is a parallel, but the terms are not identical. There are circumstances where qualitative research can

be used to present detailed descriptions that cannot be measured in a quantifiable manner. Therefore, **the questionnaire-driven (quantitative) technique should be combined with a qualitative research approach when the goal is to gain understanding of the research problem setting**. [Malhotra, 2007] **This approach was used in this dissertation.**

2.2.2.3 Sample selection, data collection and measurement

Probability sampling is the primary technique of selecting large and representative samples for research. At the same time, probability sampling can be impossible or inappropriate in many research situations, especially when no list exists of the statistical population. Since no such list exist about all the innovative companies in Hungary, in this research **purposive (judgmental) sampling** was used. This is a type of nonprobability sampling in which the units to be observed are selected on the basis of the **researcher's judgment** about which ones will be the most useful or representative. [Babbie, 2010] So, the list of the surveyed companies was put together by me, based on **multiple sources**: my experience gained on this field; the members of two professional associations: the Hungarian Association for Innovation and the Hungarian Association of IT Companies. The two organizations represent such companies which can be labelled as innovative. They provided the public list of their members. Furthermore, the National Research, Development and Innovation Office (which is the governmental agency for RDI) and the Regional Innovation Agencies (there are seven spread throughout the country) were asked to forward the questionnaire to their clients.

When field research involves the researcher's attempt to understand some typical setting much of that understanding will come from a **collaboration** with some members of the group being studied. Talking to **informants**[6] makes it possible to construct a **composite picture** of the group those respondents represent. *"The interrelated steps of conceptualization*[7]*, operationalization, and measurement allow researchers to turn a general idea for a research topic into useful and valid measurements in the real world."* [Babbie, 2010, p. 163., p. 166.] A similar approach was used during my examinations.

When measuring different variables or phenomena, **different measures** can be exerted [Babbie, 2010]:

- **Nominal measures:** variables whose attributes are simply different from one another. E.g. place of operation, industry.
- **Ordinal measures:** variables with attributes which can be logically rank-ordered. E.g. number of employees, revenue.

[6] Informant: a member of the group who can talk directly about the group per se.

[7] The mental process whereby fuzzy and imprecise notions (concepts) are made more specific and precise.

- **Interval measures:** a level of measurement describing a variable whose attributes are rank-ordered and have equal distances between adjacent attributes. E.g. temperature, level of maturity.
- **Ratio measures:** a level of measurement describing a variable with attributes that have all the qualities of nominal, ordinal and interval measures and in addition are based on a "true zero" point. E.g. age.

This research was **mainly** based on **ordinal measures and ratio measures** when categorizing the different companies being observed. Their innovation management activities in various dimensions were put on a **Likert-scale**, where responses were scored along a range of (usually) 1-5.

2.2.2.4 Data analysis

The most important characteristics of qualitative analysis that it transforms data into **findings** – but for this transformation no formula exists. Qualitative data analysis is about focusing on **text** rather than on numbers. That text can be transcripts and abstracts of interviews, expert surveys or notes from different observations or personal experience. The goal of such analysis is to gain new insight leading to **new understanding** – even for the researcher or for a larger scale, e.g. the scientific and practitioner community. From this point of view, the **background of the researcher** plays a significant role. Other researchers with different background could come to markedly different conclusions. Since **qualitative data analysis** depends more on the individual insights of the researcher than on the tools available to support the analysis, it **remains as much an art as a science** [Babbie, 2010].

Qualitative data analysis seeks to describe data in ways that capture the setting or people who produced the data on their **own terms** rather than in terms of predefined measures or hypotheses. Thus, qualitative data analysis follows an **inductive** approach: relationships and patterns are identified through a process of discovery, usually without any predefined measures or hypotheses. Furthermore, the **big picture** is always more important than the details – or with other words the whole is always understood to be greater than the sum of its parts, and so the **context** of the observed phenomenon becomes essential for interpretation. [Schutt, 2012]

Consequently, a research questions-based, explorative approach was applied, with the aim of finding **significant correlations** between being a successful innovator and using lean startup methods.

2.2.2.5 Scientific foundations, practical implications

This dissertation was built on **solid scientific foundation** with the aim of providing useful implications for **practitioners**. Therefore, it contains not only the **theoretical background** of

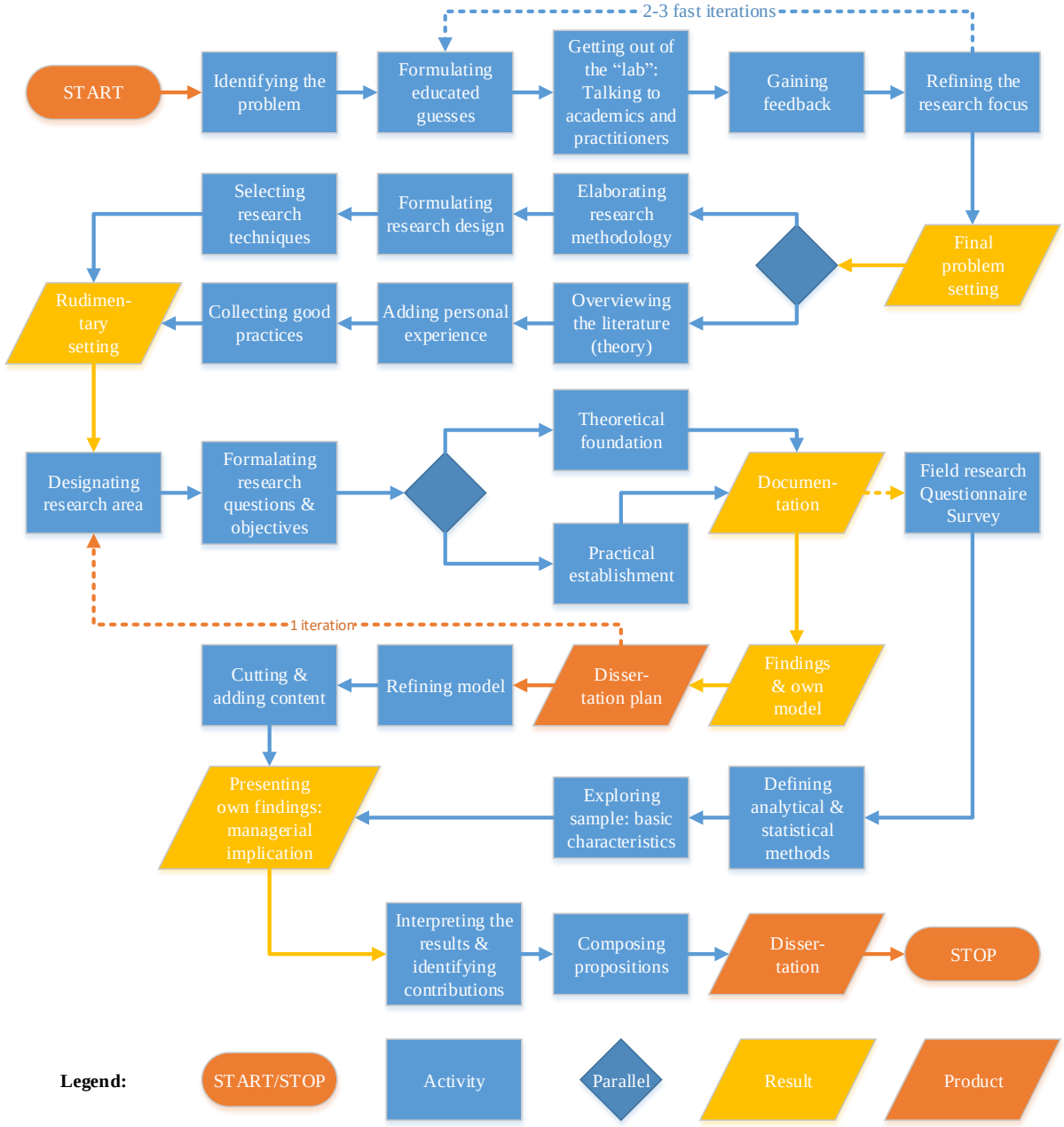
the topic, but introduces **many examples** how the findings can be applied in **real-life situations**.

Furthermore I believe that using lean methods across a **portfolio** of startups and innovative companies will result in **fewer failures** than using traditional management methods. A lower failure rate could have profound **economic consequences**. In the age of disruption established industries are shedding jobs, and **employment growth** will come from **new ventures**. Fostering an environment and elaborating novel management tools and techniques is a **common interest**. **The creation of an economy driven by the rapid expansion of innovative companies mastering disruption like startups has never been more imperative** [Blank, 2013].

2.3 Research activities

The following flowchart summarizes the performed research activities, while putting them into a comprehensive, holistic and systemic framework. Furthermore, it shows how the various activities succeeded each other and lead to the research products. The process is detailed by showing the feedbacks, iterations, and parallels.

Figure 10: Research activities



Source: own design

The applied research approach and methodology basically specify the set of results might be achieved and the objectives might be attained. This chapter clearly defined the path followed and the methods used – which fitted best to the needs of answering the research question.

3 Understanding singularity

"The ever accelerating progress of technology (…) gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue."

John von Neumann, 1950s

In his prominent book The Innovator's Dilemma, Clayton Christensen [Christensen, 1997] indicates that **disruptive innovation rarely arrives from the status quo**. Practically it means that established and incumbent industry players are seldom prepared and structured to counter disruption when it suddenly shows up, without any signs. The rule about the insiders' economic advantage also changes and outsiders will gain all the advantages: enjoying low overhead and easily taking benefit of the democratization of technology and information, newcomers can move quickly with minimum expenses. They dispone over the necessary resources and tools to attack almost any market, using exponential technologies enhanced with radically improved business models. The best approach for established companies is to assume that someone will disrupt them. As Steve Forbes suggests: *"You have to disrupt yourself or others will do it for you"*. This applies to every market and every industry. [Ismail, 2014, p. 103., citing Steve Forbes]

As startups are transiting to established companies, they tend to **lose their edge** for breakthrough and especially disruptive innovation. The more mature they get the more they will rely on processes that are designed to optimize current business activities rather than exploring disruptive offerings. However, to stay ahead of competitors and satisfy shareholders' and customers' expectations, large companies need to innovate on a radical level [Christensen, 2003]. Indeed, investors discount into the present value of a company's stock price the rate of growth they foresee the company is achieving. Therefore, even if an enterprise's core business is growing, the only way its managers can deliver a risk-adjusted rate of return above the market average is through **growing faster** than the market expectations. But what growth can a company achieve in the future? In case of established companies this is mainly judged based on their historical ability to come up with radical innovations. Even though such companies usually possess more capacities and resources (research, financial, HR) than startups, they are often not as well positioned to innovate. Hence, managers and executives are constantly looking for new ways to make their company better at innovation. [Ismail, 2014]

This chapter provides an overview of the reasons and solutions about the **set of steps** around disruptive innovation by revising the fundamental and most recent literature:

- Domain (or technology) becomes information-enabled[8].
- Costs drop exponentially and access is democratized.
- Hobbyists come together to form an open source community.
- New combinations of technologies and convergences are introduced.
- New products and services appear that are orders of magnitude better and cheaper.
- The status quo is disrupted (and the domain gets information-enabled).

In the 1950s, John Von Neumann was quoted as saying that *"the ever accelerating progress of technology (…) gives the appearance of approaching some essential singularity in the history of the race beyond which human affairs, as we know them, could not continue."* [Ulam, 1958, w/p] In the age of disruption we get closer and closer to this singularity.

My opinion – based on personal experience and the relevant literature – **is that decision makers should not rely on old rules but rather on models incorporating lean, agile and exponential approaches** (which are also rooted in old rules). **I think that for every today company exploring and understanding singularity is a must.** By overviewing the relevant literature, the upcoming subchapters provide the necessary theoretical foundations. The aim is to gain the required recognition of the topic, to introduce the available methods and to collect enough knowledge for making an **own contribution** to the scientific and managerial dialogue.

The questions and objectives related to Theoretical foundation is shown in Table 6.

Table 6: Sub-questions and sub-objectives related to Theoretical foundation

Sub-question	Sub-objective
A) Theoretical foundation	**To build a deep and wide foundation from already researched, documented and validated sources which serve as pillars of new findings and insights.**
A1) Why is it important (for an established company) to be innovative?	To have an overview about the development of exponential technologies and disruptive innovations, their effects on the global economy and the nature of innovation management.
A2) How established companies are trying to be innovative?	To explore the innovation conundrums of established companies in order to identify focus areas of management cognition and action to which the delivery of top or potentially disruptive innovations are highly dependent.
A3) How startups are making innovation happen intentionally and not exceptionally?	To show the main characteristics of startups and to bring a preliminary insight into the lean startup method used by them.

Source: own design

The first sub-chapter gives an overview about the advancement of technology and its consequences on our everyday lives and the management practice. The upcoming parts will

[8] Enhancing a product or service with connectivity and shared information

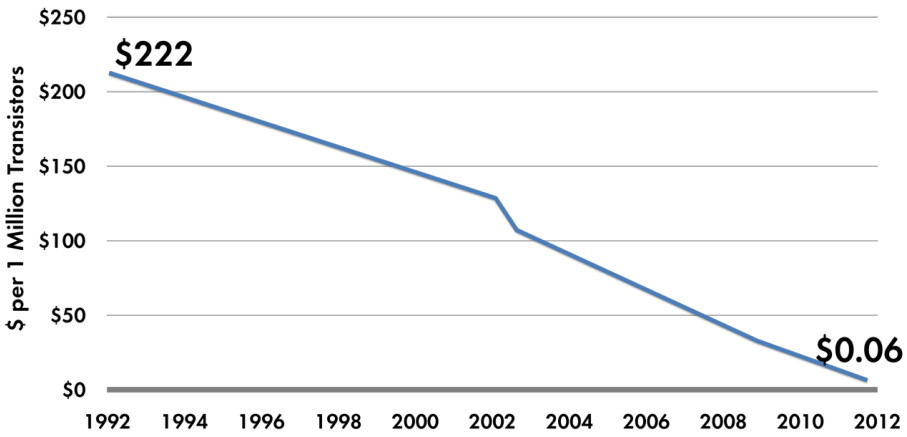
provide answers on the research sub-questions respectively, while a summary of the findings and the evaluation of the objectives will follow in the last section.

3.1 The age of disruption

In 1965, Intel cofounder Gordon Moore observed that, over the history of computing hardware, the number of transistors in a dense integrated circuit has doubled approximately every two years [Moore, 1965]. This observation was named **Moore's Law**, and it predicts that the processing power of the semiconductor will continue to get twice as fast every 12-24 months, even as price held constant. The **exponential evolution** of the ICT industry has led to a **new economic era** in which innovation can be developed and launched quickly and cheaply. In the age of disruption these rules are also valid in industries far from the world of computing [Downes – Nunes, 2014].

Moore's Law refers to the number of transistors on an integrated circuit of fixed size, and sometimes has been expressed even more narrowly in terms of transistor feature size. But rather than feature size (which is only one contributing factor), or even number of transistors, the most appropriate measure to track is computational speed per unit cost. This takes into account many levels of "cleverness" (i.e. innovation, which is to say, technological evolution). In addition to all of the innovation in integrated circuits, there are multiple layers of innovation in computer design, e.g. pipelining, parallel processing, instruction look-ahead, memory caching, and many others. [Kurzweil, 2001] The result is **radically dropping cost** of computing performance (shown on Figure 11).

Figure 11: Computing cost performance (1992-2012)



Source: Hagel et al., 2013

The counterintuitive behaviour of innovation (and the innovators who create them) has redefined the rules and the inventions of the past sixty years transformed industries through software which can be widely delivered at global scale. As **software is eating the world** [Andreessen, 2011], the line between technology companies and traditional-products companies is blurring to the point of making the distinction irrelevant. Innovative software

coupled with new electronics results in new ways for computers and humans to interact. This is how approaching singularity happens by using exponential technologies.

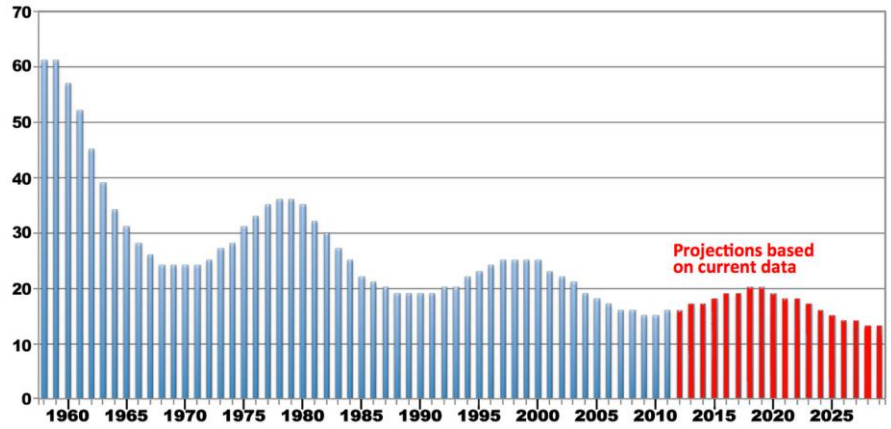
In this aspect, exponential technology refers to any technology accelerating on an exponential growth curve – that is, doubling in power on a regular basis (semi-annually, annually, etc.) – with computing being the most familiar example. When we are holding a smartphone in our hands, we are using a device a million times cheaper and a thousand times more powerful than a supercomputer from the 1970s. That is what exponential change means in the real world, and today, this kind of **change is everywhere** we look: information technology, networks, sensors, robotics, artificial intelligence, synthetic biology, genomics, medicine, and nanotechnology – just to mention a few [Diamandis – Kotler, 2015]. The development affects large and established companies, facing a rapidly changing environment where entrepreneurs are using radically accelerating technology to wholly transform products, services, and industries on a global scale.

Making business in industries highly affected by exponential technologies also means that there is a **greater chance for inflection[9] and disruption** on a new or previously unknown field. If a company misses an inflection or disruption or a competitor manages the transition better, failure is more likely, regardless the size and age of the company.

Since the advancement of technology – according to Moore's law – follows an exponential curve, gets faster by time, inflames competition. This affects well-established companies which experience their market penetration to shrink quickly. This trend was also confirmed in a recent study by Deloitte: 50 years ago the expected lifespan of a Fortune 500 company was 75 years, by today it has decreased to 15 years [Humble et al., 2015]. It also means that by 2020 the S&P 500 index will contain several such companies which did not exist in 2012 which means a real threat for the today's incumbents. [Gittleson, 2012]. This is also shown on Figure 12.

[9] The time of transition of a company's competitive position that requires the company change the current path and adapt to the new situation or risk declining profits. [dictionary.com] *"An event that changes the way we think and act."* [Grove, 1999, w/p]

Figure 12: Average company lifespan on S&P 500 Index (each data represents a rolling 7-year average of average lifespan)



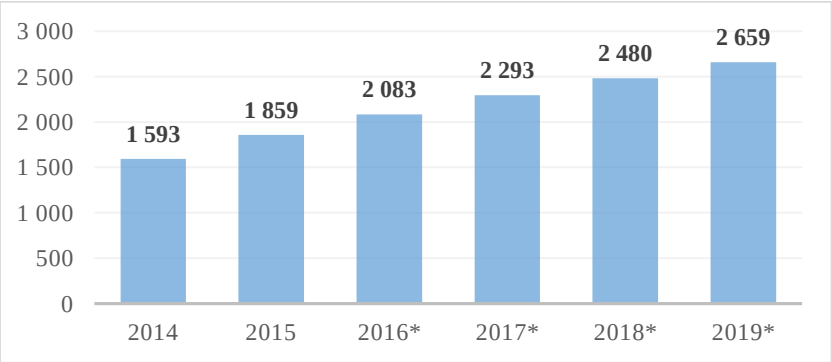
Source: Innosight, Richard N. Foster, S&P, 2011

To put the concept of singularity into perspective, let us explore the history of the word itself. **Singularity** is meaning a unique event with profound implications. **In mathematics**, the term implies infinity, the explosion of value that occurs when dividing a constant by a number that gets closer and closer to zero. **In physics**, (gravitational) singularity is a location where the quantities that are used to measure the gravitational field become infinite in a way that does not depend on the coordinate system. [Wikipedia: Gravitational singularity]

In economics and innovation theory it refers to the condition of mature industries, where **established entities** (organizations, enterprises, supply chains) **become gradually threatened** by increasing pressure of new entrants mastering disruptive technologies. The disruptors (often originating from outside the industry) appear first as random and failed experiments, but they forecast the change that is about to arrive. [Downes – Nunes, 2014]

In the late 1990s, when the first smartphones were introduced, there was only a little reason to imagine that they represented the first signs of a new singularity. But the launch of Apple's iPhone in 2007 and the Android operation system in 2008 transformed smartphones into full-fledged mobile computers. The devices turned to be engines for the expedited creation and delivery of numerous disruptive innovations. Today, there are more than 2 billion such devices in use – and the number is growing rapidly.

Figure 13: Number of smartphone users worldwide from 2014 to 2019 (in millions)



Source: Statista, 2016 **: forecast*

Such trends make whole sectors and industries (e.g. stem cell research, renewable energy, genomics, robotics, materials science etc.) move, change and adopt. The architecture in behind **dramatically accelerates** the speed of product development even as it reduces risk by eliminating market entry barriers and opening **almost-free** distribution channels. This effect spills over to all fields of the economy, blossoming a new era of enterprises and entrepreneurship, and the **advantage of large enterprises over small businesses is turning to history**.

Singularity has many faces. It represents the nearly vertical phase of exponential growth, where the advancement of technology appears to be infinite. Singularities often mean the cradle of disruption. [Kurzweil, 2001] Using **new technologies** (such as internet, cloud computing, mobile technology) **can destabilize mature industries** quickly, leaving incumbents (together with their supply-chain partners) astonished, and soon after shattered.

In the age of disruption, exponential technology and digital economy, nearly everything we knew about strategy, management and innovation has suddenly become wrong. The traditional rules of competition became obsolete, as disruption arrives faster, dispatching incumbents more quickly than ever. Once they hit the market, there is no chance for strategic response [Downes – Nunes, 2014]. **My viewpoint is**, that the more disruptive a new idea or change, the more **traditional management methods can fail**, and the more useful are the methods pioneered and applied by startups. Therefore, established companies need to have operations and vision, which makes them able to successfully come up with disruptive innovations – otherwise they will be the one being disrupted.

In the last 100 years we learned how to **scale technology**. Now it is time to learn how to **scale organizations** and manage established enterprises facing the digital transformation. This calls for a different solution for building new businesses, improving rates of success, solving the challenges that lie ahead [Ismail, 2014], growing further on and ultimately, staying profitable.

This was also confirmed by various estimations, which suggest that the next generation of exponential technologies will generate trillions of dollars of new value in the coming decade, it is important to note that in the US 100% of new job creation has come via startups and entrepreneurs. [Manyika et al., 2013] So, startups are vital for job generation and economic growth, and they are becoming an increasingly important part of the economic system [Reynolds – White, 1997]. For example, Kane [2010] shows that in their first year startups add an average of 3 million jobs to the US economy. In fact, *"without start-ups there would be no net job growth in the US economy"* [Kane, 2010, p. 2.]. Moreover, a large number of individuals are involved in entrepreneurship at a given point in time: the Global Entrepreneurship Monitor found that, in the 34 countries surveyed, almost 9.3 % of the population either were nascent entrepreneurs or were involved in startups [Ács et al., 2004]. By 2020 the number is expected to increase by 500 million and reach 1 billion and 55 % will come from existing companies [Founders and Founders, 2013].

If established firms do not want to lose their people, they need to operate as startups – at least from innovation management point of view – and offer similar circumstances to new entrants. Furthermore, the greater frequency of disruption shortens business model lifecycles and progressively forces companies to find new ways to preserve their innovativeness [Ghoshal et al., 1999; Tidd – Bessant, 2009]. Although established organizations devote significant effort to innovate their products or processes, such alterations are often time-consuming and expensive, requiring considerable investments [Amit – Zott, 2010]. Given this, **business model innovation** constitutes an eminent means to fundamentally innovate organizations' existing markets and to break out of intense competition [Eppler et al., 2011; Markides, 1997; Hamel, 1998].

Nevertheless, **established companies face difficulties in eliciting breakthrough innovation**. Although they possess of adequate resources and in-depth market understanding [Koen et al., 2011], venturing into new market spaces or giving appropriate answers to disruption is a real challenge. Their dominant logic translating into organizational inertia, inflexible as well as rigid business processes discourages incumbents to nurture entrepreneurial spirit within their organizations [Koen et al., 2010]. Given this and the fact that innovation has become a matter of survival within today's market environment, established firms increasingly demand for **outside-in innovation** through integrated networks and value chains [Becker – Gassmann, 2006].

In contrast, startups are considered as being at the other end of the continuum of innovation activity since they regularly introduce new products and services that disrupt the competitive positions of incumbent companies. Although evidence is far from comprehensive. It is assumed that **startups are more innovative than established firms** [Criscuolo et al., 2012]. However,

startups carry the burden of a deficient resource base which ultimately causes them to fail at higher rates than do incumbents [Freeman – Engel, 2007]. Thus, **developing synergies** with incumbents and transferring resources is a key success factor for startups to prosper.

Combining the falling costs of launching an internet startup with the steeply increasing number of entrepreneurs means that the disruptive transformation will be pioneered by startups, and therefore, incumbent companies should be open to cooperate with and be able to learn from them. According to **my observation** this is not just possible but with the penetration of new rules, a **roadmap** can be designed to make this learning and adoption process transparent and repeatable.

3.2 Declining old rules, penetration of new ones

Established companies as of today should not look for their most dangerous enemies among competitors breathing down their necks. Furthermore, it is even useless to look for them, because they usually do not exist, or they just started to climb the exponential growth curve and will disrupt old markets, create new ones just in some months and so, overwrite the status quo and the logic of business as usual. No company can get ready for such an occasion by believing in the **old rules**: the market which will overwrite the old one does not exist, the enabling technology is not available and no players and possible threats can be identified.

The book industry is a clear example: no more printing, no more driving, no more brick-and-mortar stores. Even the story of the Barnes&Noble e-book readers is over: bibliophiles are downloading books from Amazon and view them on they Kindles. Similar scenario is working out in the publishing industry, while WhatsApp or Viber are supplanting face-to-face social events. Coursera, Khan Academy and Udacity are replacing schools. Photography has become a digital pastime, and telephony has been encroached by Skype. The dawn of 3D printing, internet of everything, software defined anything and deep learning is just starting, and the ascendency of software delivered through increasingly ubiquitous mobile, cloud, and social networks fundamentally changes the landscape for entrepreneurs.

According to Owens and Fernandez [Owens – Fernandez, 2014], any corporate innovation strategy needs to take into account the following **principles** of this new environment:

1. Market movements are unpredictable.
2. Small teams can easily have global effects.
3. Winners take it all.
4. Speed becomes the number one competitive advantage.

I agree with their suggestions, but **my observations** resulted in three additional principles:

5. Transaction costs decline rapidly.

6. Marginal costs approach zero.
7. New methods emerge quickly.

The following subchapters will also provide the answers on research sub-question **A1) Why is it important (for an established company) to be innovative**.

3.2.1 Rapidly declining transaction costs

Nobel-laureate Ronald Coase was studying established companies how their activities and processes were managed on a large scale. Coase discovered that companies are getting bigger, because markets were too expensive for repeated and high-volume activities (like car manufacturing). Furthermore, the costs of finding each other for buyers and sellers were also significant. The price of doing a deal was called by Coase **transaction cost**. He also found that the existence of transaction costs made companies to internalize more and more activities – the firm was cheaper than the market. The theses related to transaction costs were summarized in his famous article, The Nature of the Firm [Coase, 1937].

Disruptive innovations in the field of information and communication technologies have dramatically lowered the costs of **information exchange** which also affected transaction costs – the costs of search for buyers and sellers, making it able to find the right goods at just the right time, place and price. With this change, consumers and not companies are the first to adopt new technologies, and embrace better and cheaper computing products and services.

Some economists see transaction costs in the market falling more rapidly than they are in large enterprises. So does **the advantage in transaction costs shift from companies' side toward the markets'**. This change in basic logic of supply and demand can be catastrophic for incumbents whose competitive advantage relies on incomplete information (or even misinformation). When search costs are high, some economically valuable exchanges simply do not happen. But when exponential technologies cause very high transaction costs to disappear, the number and type of market transactions will increase considerably. This opens the way before the **sharing or peer-to-peer economy**. Examples could be eBay, Amazon, Airbnb, crowdsourcing or car sharing. As a consequence, the increased availability of near-perfect market information is also redrawing the classic technology adoption bell-curve and makes growth unconstrained (see chapter 3.2.3). [Downes – Nunes, 2014]

3.2.2 Annulling marginal costs and the Law of accelerating returns

An analysis of the history of technology has shown that its change follows an **exponential function**. Famous futurist, Ray Kurzweil said that *"We won't experience 100 years of progress in the 21st century – it will be more like 20,000 years of progress (at today's rate). (…) There's even exponential growth in the rate of exponential growth. Within a few decades, machine intelligence will surpass human intelligence, leading to The Singularity – technological change*

so rapid and profound it represents a rupture in the fabric of human history." [Kurzweil, 2001, w/p]

Kurzweil took Moore's Law several steps further, noting that **every information-based paradigm operates in the same way** – something he called the **Law of accelerating returns**. There is a growing recognition that the pace of change formerly seen in computing is now mapping into other technologies with the same effect. For example, the first human genome was sequenced in 2000 at a cost of $2.7 billion. Because of the underlying accelerations in computing, sensors and new measurement techniques, the cost of DNA sequencing has been moving at five times the pace of Moore's Law: resulting to sequence a genome for a penny in 2020.

Something similar is happening today which was observed by the venerable twentieth-century economist, John Maynard Keynes. He wrote in one of his essays [Keynes, 1930] that new technologies were advancing productivity and reducing the cost of goods and services at an unprecedented rate. They were also dramatically reducing the amount of human labour needed to produce goods and services.

Jeremy Rifkin, an economic and social theorist believes that what we are seeing is a **new economic system** emerging for the first time since the rise of capitalism, a new world of very low or zero marginal costs, one that he refers to as the **Collaborative Commons**. [Rifkin, 2014] The key drivers for this dynamic are goods and services made **information-enabled** on a global scale by exponential technologies and disruptive innovations, pioneered by startups.

Such a paradigm-shift also means that upon **information-enabling different resources will result in marginal costs dropping to zero**. Adding a new user for Facebook is nearly zero, or reaching possible clients using the internet has a cost of nearly zero. The Law of accelerating returns leads to a **zero marginal cost economy** where technology enables abundance, and where access triumphs over ownership – as we will experience in chapter 4.2.2. [Diamandis – Kotler, 2014]

Fierce transition is difficult to predict and causes unexpected market movements or even emerging new markets. Established companies are advised to apply flexible business models to minimize the risk of being disrupted.

3.2.3 Unpredictable market movements

The marketable **use of disruptive innovations is unknowable** at the time they are discovered or invented [Christensen, 1997]. Today it is especially true for the so-called **platforms** which are linking the different groups of different markets, and creating a powerful network of them. Examples could be Apple iTunes or Google Play. Being disruptive innovations, their appearance can cause powerful market movements and change the roles of business.

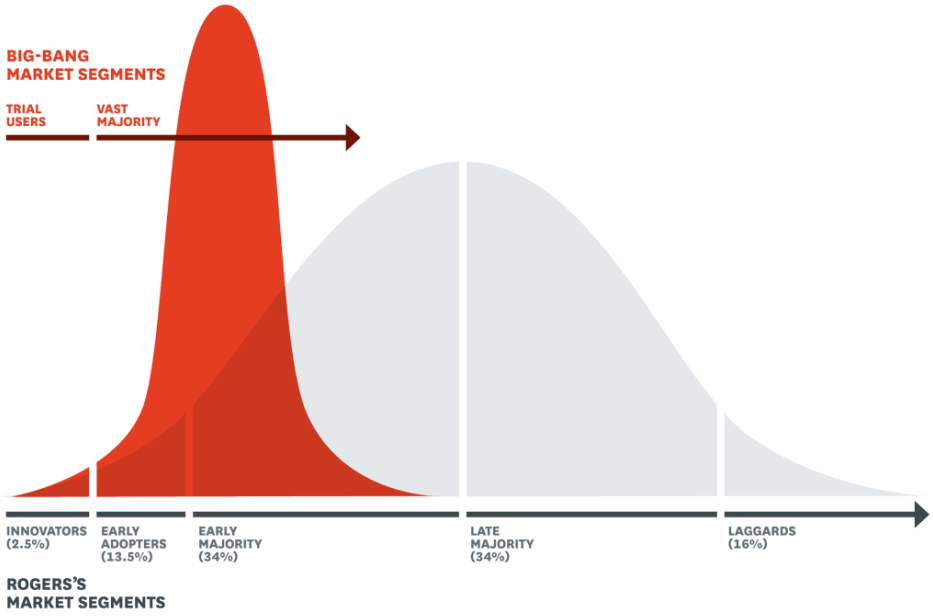
Another important characteristic of disruptive novelties is that they can trigger additional spill-over effects. Example could be the open platform of Twitter which provides access to its infrastructure through an application programming interface (API). It unleashes **open market forces** that are difficult to assess and whose outcomes are impossible to foretell. Similar is true for eBay, Facebook or Amazon. [Owens – Fernandez, 2014] These giants opened up their infrastructures to tightly link themselves to customers and solution providers of e-commerce, in-site applications and cloud services.

My viewpoint is that established companies usually react in the right way when accepting and counting with market unpredictability, increased risk, all included into their business strategies. But this requires a different approach and new methods for execution: namely the **rapid experimentation**. Despite this activity is unusual for established organizations, it turned to be a must to excel it on a daily basis, even when continuously leading to failures. It is necessary for being able to recognize real opportunities and kill unreal ones. Because only a few portion of experiments result in disruptive innovations, swarm of good ideas are indispensable, besides having a flexible structure to handle the accompanying collaboration with startups.

In the age of disruption diffusion do not follow Everett Rogers's classic bell-shape curve of five customers segments (innovators, early adopters, early majority, late majority, laggards). [Rogers, 1962, 1995, 2003] Despite there are only two groups to be distinguished: trial users (who often participate in product development), and everyone else (without any chasm in between, as it was defined by Geoffrey Moore [Moore, 1999]). In practice it means that once available technology meets the right business model (which happens by experiments and not by rigorous plans), mainstream customers all move to the "winner" – and the winner takes it all. The **adoption curve** of such a process acts similarly to outliers, making it unable to predict its time and impact. After it happened, falls rapidly when saturation is reached or a new disruption appears. [Downes – Nunes, 2014]

As adoption is getting very close to **all-at-once or never**, innovators should be ready not only to rapidly scaling up, but also prepare to quickly scaling down. This also means that the bell curve has lost its value as a planning tool, and disruptive innovations are demanding a radical new model of adoption. The lifecycle of disruptive innovation (see Figure 14) looks *"like a cliff, as dangerous to incumbents on its way up as it is to innovators on the way down"*. [Downes – Nunes, 2014, p. 48.]

Figure 14: Disruptive vs. bell-shape adoption

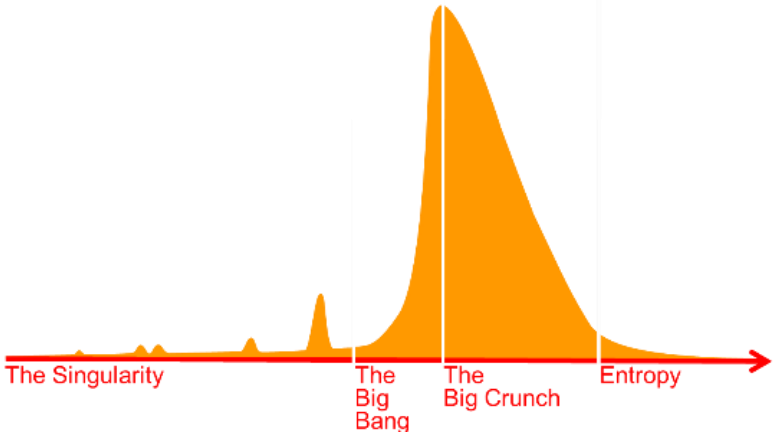


Source: Downes – Nunes, 2014

Under such circumstances it is vital to constantly watch for early warning signs of disruptive change – mainly coming from outside mature industries. Here, singularity refers to the condition, where stable supply chains become increasingly threatened by the pressure of new entrants wielding disruptive technologies. Though they appear first as failed experiments, they signal the change that is about to arrive. This characteristic is at closes mapped by the volatility in the revenue of companies. **Similar market movements were identified also by my research:** the group of innovation leaders (within the sample) face high volatility in their revenues – which is also shown on Figure 51 (in the appendix, 8.2.2).

When early experiments hit a right combination of technology, business model and customer adoption (the so-called big bang), new markets and ecosystems are created, while old ones get abandoned. During the big crunch, market saturation reached in record time, while the disruptor enters its own mature state, where innovation becomes incremental and growth slows. Entropy, reflects the last phase of dying industries, where remaining assets (mainly intangible) are smashed together to create new singularities – as shown on Figure 15.

Figure 15: The four stages of disruptive lifecycle



Source: Downes – Nunes, 2014

Something similar happened in the case of a Hungarian medtech startup, developing a compact inverse microscope equipped with a digital camera and used in human embryology. Their product globally disrupted the market of traditional cameras, made the big bang with venture capital stake and two years later the company was sold to a professional investor – which had enough resources to finance and execute a global full-court offense – to make the big crunch before followers do.

This was an example how a small team can have global impact.

3.2.4 Think big, start small, scale fast

In the age of disruption and exponential technologies, organizations have to **think big** – this will pursue a business strategy to achieve rapid growth. Even if a company somehow manages to achieve an impressive level of growth, the scale of its business will quickly outplace its business model and leave the company lost. [Ismail, 2014]

Today, size does not matter, and no more huge teams or heavyweight infrastructure are required to create new products and bring them to the market. In many cases, and especially disruptive innovation, **small teams** are the ones creating outsized values and changing the course of markets by **scaling fast**. Just think of AngelList (50 employees, $150 million valuation), SnapChat (21 employees, $800 million valuation – but in 2014 turned down Facebooks' $3 billion acquisition offer), WhatsApp (55 employees, sold for $21.8 billion to Facebook).

What could be the possible reaction of established companies? They have to understand that small and specialized teams can react and respond on exponential changes more quickly. And such teams are capable to create scalable products, market them globally and reach hundreds of million dollars in sales. Efficiencies driven by new technology are empowering even single individuals to coordinate and achieve results that formerly required entire corporate departments.

Furthermore, such companies need to acquire using resources efficiently, which are also available for startups. When starting with new product development projects, there is a temptation to spend huge amounts on unnecessary equipment (e.g. servers) instead of paying per use (e.g. cloud services), just to make market experiments. The same is true for sales channels: building and operating own channels is the past. Today, any company can use AdWords and Facebook to find clients. Information technology removed entry barriers by driving down investment requirements of starting an internet-based company to zero.

The morale motivates larger companies towards **setting up innovation missions** consisting of 2-8 highly skilled, quickly moving and empowered teams – made not only of permanent employees but external members as well.

Besides focusing on people, established companies should never forget the rules of disruptive innovations, which is – as we have already seen – almost unable to predict. The process begins with a large number of experiments – the fast and cheap way of finding the right combination of component technologies and pairing them with the right business model. At the beginning it looks like that nothing is happening. But after match is found, take-off is immediate, and customers adopt the disruptor as quickly as supply allows. [Downes – Nunes, 2014] Saturation is reached quickly, market penetration is often nearly instantaneous, but adoption drops similarly to take-off. Market movements are happening in a flash, and winners take all the money.

3.2.5 Winners take it all

Emerging market niches created by disruptive innovations will be dominated by only one company – e.g. there are no serious competitors to Amazon, eBay, Facebook, Google, LinkedIn, Uber or Waze. The same is true for the hardware market: iPad, Kindle, Nest, Pebble. In such industries and markets, the network effects (known to economists as demand-side economies of scale) resulting from the dominant role are strong. According to **Metcalfe's Law** (named after the founder of 3Com and the inventor of Ethernet), the value of such networks is the square of the total number of nodes. An example could be the telephone: the gadget becomes more useful (and the network more valuable) as more people have one, and additionally, the harder it gets for followers to enter the market. [Owens – Fernandez, 2014]

Established companies are often lazy because they can simply win markets by acquiring also-ran competitors or starting own initiatives and combining with their strengths, fame and enormous resources for branding, marketing and distribution. In the age of the digital revolution such strategies have a very hard time, since the internet broke down many walls: when access is free, there is no reason to choose the second. Tumbling transaction costs are altering the economics of organizations and invalidating old business models. New giants, along with

emerging ones reap the benefits of a new phenomenon, called the **winner takes it all**. [Straub, 2015] The question is now will management advance to influence the path and force of this revolution, where quickness means the most important competitive advantage.

3.2.6 Speed as competitive advantage

The easiest way to market or industry leadership is to create a new one and to achieve the first position. In The Innovator's Dilemma, Clayton Christensen [Christensen, 1997] noted that the only companies to gain substantial market share in the hard disk drive industry were those that launched a product within the first two years after the technology became available. The window of opportunity has only become narrower since he wrote his book in 1997. This statement is valid as of today with the difference that **the window of opportunity is only several months "wide"**. The need for innovation speed was never so strong as it is today [Ringel et al., 2015].

The exponential advancement of technology overwrites the opinion that companies should be left run forward with their innovations and let them fail, and learn from their failures, avoid pitfalls and so turn to be the market leader. As long as telephones required 75 years to reach 50 million users, the radio needed only 38 years, TV 15 years, Facebook 3.5 – and the Angry Birds game just 35 days. **Lessons for established** companies are threefold [Owens – Fernandez, 2014]:

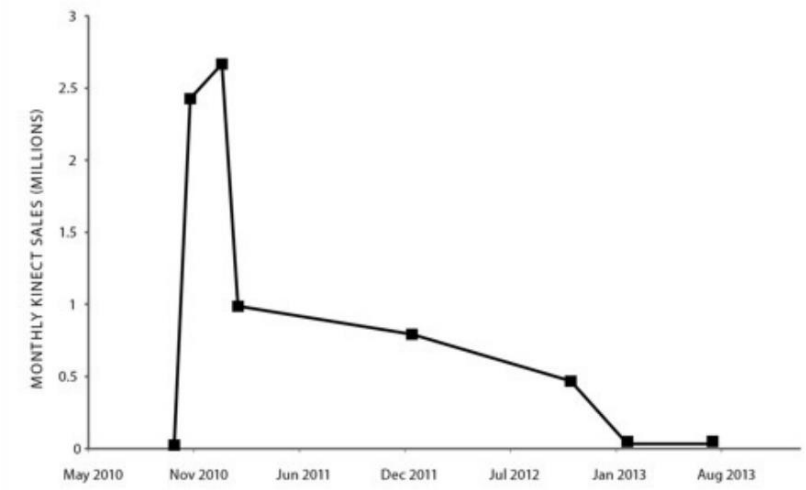
1) Being first confers the powerful benefit of being the first to learn and experience what customers really want and how to serve their needs. All the followers need to climb the same learning curve, so being a follower (or copy-cat) is not a profitable strategy.
2) Being first also means gaining first access to early adopters. In the case of a disruptive innovation such adopters are called early evangelists, exerting a crucial influence over the early majority. Gaining their trust and loyalty also means that competitors will have to work harder to attract them.
3) Being first equals to reaching all channels of distribution first. The first entrants always have greater media recognition, and the chance of getting hyped on social networks is also significant. For latecomers, such advantages are no more available.

Being able to capitalize on the opportunity of being the first on a new market, the ability and agility to quickly scale up and then turning to another innovation are essential. Despite this opinion **my experience** is that there is one more thing harder than scaling up: scaling down, in the right time and the right way.

An **example** is the introduction of Kinect, a motion, voice and facial recognition device for Microsoft Xbox. Earlier no one had ever put all these components together or integrated them with a catalogue of new games designed specifically to take advantage of the powerful hardware

and software. It then turned to enormous hit, selling eight million units in just the first sixty days – the sales curve is shown below.

Figure 16: The Kinect "shark fin"



Source: Downes – Nunes, 2014

For such disruption, however, catastrophic success invariably leads to rapid market saturation, and with it decline and sunset. Within six months, the pace of Kinect sales also dropped precipitously. But such novelties can have second lives as new innovators deconstruct them and recombine their parts into something new – as it happened to Kinect with remote tracking and miniature satellites, which created plenty of startups.

Increasing the speed to market brings additional financial and nonfinancial benefits. Greater **agility (as one of the emerging new methods) has the possibility to enhance the companies' performance** – measured by financial benefits.

3.2.7 Emerging new methods

Many of today multinational companies started they careers with introducing a disruptive innovation and creating new customer needs along with new market segments. But as they were growing they were **losing their innovativeness**. Instead of new disruptive technologies they concentrated on sustaining innovations. They have done so because they already had had something to loose: satisfied customers, significant market share, and investors' trust. They decided to go into the direction of **reduced risk and reduced growth** opportunities, and they were not thinking of how they will react on somebody else's disruptive innovation. Most of them do not have a proper answer for this question and they do not care about. [Christensen, 1997]

Innovation management practices have developed incrementally in the past decades and so, could not follow neither the exponential development of the technology nor the methods used by startups which are creating innovations at a high pace. Executing business models where customers, their problems, necessary product features, the market and the competitors are

evidences generally leads to incremental improvements, even if based on true innovations. This is necessary to stay ahead of the competition, but will not provide protection against disruption.

Success stories of implementing emerging new methods in the management of established companies have shown that these practices are not just for young tech ventures. Large corporations have spent the last several decades increasing their efficiency by continuously decreasing costs. But only focusing on improving execution is not enough anymore. Large companies have to understand that they need to cope with exponentially-increasing external disruptions by continually innovating. To ensure their survival and growth, established companies need to keep inventing not only new ways to satisfy customer needs, carrying out R&D activities and successfully introduce innovations but also applying **new business models**. This challenge requires entirely new organizational structures and skills. [Blank, 2013]

In this problem-set, the **promise of lean management** is that organizations can fundamentally improve their competitive advantage [Liker, 2004; Lewis, 2000], so they can **do more with less**. Eliminating unnecessary feature-related costs, aligning activities of business processes, combining workers into cross-functional teams and continuously striving for improvement made it an ultimate method of today's business success [Chen – Taylor, 2009].

During a waste-elimination process, lean frees up resources which are typically deployed to more value-adding activities, and thus, is moving closer to providing customers a product or a service they want, and when they need it [Schiele, 2009; Womack – Jones, 1994]. Although pioneered by Toyota in Japan, **lean management** spread globally and evolved into a wide concept with implication for many aspects in a business setting [Parker, 2003], and has changed almost everything in every industry [Womack et al., 1992].

Today, advances in science, technology, psychology and analytics (all resulting in exponential change) suggest that lean management is **still emerging** [Duncan – Ritter, 2014], even finding its way towards startups, which is a real challenge for lean theorists and practitioners. This is where **lean startup** comes in, and combines lean management with customer development and agile methodologies. [Cooper – Vlaskovits, 2013]

3.2.8 Incursion of the lean startup approach

What startups and lean management are having in common? On a very intuitive level it appears to be associated with the traditional lean manufacturing concept of waste reduction, since for a startup *"the biggest waste is creating a product or service that nobody needs"* [Mueller – Thoring, 2012, p. 151.]. The lean startup approach translates the well-known lean paradigm into the early stage business context by focusing on minimizing the expenditure of resources for anything but the **creation of value** for the customer. Such approach to entrepreneurship

favours experimentation over planning, customer feedback over intuition, and iterative design over the traditional business plan design. [Blank, 2013]

Most startups do not fail because of being unable to develop and ship its product or service to the market. **The cause of failure is more evident: there is no demand for that particular product or service.** The root of such failures is not taking attention on market demand, and not taking into consideration customer needs. Paying too much attention on delivery, and the execution of the business plan easily makes them forget the most important: learning, and based on lessons learned the required and inevitable pivots. This is where the lean startup approach comes into the picture and can contribute the most to successful innovation at startups and established companies.

In the last decade, the lean startup movement brought **proven methods** for building viable early-stage ventures at low cost and high speed. **Established companies can adapt** the lean startup practices (will be detailed in chapter 3.4) to achieve similar results. The discipline of the build-measure-learn loop – iteratively building a minimum viable product, experimenting on real-world customers and making a decision on pivot or persevere – offers a process of unprecedented efficiency for building sustainable ventures or switching to a brand new business model. [Owens – Fernandez, 2014]

The lean startup is a **hot topic** for innovation. As a set of techniques for accomplishing problem/solution and product/market validation, it promises customer-targeted product development at low cost with a **fail-fast, fail-cheap** setting to quickly and continuously reach validated learning and avoid burning resources unnecessarily. **The lean approach fits comfortably into the structure of established companies** with strict KPIs or other financial metrics and waterfall-like project management.

The lean startup concept has spread globally – and so established companies have also noticed this phenomenon. They recognized that several elements of the lean startup methodology could be used by them as a pill against their poor innovation performance. **My research** also resulted in similar findings: a set of techniques is recommended for being applied and so bring the startup spirit into mature businesses and thereby dissolving innovation-related frustrations.

3.3 Frustrations with innovation at established companies

Despite massive investments of management time and money, **innovation remains a frustrating pursuit** in many established companies. Innovation initiatives frequently fail, and successful innovators have a hard time sustaining their performance. [Pisano, 2015]

Furthermore, **technology giants lose billion dollars** on being unable to create a supportive business environment and culture for innovation. Just take a closer look on Google – the icon of Silicon Valley lost 44 billion dollars in the last decade because of **unsupportive internal**

processes and procedures, and thus employees left the company and founded Twitter (valued 39 billion dollars), Pinterest (valued 4 billion dollars) and Instagram (valued 1 billion dollar), and dozens of young companies (e.g. Asana, Cloudera, Foursquare, Ooyala). [Owens – Fernandez, 2014]

That is a bad news for Google and similar companies, because it means that despite the highest engagement, there is a high chance for passing up billion-dollar ideas. But it is good news for established companies that wish to foster innovation within their organization, since it also means that among the thousands of workers there are likely to be scores who have ideas that could create tremendous value. They "just" need to unlock and retain latent entrepreneurial talent. They can create an organization that innovates successfully, predictably and repeatedly. Not by chance but **by design**. [Owens – Fernandez, 2014]

The value of today technology companies is growing at an unprecedented speed: the number of companies that have soared to a 1 billion dollar valuation or higher, based on fundraising, passed 60 in autumn 2014 and is 174 in April 2016. [The Unicorn List, 2015, 2016] This phenomenon means a significant threat for established companies. These emblems of growth have an uncanny ability to bring to market exciting products and services and open vast new markets. Highflying corporations like Xiaomi, Spotify and Palantir have proven that big companies can do it. But for lessons in how, the best place to look is startups.

Applying traditional management methods elaborated in the last 100 years, established companies cannot win simply by making their current strategies more disciplined. Pulling back to focus on their best customers or delivering higher quality or a lower price will buy them only a little time, if any. More rigorous strategic focus just blinds them to the next wave of disruption coming from the top, bottom and sides. [Downes – Nunes, 2014] For established companies, the need for unlocking innovation is greater than ever.

After having answered the research sub-question **A2) How established companies are trying to be innovative? my viewpoint** is that they also need to look for **possible solutions at fresh companies** and smartly adopt them within their organizations.

3.3.1 The need for unlocking innovation at established companies

When the innovation simply extends existing successful products or business models in an enterprise, it can be effectively managed within the existing processes and procedures of the organization itself. Many of the most successful enterprises are highly skilled at this type of innovation, and they have set up extensive research & development divisions that harness these skills. [Gaffney et al., 2014] However, it is more difficult when **the innovation is not aligned with the existing products or business models**. In this case, the business usually does not have any processes in place to nurture and develop such innovation, and in fact, the enterprise is

stubbornly efficient at **killing the innovation** completely before it has time even to be fully invented. [Christensen, 1997]

In his another bestseller, The Innovator's Solution, Clayton Christensen [Christensen, 2003] writes that enterprises need to **innovate or perish** at the face of the disruptive innovation which creates new markets by offering features to current non-customers, or offer more convenience and lower prices to existing customers at alternate segments of the market. It is the disruptive innovation that can lead to the downfall of existing businesses as well as the markets themselves, as in the case of Kodak, not successfully making the transition to digital cameras, or Nokia, failing the transition to smartphones.

It also strengthens the view that it is **very hard to alter the innovation focus**. Management, business processes and cultural issues also mean a barrier to creative innovation, which is hindered by **lack of management support and bureaucracy**. Furthermore, **fear of failure**, intolerance to out-of-box thinkers and absence of recognition that value disruptive thinking are mostly not part of corporate cultures. [Kahn, 2007]

The aim is to develop such a potential which makes companies able to spot the early signs of disruptive change and recognize ahead of others the signals that disruption is imminent. Gaining this ability makes it possible to be a successful and disruptive innovator.

3.3.2 Difficulties established companies are facing

Established companies are facing many **difficulties** when trying to innovate and come up with new ideas, products and offerings. Generalized conundrums and situations at established companies could look like as follows [Blank, 2015a; Criscuolo, 2012; Christensen – Bever, 2014; Ries, 2011]:

- Despite historically low interest rates, corporations are sitting on massive amounts of cash and failing to invest in innovations that might foster growth.
- Established companies are permanent organizations designed to execute a repeatable and scalable business model.
- The innovation teams within such companies are temporary organizations designed to search for a repeatable and scalable business model.
- The companies willing to innovate usually are having resources and capabilities in brand, supply chain, distribution, sales force, financial metrics, all tailored to execute the existing business model, not to help search for a new one.
- The resources and capabilities optimized for execution interfere with the processes needed to search for a new business model.
- The company needs new and different processes for innovation while retaining the ones that work well for execution.

- The managers want to use the same organization that provided support for execution (brand, supply chain, distribution, sales force and financial metrics) to provide support for innovation.
- Their structural inertia negatively influences their ability to introduce disruptive innovations because these innovations are instantaneous, not standardized, characterized by attributes that are harder to identify and control and can be produced much more easily when the firm is a startup.
- Optimization activities in a well-run traditional organization offer incremental benefit for incremental effort.

Most of the **impediments** the internal innovation teams are facing are mainly tactical:

- The HR policy says the innovative groups can recruit employees only by seniority.
- The marketing department refuses to allow any form of the company name to appear on a minimum viable product.
- The legal people are saying that the new products could lead to lawsuits.
- The executives do not spend sufficient time on understanding the essence of innovation.
- Their structural inability leads them to rely on the same previously successful routines inappropriately in all novel situations and makes it economically suboptimal to engage even in small adjustments in their capabilities.

Despite the limiting factor to growth has shifted in the las 100 years from the number of bodies (human or animal) to the number of machines and the capital expense deployed, the **growth takes typically long time and requires enormous capital investment**. In such situations the management of established companies often find themselves “betting the company”, and as a consequence pharmaceutical, aerospace, automotive and energy companies routinely make investments whose returns are not known for many years, but much money and valuable talent is locked up in decade-long projects whose likelihood of success cannot be measured almost until the moment they fail, adding up to enormous waste. [Ismail, 2014] Contrary, smaller firms undertake more radical and original innovations and jump into unknown situations (namely the singularity) when they see the early signs of disruptive innovation. [Akcigit, 2009]

All the above cited authors are true in their sample spaces, but **my multi-faceted approach** is that developing startup capacities within established organizations requires first evangelists who understand the nature of lean methodology and second they are empowered to spread the learnings within the organization. Without a documented knowledge-base their mission is put on a side track.

3.3.3 Learning from starters

As of today, there are 500-550 million entrepreneurs on Earth. By 2020 this number will exceed 1 billion, which is a 450-500 million increase just in 4 years. This means that the number of people with the aim of launching an **own business** will significantly increase – or the same persons will want to work for startups instead of being soldiers at multinational companies[10]. This is rather true for the youngest generation, called **millennials**[11]. Those youngsters do not look on money as an ultimate aim (at most, as a tool), despise corporate hierarchy and risk avoidance. As children, they are originally and naturally open for being entrepreneurs and know lot more about this topic than their peers 15-20 years ago.

Another important trend that the costs of starting internet-based companies decreased 1000-times between 2000 and 2011, the **capital** for growth is as **easy to access** as never before, not to mention the access to **technology and infrastructure** required for execution and realization. Furthermore, the **motivation** of founders is extremely strong: there are millions who want to be the next Larry Page, Mark Zuckerberg, Jeff Bezos, Richard Branson or Elon Musk. They want to create the **next big thing**, founding whole new industries, markets and disrupt formerly incontestable large companies. On one hand, large and established companies need to get ready for such challenges, and on the other hand, startups should never forget that if they stay alive and turn to be multinationals, they can face their own manifestations after 10-15 years.

While the operational focus of a growing company shifts from disruptive innovation towards sustaining innovation, their internal structure stiffens, lose flexibility and turns to be dependent from various external resources. The number one responsibility of managers will be to secure those resources, and they are also losing direct control over high-level priorities. Investors, suppliers and customers also expect predictability without fluctuations – fulfilling such needs is easiest by not moving anywhere from the current position. This attitude get them stuck and petrifies innovation. Getting out from similar situations or avoiding them is not impossible but is very though.

While established companies are good in executing a proven business model, startups are the greatest in searching for disruptions and suitable business models. Execution requires disciplined operation – and to the contrary, searching is only possible in an undisciplined environment. Such companies start life with better performance at a lower price and greater customization. They are a contradiction of what was thought by academics such as Michael Porter or Michael Treacy: startups compete with mainstream products on all three value

[10] For a similar situation Steve Jobs said that „It's more fun to be a pirate than to join the Navy".

[11] People born after the millennium.

disciplines (low cost, premium product, customized offerings) right from their inception. [Downes – Nunes, 2014]

Entrepreneurs usually start with a **wrong story**. But until they start testing their underlying hypotheses, they do not know how wrong they are. Unlike managers at established companies, they do not have the luxury of decades of data from similar initiatives or huge pools of resources which they can use. They are creating a new product or market, rather than placing a new product into a mature market. Spending months in planning and developing before sending a product into the market, the result could easily be a swing or a miss. Of course, if going to market more quickly by applying the concept of minimum viable product, iterating quickly on the build-measure-feedback loop and learning fast, the result still can be the same, but not the amount of **burned resources**. [Blumberg, 2013]

The conclusion is that **the most important resource for disruption is learning**: how to test the core hypothesis of the underlying business model with minimum time and effort.

3.3.4 The failure of intrapreneurship

Conscious large enterprises are keen on building such internal culture and environment which spurs innovation. They adorn their offices with ping-pong tables, comfortable sofas, free refreshers or even beer, snacks, chocolate, welcome the dogs of their employees and offer laundry or home-cleaning services. With such services they expect their best and brightest employees to **take risks** that ordinarily would be frowned upon in the interest of bringing radical new products to market. The responsibility of **intrapreneurs** (intracorporate + entrepreneurship = intrapreneurship) is to act within established companies as they would be entrepreneurs (or even founders) at startups. They have to bring ideas to market with a profit by enjoying exceptional freedom in making decisions.

But the experience is that most of such initiatives come to naught – intrapreneurs are stymied by internal politics or side-tracked into low-growth activities. Intrapreneurial projects launched with great ambitions are often wildly misdirected, wasting huge budget and leaving sterling brands tarnished. Energies get channelled into slow-moving products that fail to make a dent in the market. Acquisitions intended to bring in strategically important technologies or talent usually suffer poor integration. Since the roles of employee and entrepreneur are mutually incompatible, the word intrapreneur is an **oxymoron**, and executives who expect salaried workers transplanted into an innovation department to come up with great ideas, are fooling themselves.

Furthermore, innovation at mature organization is often hampered by **lack of autonomy**, **inflexible remuneration** and **focus on performance improvement**. The objective of a mature company is to concentrate on existing clients, markets and products. Any deviation can put the

operation and survival at risk. Such internal politics do not motivate creativity and innovative approaches because the return of such adventures are uncertain and does not fit within the frames of day-to-day activities. The employees will not take any **risk** if they cannot count on any kind of **compensation**. They are paid for fulfilling their tasks laid down in their labour contracts. When planning the budget of the next year the department responsible for innovation will have similar rights and possibilities as other ones. As innovation is usually the result of a long-term research and development activity, this filed will not be able to provide nice looking figures about the past quarters, and will lose the battle against other departments. [Owens – Fernandez, 2014]

Instead, **people with the right talent and entrepreneurial spirit should be hired** to replicate key facets of the startup culture. After having spent some months with the company, they will start to emerge and become visible and then they should be reassigned into other innovation projects or refer other teams to them for advice, learnings and example. Little by little was the Spanish telecommunications mammoth – and a diverse range of established organizations such as Pfizer, Target, Exxon Mobil, GE and Intuit – building a network of skilled people that could support innovation projects later on. [Jurado – Olano, 2014; Ferrier, 2015]

In a startup, no such problems arise: their founders are having an entrepreneurial spirit by definition, otherwise they would not team up and undertake risky businesses with a high upward potential. Their example should be analysed when trying to solve innovation-related conundrums.

3.3.5 Solving the conundrum

Startups naturally have a suitable structure for being innovative, as a consequence of being small and independent companies. Within large organizations, teams being responsible for innovation require support from senior management to create the desired structure. The **required structural attributes** are threefold:

1. scarce but secure resources,
2. independent authority to develop the business, and
3. a personal stake in the outcome.

Each of these requirements is different than we can experience at established companies. It is also important to note that structure is merely a prerequisite. It does not guarantee success, but a wrong structure can lead to failure. [Ries, 2011]

In case these structural attributes are available, it is important to focus on **establishing the basic rules for autonomous startup teams** to operate. These rules are about **protecting the parent organization**, **hold entrepreneurial managers accountable** and in case there is a successful innovation, how to reintegrate it to the parent organization.

A possible solution could not be revamping the existing business processes with outside consultants but writing own innovation processes, procedures, incentives and metrics with the inside team responsible for innovation. **The goal is to grow the new innovation policy as needed, from bottom of the organization.** Such approach will lead to a situation where innovation and execution policies, processes, methods and metrics will co-exist side-by-side. [Blank, 2015a]

3.3.6 Conventional vs. exponential mindset

Businesses today face a market of **constant instability and disruption** due to significant changes in customer behaviour, technology, regulation and demographics. Therefore, enhancing entrepreneurship, increasing creativity and boosting innovation is not only on the priority list of startups. It is also desired by small, medium and large-sized companies.

Such companies often think they are strapped for resources, but entrepreneurs cannot believe how many resources they have. If the previously mentioned unicorn companies can **start with zero**, it is difficult to imagine what they would have done if they had had distribution pipes of multinationals! Entrepreneurs can help established companies to combine relentless focus, expansive search and a bootstrapping mentality. In a startup, if founders do not focus relentlessly on the core of their idea, pivot quickly and learn fast, the results can be devastating. Related to this radically resourceful view, research shows that, compared to more established, well-resourced companies, entrepreneurs and companies with entrepreneurial management practices are innovative in part because of their resource constraints. **Limited resources** make them to focus on their existing advantages and remain **experimental**. Instead of investing primarily in maintaining the status quo and aiming for incremental improvements, as those with excess resources tend to do, they invest heavily in active search for unmet needs, new business models, creative ways to recombine knowledge or resources, and new opportunities to apply their competitive advantages. [Altringer, 2013]

The new rules of disruptive innovation undermine much of the conventional mindset of searching, planning and execution. From strategy to marketing to innovation, those who succeed in environments dominated by exponential technologies have discovered new ways of developing and implementing their business strategies. **Table 7** summarizes the most important differences. These differences also tell about **how established companies and startups are trying to be innovative** – which is also a **synthetic answer to the research sub-question A2)**, and a conduction to the sub-question A3).

Table 7: Conventional vs. exponential/disruptive mindset

Conventional mindset		Exponential/Disruptive mindset
Focus on only one strategic "discipline" or "generic strategy" – low cost, premium product or customer intimacy.	**Strategy**	Compete on all strategic dimensions at once. Enter the market better, cheaper and customized. Innovate constantly.
First target a small group of early adopters and later enter the mainstream market.	**Marketing**	Market to all customer segments immediately and be ready to scale up (and exit) swiftly.
Seek innovation in lower-cost, feature-poor technologies that meet the needs of underserved customer segments.	**Innovation**	Launch low-cost experiments directly into the market. Combine reusable components rather than designing from scratch.

Source: own design, based on Downes – Nunes, 2014

The real challenge for established companies is to create a mechanism for empowering innovation teams out in the open. This is a proven path toward a sustainable and fertile culture of innovation over time as these organizations face repeated existential threats of newcomers, startups and exponential technologies. The mindset required for established players lay somewhere between the two poles. While the next chapter introduces **lean startup in theory**, its **practical applications** will be demonstrated in chapters 4.3 Using lean startup principles at established companies and 4.4 Applying lean startup methods at established companies.

3.4 Lean startup in theory

By definition, *"the lean startup is a set of practices for helping entrepreneurs increase their odds of building a successful startup"*. [Ries, 2011, p. 37.]

Lean startup states that most forms of waste in innovation are preventable once their causes are understood. All that is required is that managers at established companies change their collective mind-set concerning how things are getting done. Only focusing on functional efficiency, they lose sight of the real aim of innovation: to **learn** the unknown. *"The lean startup movement stands for the principle that the scientific method can be brought to bear to answer the most pressing innovation question: How can we build a sustainable organization around a new set of products or services?"* [Ries, 2011, p. 265.]

Startups need to face a high level of **uncertainty** every day. This situation is handled by quickly creating and validating **hypotheses** about their businesses. The process of searching is cyclical and the aim of it is to build a product or service, to measure the users' reaction and to provide a feedback which leads to validated learning. Repeating this loop results in quick failure or in awesome success, and so, the time and money squandered can be minimized.

As already described, a startup is not a smaller version of a large company. Regardless age or size, it is an organization formed to **search** for a scalable and repeatable business model. [Blank, 2014] After launch, the business model is mainly built up of **ideas and assumptions**. In its

early days the company does not have any clients and has limited knowledge about when product/market fit will be reached. The lean startup method puts the user in the middle and builds on **continuous feedbacks**.

After thousands of new ventures gone bankrupt, a decade ago the paradigm about management and entrepreneurship started to change. It turned out that the success of startups is not a consequence of good genes, acumen or stamina. **Startup success can be engineered by following the right process, which means that it can be learned, which means it can be taught.** [Ries, 2011]

This all implies that it can be documented, operationalized and repeated. Even established companies can apply lean methods and master disruptive innovation like startups. In this chapter the detailed introduction of lean startup will follow. The aim is to provide a deep insight and give the answer to research sub-question **A3) How startups are making innovation happen intentionally and not exceptionally?**

3.4.1 Building blocks of the lean startup method

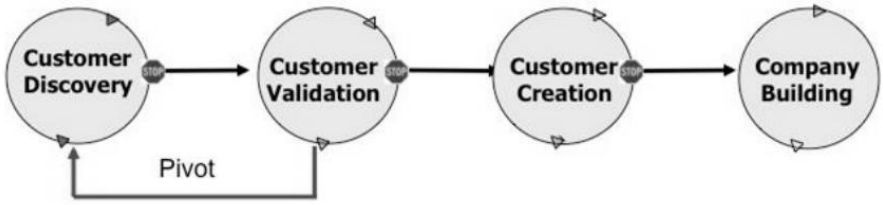
Eric Ries has built up the lean startup method of the following **blocks** [Ries, 2011]:

Lean manufacturing. The lean startup takes its name from the lean manufacturing revolution that was developed at Toyota, hallmarked by Taiichi Ohno and Shigeo Shingo. Lean thinking is fundamentally altering the manner supply chains and production systems are run. Among its prescriptions are drawing on the knowledge and creativity of individual workers, the shrinking of batch sizes, just-in-time production and inventory control, and an acceleration of cycle times. It taught the world the difference between value-creating activities and waste. It has also shown how to build quality into products from the inside out.

Customer development. The business and marketing functions of a startup should be considered as important as engineering and product development and therefore deserve an equally rigorous methodology to guide them. It is the process which turns business model hypotheses, through continuous feedback from customers and structured testing, into facts. The problem with traditional new product development models (like waterfall approach in software development) is that they do not include customer feedback until beta and do not accept failure. The customer development model, in contrast, embraces failure as this is seen as the best way to learn and improve the business model. [Blank, 2007; Ries, 2011]

The approach suggests that before building a company or launching innovation projects the customer development process should be included:

Figure 17: The customer development process



Source: Blank – Dorf, 2012

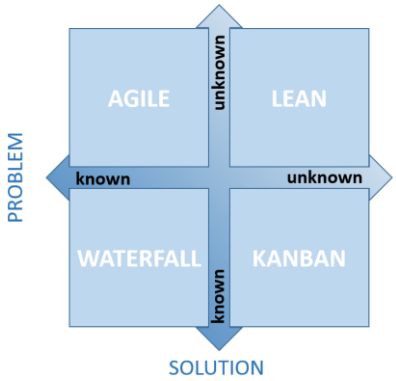
Applying these methods help to avoid unnecessary investments and preserves the company's fit and independence. Following the same rules, large and mature enterprises are also able to steer innovation as they would be newly created organizations. [Kristóf, 2014]

Design thinking. As the lean startup principle is the standardization of business development, design thinking is the result of standardizing of the idea development process, which needs to support rapid change and asynchronous updates. It is a method of meeting people's needs and desires in a technologically feasible and strategically viable way. Design thinking attempts to inspire the essential element of creativity, the ability to take an abstract idea and create something with it. It is based upon the fundamental belief that an unexecuted idea, one that is never realized, is a worthless proposition and that doing is equally as valuable as thinking. [Egiri – Wuritka, 2015]

Agile development. The traditional and waterfall product development presupposes knowledge of customers' problems and needs. This contradiction is solved by agile development, which eliminates wasted time and resources by iterative and incremental development. Working hand-in-hand with (the previously mentioned) customer development, it is the process which creates the so-called minimum viable product (see chapter 3.4.4). [Blank, 2013]

While agile methods can be used in situations where the problem is definite but there is no known solution for it, the lean approach should be applied while exploring unidentified problems and their unknown solutions. Lean startup method builds on both. In practice it means that it identifies and validates a problem and so opens the room for applying agile methods for delivering the solution. [Kristóf, 2015] This is shown on Figure 18.

Figure 18: Agile and lean in the problem-solution matrix



Source: Kristóf, 2015

Business model canvas. When launching a new business or innovating with the aim of elaborating a new product, the people involved are having on day one is a series of untested hypotheses – basically, good guesses. When running lean, these hypotheses should be summarized in a framework called business model canvas. In practice, this is a diagram of how value is created. The visual chart with elements is describing a firm's or product's value proposition, infrastructure, customers and finances. It assists firms in aligning their activities by illustrating potential trade-offs.

Validation. Validation starts by building hypotheses. At the beginning, these hypotheses can be twofold: value hypothesis and growth hypothesis. The former is about testing whether a product or service really delivers value to customers once they are using it. The latter tests how new customers will discover a product or a service.

Validation is done by scientific experiments (instead of surveys) which are based on measures and hard facts. In the lean startup paradigm this experiment is lot more than just a theoretical inquiry. It is the first product related to the new concept. Building a product should only be followed after a successful experiment. Within a mature company, it allows the product owners or managers to get started with the project. Validation is about finding synthesis between the company's vision and what customers think they want (or ought to want).

Get out of the building! One of the cornerstones of Toyota Production System is the "genchi gembutsu" which is usually translated to **"go and see for yourself"** – so business decisions can be based on deep first-hand knowledge. This approach is crucial for startups, because their early contact with potential customers merely reveals what assumptions require the most urgent testing.

Entrepreneurs must get out of the building to see and experience **real-life** situations, meet and talk to customers and learn their needs. This rule is closely related to "genchi gembutsu" and means **gathering facts** about customers, markets, suppliers and channels. The problem is that these exist only outside the building – outside the office and outside the meeting rooms. As

companies need extensive contact with potential customers to understand them, the best way to do so is to get out of their chairs and get to know them. The basic step of this process is to confirm that the assumptions and hypotheses are based on reality, and that customers' problems are significant and so worth solving.

The teams responsible for innovation have to stand up and go see how the potential customers behave when meeting the new product. This is so crucial that they themselves have to do so – otherwise the experience gained will not be strong enough. Therefore, this activity cannot be outsourced or performed by a subcontractor. Hiring such one would also against the lean method. In a startup or in a lean innovation project the resources for having subcontractors for everything is far too expensive. [Blank – Dorf, 2012]

3.4.2 Basic principles of lean startup

The lean startup method efficiently searches for a valuable **business model** by iteratively validating **hypotheses** against real users, while committing the least amount of resources at all stages. The **basic principles** are [Ries, 2011]:

1. **Entrepreneurs are everywhere.** Early entrepreneurs don not have to work in a garage to be in a startup. The concept of entrepreneurship includes anyone who works within the definition of a startup: a human institution designed to create new products and services under conditions of extreme uncertainty. That means entrepreneurs are everywhere and the lean startup approach can work in any age or size company, even a very old and large enterprise, in any sector or industry.
2. **Entrepreneurship is management.** A startup is an institution, not just a product, and so it requires a new kind of management specifically geared to its context of extreme uncertainty. In fact, "entrepreneur" should be considered a job title in all modern companies that depend on innovation for their future growth.
3. **Validated learning.** Startups exist not just to make stuff, make money, or even serve customers. They exist to learn how to build a sustainable business. This learning can be validated scientifically by running frequent experiments that allow entrepreneurs to test each element of their vision. By focusing energies on validated learning, much of the waste that plagues companies can be avoided.
4. **Build-Measure-Learn.** The fundamental activity of a startup is to turn ideas into products, measure how customers respond, and then learn whether to pivot or persevere. All successful startup processes should be geared to accelerate that feedback loop. (further details will follow in chapter 3.4.3)
5. **Innovation accounting.** To improve entrepreneurial outcomes and hold innovators accountable, they need to focus on the boring stuff how: to measure progress, how to set up milestones, and how to prioritize work. This requires a new kind of accounting

designed for startups – and the people who hold them accountable. (further details in chapter 4.4.3)

In chapter 1.4.4 (definition of startup) I showed that a startup is a temporary organization designed to search for a repeatable, scalable and profitable business model. As these companies operate with too much uncertainty the traditional management methods do not apply for them – they are designed for established companies. Furthermore, if the founders of a startup try to apply traditional management methods they will face difficulties and will not be able to find the reasons of failing. As startups are not having a past and forecasting are only accurate when based on a long and stable operating history, there is nothing to predict. There should be assumptions and hypotheses to be validated. The validation happens by repeating the **build-measure-learn** feedback loop and experiencing what is working and what is not, what is appreciated by users and what is not, and what they are having the willingness to pay for. These principles hold true not only for startups but also for established companies applying lean startup methods.

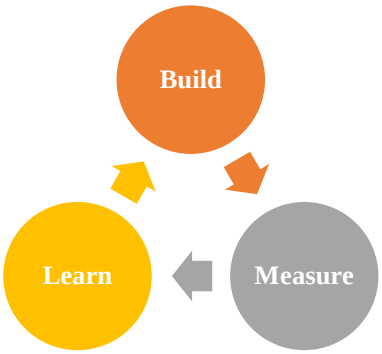
3.4.3 Build-measure-learn

The goal of the build-measure-learn loop (shown on Figure 19) is not to build a final product, to ship or even to build a prototype, but to **maximize learning** through incremental and iterative engineering.

The “build” step refers to building a **minimum viable product** (abbreviated as MVP – for details see chapter 3.4.4). It is critical to understand that an MVP is not a product with fewer features. Rather it is the simplest thing that can be shown to customers to get the most learning at that point in time.

Early on in a startup, an MVP could simply be a PowerPoint slide, wireframe, clay model, sample data set etc. Each time an MVP is built, it should be also defined what to test or measure. Later, as more is learned, the MVP’s go from low-fidelity to higher fidelity, but the goal continues to be to maximize learning not to build a beta or fully featured prototype of the product.

Figure 19: The build-measure-learn loop



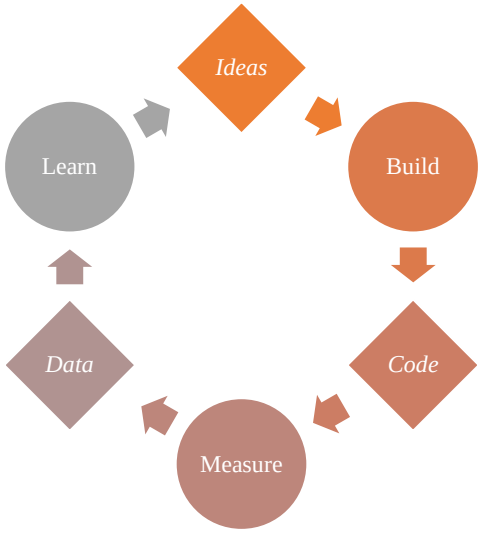
Source: Ries, 2011

A major improvement over waterfall development is that the build-measure-learn lets companies and startups – who are applying it – to be fast, agile and efficient innovators.

Let us take a closer look to each step of the **iterative process**, consisting of the following steps:

- **Build.** The three-circle diagram above (Figure 19) is a good approximation of the whole process. Unfortunately, using the word "build" first often confuses people. The diagram does seem to imply build stuff and throw it out to the market. A more detailed version of the diagram helps to clarify the meaning by adding three more elements: *Ideas* – Build – *Code* – Measure – *Data* – Learn.

Figure 20: The extended build-measure-learn loop



Source: Ries, 2011

The extended version of the diagram uncovers that the real aim of building is to **test** "ideas" – not just to build blindly without an objective. The circle labelled "code" could easily be labelled "build hardware" or "build artificial genome" – depending the type of innovation the company is working on. The circle labelled "data" indicates that after the experiments get measured, data is used to further refine the learning process, which will

influence the next ideas. The goal of build-measure-learn is not just to build things, the goal is to build things to validate or invalidate the initial idea. [Blank, 2015b]

- **Measure.** After having built a minimum viable product, the biggest challenge will be determining whether the efforts in product development are leading to **significant progress**. It is also important to note here, if the company is building something that nobody wants, than it does not matter if they are doing it on time and budget or not. Measuring means using a **quantitative approach** which allow to see that the activities of product building are profitable. As the progress can be measured, quantifiable milestones can be set, and reaching (or not reaching) them can also be objectively judged. The applied metrics are also invaluable to investors who must hold entrepreneurs accountable. The method used for measuring progress is called **innovation accounting**.
- **Learn.** The entrepreneurs must learn what **customers really want**. Not what they say they want or what the entrepreneurs think they should want. Entrepreneurship is also about discover whether the company is on a path that will lead to growing a sustainable business [Ries, 2011]

  The lean startup method reinvents learning by the concept of validation. From its context validation does matter – only learning not. In this context, **validated learning** is a rigorous method for **demonstrating progress** when one is embedded in the soil of extreme uncertainty in which startups and novel concepts grow. It is also the process of demonstrating empirically what a team has discovered about the **present and future business prospects**. Compared to market forecasting or classical business planning, validated learning is more concrete, more accurate and faster. *"It is the principal antidote to the lethal problem of achieving failure: successfully executing a plan that leads nowhere."* [Ries, 2011, p. 46.] The learning is achieved by experiments which aim at discovering how to build a sustainable business around the company's vision. From this point of view learning is the measure of progress – so, progress is achieved by learning and experiencing facts. **In a fierce competition the only way to win is to learn faster than anyone else does**, or with other words: a startup has to find ways to achieve same amount of validated learning at lower cost and in shorter time. The overarching goal of lean startup lies in supporting and driving this activity.

- **Pivot.** After having completed a round on the build-measure-learn loop there needs to be a decision: whether to continue the original strategy or make a change. Making a change is called pivot. In case that one of the original hypotheses is false than it is time to make a major change and switch to a new strategic hypothesis. *"A pivot is a*

structured course correction designed to test a new fundamental hypothesis about the product, strategy and engine of growth." [Ries, 2011, p. 147.] The same applies after being successful with early adopters and starting to sell for mainstream customers. Mainstream customers have **different requirements** and are much more demanding. The kind of pivot needed here is called a customer segment pivot.

Despite having this scientific methodology, the human elements like vision, intuition, judgement and social networks, cannot be eliminated, and nor would that be the aim. The goal is lot more to **channel human creativity** into its most productive form – and this activity is mainly misguided by the decision about perseverance. Companies like that cannot make a strategic change into a new direction, and will get stuck in the land of the living dead: neither growing enough, nor dying, but consuming enormous resources. This can be avoided by using the scientific methods of the lean startup, so the path to a successful and sustainable business is paved with pivots. [Ries, 2011]

A legendary **example** could be Groupon's[12] $12 billion pivot. Groupon was started from a company called The Point. As a social media platform working to get people together to solve problems, but was about to run out of money. The most effective campaigns on The Point were those that saved people money by grouping or bundling their purchases. The founders started blogging various deals from different businesses each day. They called this, "Get Your Groupon.com". Groupon's first offer hit in October of 2008: buy two pizzas for the price of one in the shop on the first floor of its Chicago headquarters. Twenty people bought the deal and the company was well on its way to its $12 billion pivot – their IPO valuation.

3.4.4 Minimum viable product

The focus on experimentation as a source of customer knowledge is associated with the concept of the so-called Minimum Viable Product (referred as MVP) – a product consisting of a **minimum set of features** that is used

1. as a tactic to reduce wasted engineering hours,
2. as a way of getting the product in the hands of early visionary customers as soon as possible.

The MVP concept is the basis for another difference of lean startups as compared to traditional businesses – the need for the adoption of success metrics tolerating experimentation and productive failure. [Lemminger et al., 2014]

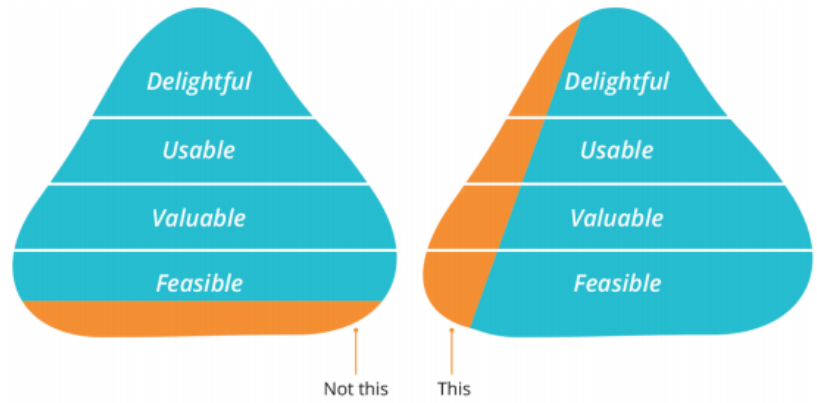
[12] The name Groupon comes from group + coupons.

The minimum viable product is such version of a new product (can be a service as well) which enables a **full turn** of the build-measure-learn loop with a **minimum effort** and the least amount of development time and resources. In this context, minimum means that it lacks many features that may be essential later on. The MVP is used for testing hypotheses by **measuring the impact** achieved by it. It helps entrepreneurs start the process of learning as quickly as possible with the goal of testing fundamental business hypotheses. [Ries, 2011]

In this context, minimum does not mean that the product is crappy or useless. Minimum refers to the features it provides: only the minimum set, which is about to **validated**. This issue involves quality-related questions as well. To presuppose the expected level of quality in a startup, is a risky assumption. It not only presupposes the quality, but also that the company already knows what attributes of the product the customer will perceive as worthwhile. Often they are not even sure who the customer is, so how should they know what quality means?

An MVP can mean anything from a clickable wireframe to a fully-fledged prototype. Important is to fulfil **four critical characteristics** in one time: feasible, valuable, usable, and delightful.

Figure 21: MVP – build a slice across instead of one layer at a time



Source: Humble et al., 2015

Google Glass, for **example**, was an MVP deployed to 10,000 people including 2,000 developers. The significance of the MVP is the ability to acquire data on what customers want and to validate a product's market viability, with an emphasis on doing that at the lowest possible cost. That's really the meaning of "lean". [Shaughnessy, 2014]

It also has to be understood that the minimum viable product needed to build to find the right customers is different from the minimum viable product needed to test pricing, which is different from an MVP needed to test specific product features. And all of these hypotheses (and minimal viable products) change over time as the company learns more and more. [Blank, 2015b]

3.5 Theoretical foundation

This part has delivered essential insights into the underlying theories of innovation, management, exponential technologies, disruption and lean startup – with **answering the questions** of the sub-question group **A) Theoretical foundation**. My **findings** (answers on the sub-questions) and **contributions** (attainment of the research sub-objectives) are summarized in Table 8.

Table 8: Findings of and contributions to Theoretical foundation

Research sub-questions and findings	Research sub-objectives and contributions
A1) Why is it important (for an established company) to be innovative?	**To have an overview about the development of exponential technologies and disruptive innovations, their effects on the global economy and the nature of innovation management.**
For established companies it is important to be innovative since because of exponential advancement of technology they become gradually threatened by the increasing pressure of new entrants mastering disruptive technologies. Such trends make not only whole sectors, industries, but the applied innovation management tools and methods to move, adopt and change. Small teams with global effects, headway of the "winners take it all" paradigm, declining transaction and annulling marginal costs, and emerging new methods are all signs of a singularity in stealth mode, and soon to appear.	The age of disruption eroded management theory and practice used in the last 100 years and dramatically shaped the landscape of entrepreneurship. Hundreds of millions starting new businesses and using zero-cost solutions to develop blockbuster innovations in just some months, significantly affecting the global economy. In such situations renowned companies having a hard time in keeping their talents, improving the necessary skills, growing further on and staying profitable, therefore emerging new methods are required. This is why and how the lean startup approach has made its triumph in the last decade, while deeply altering the nature of applied innovation management. My dissertation has shown the most important characteristics of exponential technologies and disruptive innovations. It was achieved by providing **novel extensions** to the widely accepted approach of Christensen [1997] and Rogers [2003], mainly by bringing into the discussion the topics of zero marginal costs [Rifkin, 2014] and emerging new methods [Ries, 2011].
A2) How established companies are trying to be innovative?	**To explore the innovation conundrums of established companies in order to identify focus areas of management cognition and action to which the delivery of top or potentially disruptive innovations are highly dependent.**
A typical established company does not count with being disrupted. For them, being conscious only means applying and mastering management methods elaborated in the last 100 years: focusing on the best	At most established companies innovation is a frustrating point. The reasons are partly immanent to their nature: growing and getting large means executing a proven business model, which require radically

Research sub-questions and findings	Research sub-objectives and contributions
customers or delivering a higher quality or a lower price will not save them. The more rigorous they are, the more blind they get towards the next wave of disruption. Their resources and capabilities optimized for execution interfere with the processes needed to search for a new business model – which would be essential in creating disruptive solutions or at least defending themselves against being disrupted. It is also a problem that their managers want to use the same organization that provided support for execution to provide support for innovation. This structural inertia negatively influences their ability to introduce disruptive innovations because these innovations are instantaneous, not standardized, characterized by attributes that are harder to identify and control and can be produced much more easily when the firm is a startup or the innovation happens in a well-separated unit. Furthermore, a shift from the conventional mindset to the exponential mindset is also required.	different skills then searching for a new one. The causes are rooted in their conventional mindset: focusing only on one strategic discipline, instead of competing on all strategic dimensions; first targeting only a small group of early adopters and later enter the mainstream market, instead of marketing to all customer segments immediately; first seeking innovation in lower-cost, feature-poor technologies that meet the needs of underserved customer segments, instead of launching low-cost experiments directly into the market with combining reusable components rather than designing from scratch. My findings (summarized in the left column) brought **further confirmation** to the conclusions of Pisano [2015], Blank [2015a], Owens – Fernandez [2014] and Christensen [1997].
A3) How startups are making innovation happen intentionally and not exceptionally?	**To show the main characteristics of startups and to bring a preliminary insight into the lean startup method used by them.**
Not only established companies, but also startups are facing a high level of uncertainty. This situation is handled by quickly creating and validating series of hypotheses. The process of searching is cyclical and the aim is to build a product or service, to measure the users' reaction and to provide feedback which leads to validated learning. Repeating this loop results in quick failure or in awesome success, and so, the time and money squandered can be minimized. As a set of techniques for accomplishing problem/solution and product/market validation, the lean startup promises customer-targeted product development at low cost with a fail-fast, fail-cheap setting to quickly and continuously learn and avoid burning resources unnecessarily. This is how startups make innovation happen by design.	This chapter has detailed how startups follow the path towards innovation excellence, while compressing the findings of various scholars and academics [Blank, 2007; Ries, 2011; Lemminger, 2014]. My **confirmatory findings** brought clarity and a preliminary insight into the topic about applying lean startup. These results were used while elaborating the questionnaire used in my research as a basic tool to bring understanding about the relationship between the applied innovation management techniques and the innovation performance.

Source: own design

The next chapter will show the most important startup lessons for established companies. The aim is to build the practical establishment.

4 Startup lessons for established companies

"No business plan survives first contact with customers so use a business model canvas"

Steve Blank, 2012

In the age of disruption and exponential technologies planning and predicting based on **linear models** leads to **huge failures**. In the early 80s the renowned consulting firm McKinsey advised AT&T not to enter the mobile telephone business: they predicted that fewer than one million such devices will be in use by 2000. The fact is 100 million. Another example comes from the major market research firm Gartner. In 2009 they forecasted that by 2012 Symbian will be the top operating system for mobile devices, with 39 % market share. In reality Symbian shut operation at the end of 2012. [Ismail, 2014]

There are thousands of disruptions taking place across the globe, where a profound shift is also occurring from a physical substrate to an information substrate. At the epicentre of every one of these disruptions a fundamental change in the role of information can be found – which sum up and show that we are shifting to an **information-based paradigm** which brings many questions about how the underlying disruptive innovations should be managed.

But the lean startup headway is not just about startups. It is actually a deeper **cultural shift** that cuts to the heart of the human condition. It reflects a dissatisfaction with the way much of the world has gone for the last several decades. It marks a transformation in how we view our societies, how we convene our communities, how we create value together as human beings. It is a counterpoint to the governing economic paradigm – what economists call neoliberalism – which has prized efficiency and productivity above everything else, even when it has corroded relationships that bonded together communities in social networks. [Hwang, 2014]

The startup movement is like a reboot of the human spirit. It is moving from an economic model that treats individuals as replaceable cogs in an anonymous yet efficient system, to one that recognizes that individuals are the only ones who can make the system better through their innovations, inventions and creations, thereby it **brings a new paradigm into the practice of innovation management**.

By introducing selected lessons from startups for established companies in the field of innovation management, this chapter provides a solid ground for the **practical establishment** with the aim of answering the research sub-questions and achieving the research sub-objectives shown in Table 9.

Table 9: Sub-questions and sub-objectives related to Practical establishment

Sub-question	Sub-objective
B) Practical establishment	**To bring together relevant practices about innovation-related activities of startups and established companies.**
B1) What established companies can learn from startups in the fields of innovation management?	To provide practical distinction between startups and established companies, and a detailed description about their innovation management practices and strategies.
B2) Are lean startup methods appropriate for unlocking innovation potential?	To present lean startup principles and methods from the specific perspective of getting them used and applied at established organizations.

Source: own design

Based mainly on the critical evaluation of secondary sources **my intention** is to bring clarity into the topic as well as to introduce applicable principles and methods. Therefore, the first part of this chapter gives a general introduction, while the second part puts the emphasis on principles to be used and methods to be applied.

The results of this evaluation were used as an input for **my research** carried out among innovative companies about their innovation performance and the applied innovation management methods.

4.1 A new paradigm in the practice of managing innovations

Human beings have always worked to own "stuff" and then trade to access it. Most recently, this behaviour spread to global markets, requiring ever-larger **human institutions**. In this model, value creation can be generated by owing more land, more assets and more people – managing **scarce resources** and ensuring a relatively stable, **predictable environment**. To manage people and protect assets, hierarchies were created. With the industrial revolution and the rise of the modern corporation, this hierarchical thinking was mapped onto companies and governmental structures. [Ismail, 2014]

The first hundred years of scientific management focused on building strategies and elaborating tools that formalized execution and efficiency at existing companies, managing and measuring them on a linear scale. In business, the way most products and services are built continues to mirror this linear, incremental and sequential thinking. The race to capture **economies of scale** resulted in an explosion of large globalized corporations.

As Peter Thiel said, *"Globalization is moving from one to N copying existing products. That was the 20th century. Now in the 21st century we move into a world where zero to one and creating new products will increasingly be a priority for companies due to the rise of different exponential technologies."* [Ismail, 2014, p. 36.]

In the last decade, a set of tools have emerged, focusing on the search (and not the execution) of a scalable and repeatable business model. **The new paradigm of founding and scaling ventures has arrived** just in time to also help existing companies deal with the forces of continual disruption. In the 21st century those forces will make people in every kind of organization – startups, small businesses, large corporations, NGOs and government – feel the pressure of rapid change. The lean (startup) approach will guide them in innovating quickly and aligning their activities to the new era of innovation management. [Blank, 2013]

Today, the necessary tools, infrastructure and management methods are all in place for the information age to burst into full bloom, and starting a new economic era, in which the role of technology entrepreneurship is more important than ever, as it is becoming the primary growth engine. [Marmer, 2015]

After having gone (only fifteen years ago) through a severe dotcom rise and fall, it is understandable that many academics and professionals imagine a similar fate for the current tech boom. But this entrepreneurial transformation is different since it is based on more solid foundations: the basic building blocks for the digital products and services have become so evolved, cheap and ubiquitous that they can be easily combined and recombined. [Siegele, 2014; Marmer, 2015]

By excelling **combinatorial innovation** (as it was called by Hal Varian [Varian, 2003]), startups and established companies are harbingers of long-term exponential wealth creation as the era continues to mature.

4.2 Startups vs. established companies

As companies are turning from startups to established companies they often ignore the principles behind their early success and miss the need to pivot even as it is staring into their faces. Winning early adopters means that the company has the knowledge about selling products towards them. But mainstream customers have different requirements and are much more demanding. The early actions that made them successful with early adopters are diametrically opposed to the actions they have to master to be successful with mainstream customers. Realizing this often makes them to trust **vanity metrics** – it is much more convenient to focus on ever-larger gross metrics and breaking new records in signing up paying customers and active users. As their companies are still growing and delivering month after month "up and to the right" results (which are beloved by investors) makes them ignore the signs of a required pivot. While getting larger, instead of chasing growth, revenue and profits to **test new hypotheses about new customers would be required**. Investing in quality, design and larger projects does not require to abandon the **experimental roots**. [Ries, 2011]

Acting as a startup and applying lean startup methods is not the subject of **size or age**. Remember Eris Ries' **definition** of a startup: *"a human institution designed to create a new product or service under conditions of extreme uncertainty"*. So, the issue is lot more about the problem the "human institution" is facing and how it is solving it: extreme uncertainty requires a different management approach that is critical for either entrepreneurial or corporate startups.

The **lean startup** method was created to help entrepreneurs dealing with **high-uncertainty problems** and give a viable solution on them. However, because startups often spend their time solving high-uncertainty problems, the lean startup method is **incorrectly associated** with startups rather than with the type of the problem. This is the reason why established companies should deal with methodologies pioneered by startups – and especially the lean startup method.

The underlying principle of using innovation management methods is to improve efficiency. In a startup environment, **efficiency means understanding the customer needs** (how much they will pay and for what products). Not understanding the needs is leading to waste of time and scarce resources, and following a wrong path. But finding those needs can only be achieved by experimentation and validated learning. *"Starting a new business is essentially an experiment. Implicit in the experiment are a number of hypotheses (commonly called assumptions) that can be tested only by experience"* [Block – Macmillan, 1985, p. 1.]. This is exactly what startups are the best in: dealing with uncertainty, and searching for the right business model. Established businesses already know the answers about their core activities. In areas of high certainty, existing business processes have been optimized to be efficient at answering such questions. But **innovation is about asking new questions**, trying new ways and searching for new opportunities – activities all associated with high-risk, and thus unusual for established organizations. The greater the risk, the greater the chance that traditional business processes and methods fail. In such cases, established businesses have a great deal in common with startups.

As exponential technologies change the nature of competition (via falling barriers to entry and economic liberalization), established firms are highly exposed to new entrants with radically new value propositions, aiming to disrupt existing markets and creating new ones. This phenomenon is **especially valid in the IT and the services sector**, where the service products are intangible, are characterized by a co-terminality of service production and consumption [Amara et al., 2008; Hipp – Grupp, 2005; Miles, 2005], and have low capital intensity [Sirilli – Evangelista, 1998]. Furthermore, startups are having significant advantages over incumbents in capturing returns on innovation [Criscuolo, 2012] while the structural inertia of established firms limits their abilities to introduce innovations because they cannot easily change their existing ways of doing things [Balasubramanian – Lee, 2008; Katila – Shane, 2005; Sørensen – Stuart, 2000].

A dense comparison of established companies and startups was made by Kawasaki, in his seminal book, The Art of the Start [Kawasaki, 2004, 2015]:

Table 10: Differences between established companies and startups

Topic	Established company	Startup
Positioning	Being all things to all people	Finding a niche and dominate it
Pitching	Sixty slides, fourteen-point font, 120 minutes	Ten slides, thirty-point font, twenty minutes
Business plan	200 pages of extrapolation from historical data	twenty pages of wishful thinking
Bootstrapping	Staying in a Hyatt Regency instead of a Ritz Carlton	Staying with college buddy instead of a Motel Six
Recruiting	Corporate head-hunters screening for candidates with Fortune500 or Big Four track records	Sucking in people who "get it" and are willing to risk their careers for stock options
Partnering	Negotiating I win / you lose deals that the press will take	Finding a way to increase sales by piggybacking on others
Branding	Advertising during the Super Bowl	Evangelizing in the trenches
Rainmaking	Spiffs for resellers and commissions for sales reps	Sucking up, downs and across
Being a mensch	Calling the legal department	Helping people who can't help you

Source: Kawasaki, 2004

I contend that these characteristics are key to **understand the innovation differential** between startups and established firms in the applied innovation management tools and methods. Next, detailing the characteristics will follow.

4.2.1 Transition between startups and established companies

When newly started companies successfully iterate on the build-measure-learn loop it also means that they are incrementally transitioning and turning to an established company. Their initial competitive advantage (high velocity in validated learning) can help them to develop more complex processes, and so changing from a project-driven to a **process-driven operation**.

One of the primary benefits of lean startups is that they were trained by principles based on lean manufacturing and so, when growing up, are well positioned to develop operational excellence, because they already know how to master discipline, develop tailor-made processes and apply lean techniques. As these companies make their transition to established companies, will be well poised to develop a culture of disciplined execution that characterizes the world's best firms, such as Google, GE or Toyota. But the transition is **just the beginning** of the story. [Ries, 2011]

A startup's work (regardless it is happening at a new entity or within a mature organization) **is never done**: even turning to established companies, they must fight to find new sources of growth through innovation. As it was already shown in earlier chapters, this imperative is coming earlier in companies' lives: none of them can expect to have years of advantage after the introduction of a brand new product or service, as immediate pressure is caused by scrappy

startups, fast followers and new competitors. [Ries, 2011] It also means that **no discrete phases can be differentiated between startups and established companies**, hence, both of them must learn to excel multiple tasks, pursuing operational excellence and disruptive innovation parallel, requiring ambidextrous organizations and managers: constantly looking backward, attending to the products and processes of the past, while also gazing forward, preparing for the innovations that will define the future [O'Reilly – Tushman, 2004]. Applying the ambidextrous concept, companies can do continuous innovation with executing their core business model while innovating in parallel.

The growth of any business requires entrepreneurs to shift emphasis and do not stick with what has been working in the past. The failure to understand the demands of the transition lead to the failure of the company itself.

Flexibility and agility is vital to figure out how and what potential customers will buy. But **agility and flexibility** must begin to make way for **reliability and efficiency** after the scalable and repeatable business model is found. This also means a transition from project mode to process mode, since, reliability and efficiency need that tasks are accomplished repetitively in a prescribed fashion, resulting in minimal variation and cost. Although work in a maturing enterprise is progressively dominated by processes, projects never go away entirely – they will be required to create new and improve existing processes. It is the leaders' responsibility to keep the good project-loving people, who found a repeatable and scalable business model and who captured the first customers, by assigning them to project work. Process-loving people should be focused on helping the enterprise to become increasingly efficient and reliable. [Lidow, 2014]

The main difference between a startup and an established company is whether the organization has found a repeatable, scalable and profitable business model or not. From activities point of view search versus execution is what makes the difference. Therefore, the primary objective of a startup is to validate its business model hypotheses (and iterate and pivot until it does). The major processes used to organize and implement the search for the business model are customer development and agile development (tools comprised in lean startup). **A search for a business model can be in any new organization** – in a brand new startup or in a new division of an existing company. Then it moves into execution mode. At this point the business needs an operating plan, financial forecasts and other well-understood and traditional management tools. The more granular are the different plans, the better people can execute it. While traditional business plans assume that their expectations are correct, startup business models assume that their expectations are probably wrong, the organization required to execute a business model significantly differs from the one used for searching that model [Blumberg, 2013].

Companies in execution mode suffer from a **"fear of failure culture"** (since they were hired to execute a known model with a detailed plan). Oppositely, startups have a **"learning and discovery"** culture for search. The fear of making a move before the last detail is nailed down is one of the biggest problems existing companies have when they need to learn how to search. The twin of this problem at startups is not having a functional organization until the proven business model is found. There are no sales, marketing or business development departments when searching for a business model. [Blank, 2012]

4.2.2 Balancing organizational set-ups

"Our organizations are set up to withstand change from the outside, rather than to embrace those changes even when they are useful" [Hagel – Brown, 2005; Ismail, 2014, p. 35.]. As **linear organizations** are built to get bigger and to take advantage of economies of scale, they **will rarely disrupt their own products or services**. They have neither the tools, nor the attitude or the perspective to do so. The paradigm of scalable efficiency drives most corporate strategy and corporate architectures. [Christensen, 1997; Ismail, 2014]

The matrix structure of large organizations is a great tool for command and control, but it is terrible for accountability, speed and risk tolerance. Furthermore, scholars observed that over time, power accrues to the support functions. These horizontals (e.g. legal, HR, finance or IT) have no incentive to say yes to any changes, so their default answer becomes no. [Ismail, 2014]

Companies reaching global scale, operating extensive facilities and having tens of thousands of employees are paying a lot, because the flip side of size is flexibility, so disruptive change is something that large organizations find extremely difficult. Therefore, **balancing exploration** (i.e. creation of new businesses, search) **and exploitation** (i.e. development of existing business, execution) is inevitable in order to thrive on both short and long term. The corresponding **integration of incremental and disruptive innovation** can basically be achieved in different ways, e.g. building ambidextrous and lean startup capabilities or teaming up with small firms or startups. Since established companies are good in exploitation and execution, their exploration and search capabilities should be improved. [Ohr, 2014]

Building lean startup capabilities and establishing partnerships with startups or small firms can be two promising, maybe even complementary ways for established companies to increase their exploration success. Depending on a particular company's industry, culture, organization and strategy, one or the other approach may turn out to be more appropriate. All these findings are summarized in Table 11.

Table 11: Search versus execution

	Search		Execution
Strategy	Business model hypothesis	→	Operating plan and financial forecasts
Process	Customer development, agile development	→	Product management, agile or waterfall management
Organization	Customer development team, founder-driven	→	Functional organization by department, led by management

Source: own design, based on Blank, 2012

4.2.3 Transformation of industries and the role of human factor

Six decades after the computer revolution, four decades after the invention of the microprocessor, and two decades after the rise of the modern internet, these disruptive technologies triggered the **transformation of all industries**. [Andreessen, 2011] Companies in every industry need to assume that **a software revolution is coming** which enables such services where the **marginal cost of supply goes to zero**. Examples could be Uber (adding an additional car and driver to its fleet costs zero) or FarmLogs (adding an additional farm using their professional farm management software costs zero). Such fast moving and fast growing companies are able to scale with **near 100 percent variable costs**, even in traditionally capital-expenditure-intensive industries: for Airbnb, the marginal cost of a new room to rent is essentially zero. Not so for Hyatt or Hilton. [Ismail, 2014]

Lean startup is also a motivation tool because it empowers people to make experiments, work in teams, make decisions, meet the customers and build their ideas. It also gives people autonomy. Once people try this way of working and building things, they would find "frustrating" going back to traditional ways, because they realise the value they are creating.

As companies are designed for execution and not innovation, a new style of human leadership is required. In such an environment, C-level managers are no longer chief decision makers. Instead, they are chief experimenters who formulate hypotheses with their teams, conduct experiments, allocate just-enough resources, empower people and let the data speak for themselves. These managers need to act as facilitators, and the result of their activity should be the data which supports decision making – and not by them, but by the facts. [Furr – Dyer, 2014a] The **main differences between traditional and entrepreneurial management** are summarized in Table 12.

Table 12: Traditional and entrepreneurial management methods

	Traditional management	Entrepreneurial management
Core focus	Execute in certainty	Experiment in uncertainty
Strategy	Protect existing resources Leverage existing resources Sustain competitive advantage	Circumvent resources Discover or build new resources Temporarily ignore advantage
Organizational behaviour	Hire experts Hire for divisional roles Hierarchical organization	Hire generalists Hire for multifunctional roles Flat organization

	Traditional management	Entrepreneurial management
Leadership and teams	Vertical team Manager-supervisee structure Maximize and optimize	Horizontal team Peer group structure Minimize and suffice
Operations	Efficient routines for execution Longer cycles Avoid error	Flexible routines for search Radically short cycles Embrace error
Marketing	Full-featured, appealing product Quantitative market segmentation Build and protect brand	Minimum feature set product Qualitative customer interaction Temporarily ignore brand
Finance and accounting	Marginal cost logic Fixed costs to lower average cost	Full cost logic Avoid fixed costs to be flexible

Source: own design, based on Furr – Dyer, 2014a

Because long and slow feedback loops between management of large organizations and teams often required considerable oversight and intervention, control and management frameworks are usually introduced. Over the last few years, however, a **new wave of collaborative tools** have emerged to allow organizations to monitor each of its teams with little oversight and maximum autonomy. Companies dealing with disruptive innovations are learning to harness these capabilities and deliver self-management – often with extraordinary outcomes – by tracking data on a real-time basis. The so-called trust frameworks are to overcome today's volatility by motivating creativity of people within organizations. [Ismail, 2014] This basic approach enables using the right methods with the right timings.

4.2.4 Right method, right time

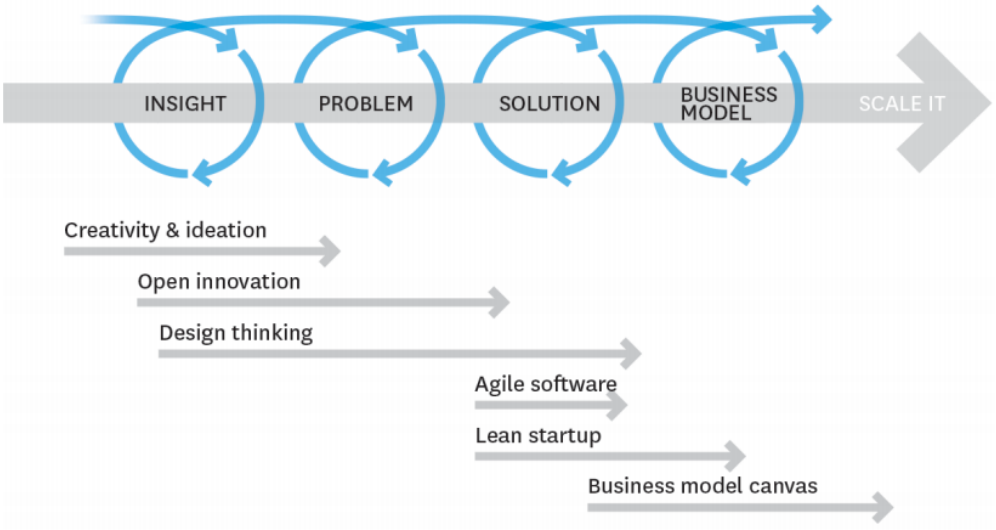
A recent research [Furr – Dyer, 2014a] has shown that **established companies can achieve innovation excellence by using different set of tools than applied by their traditional counterparts**: tools pioneered by startups and specifically designed to manage uncertainty. These can be synthesized into an **end-to-end innovation process**. The method – consisting of the **four steps** shown on Figure 22 – is for solving high-uncertainty problems and turn insights into successful innovation:

- **Step 1. Insight:** savour surprises. Searching for insights about problems worth solving.
- **Step 2. Problem:** discovering the job-to-be-done. Exploring the customers' needs or problems and going after a problem worth solving. The aim is to reach problem/solution fit (see chapter 4.4.1).
- **Step 3. Solution:** creating the minimum viable product. Instead of developing full-scale products, leveraging theoretical and virtual prototypes of multiple solution dimensions, by iterating on each solution to develop an MVP.
- **Step 4. Business model:** validating the go-to-market strategy. Once problem/solution is found, validating the other components of the business model follows. The aim is to

reach product/market fit (see chapter 4.4.1). This is followed by scaling and making the transition from a startup to a(n established) company.

Figure 22 summarizes the four-step end-to-end innovation process by giving suggestions about which innovation method should be applied during the steps.

Figure 22: An end-to-end innovation process – steps and methods



Source: Furr – Dyer, 2014a

Even though this process looks simple, billions of dollars wasted on failed innovation projects shows that it is difficult to implement. **My dissertation**, introducing most aspects of this process, **focuses on methods elaborated by startups** (namely design thinking, agile development, lean startup, business model innovation), dives into the deep of corporate practice and provides insights into the differences of the lean startup and the traditional innovation methods. Table 13 synthesizes these differences on the various levels.

Table 13: How lean startup method is different?

Traditional innovation management	Lean startup method
STRATEGY	
Business plan Implementation-driven	Business model Hypothesis-driven
NEW-PRODUCT PROCESS	
Product management Prepare offering for market following a linear, step-by-step plan	Customer development Get out of the office and test hypotheses
ENGINEERING	
Waterfall development Fully specify the product before building it	Agile development Build the product iteratively and incrementally
ORGANIZATION	
Departments by function Hire for experience and ability to execute	Customer and agile development teams Hire for learning, nimbleness and speed
FINANCIAL REPORTING	
Accounting Income statement, balance sheet, cash flow statement	Metrics that matter Customer acquisition cost, customer lifetime value, churn, viralness

Traditional innovation management	Lean startup method
FAILURE	
Exception Fix by firing executives	Expected Fix by iterating on ideas and pivoting away from ones that do not work
SPEED	
Measured Operates on complete data	Rapid Operates on good-enough data

Source: own design, based on Blank, 2013

Based on these differences, **my questionnaire** also contained several related questions on strategic and operative levels. The **results** have shown that there is a significant difference between the various traditional and lean methods applied.

4.2.5 Innovation strategies

According to a 2013 Bloomberg report, 8 out of 10 entrepreneurs who start businesses fail within the first 18 months. The ratio also applies for startups and innovation-enabled new products within established companies. Both organizations find it hard to sustain their performance on a global scale – as Kodak, Polaroid, Nokia, Yahoo or Hewlett-Packard (and countless others) have found. But why is it so hard to build and maintain the capacity to innovate? The reasons go much deeper than the commonly cited cause: a **failure to execute**. The problem with innovation improvement efforts is very often rooted in the **lack of an innovation strategy**. [Pisano, 2015]

"A strategy is nothing more than a commitment to a set of coherent, mutually reinforcing policies or behaviours aimed at achieving a specific competitive goal." [Pisano, 2015, p. 2.] Despite established companies regularly define the overall business strategy, they rarely articulate strategies to align their innovation efforts with it. But without an innovation strategy, efforts can easily become a random walk in following best practices, e.g. dividing R&D into decentralized autonomous teams, building internal venture hatcheries, setting up corporate venture capital divisions, pursuing external alliances, embracing open innovation and crowdsourcing, collaborating with customers, implementing rapid prototyping or introducing agile development. The result is that such companies will not be able to make trade-off decisions and choose the necessary elements of their innovation system. Only an **explicit innovation strategy** can support them design a system to match their specific competitive needs and appoint priorities. Therefore, the creation of a great innovation strategy should start with a clear understanding and articulation of specific objectives related to helping the company achieve a sustainable competitive advantage, while answering the following **questions** [Pisano, 2015]:

- How will innovation create value for potential customers?
- How will the company capture a share of the value its innovations generate?

- What types of innovations will allow the company to create and capture value, and what resources should each type receive?

Strategic innovation is a fundamentally different way of competing in an existing business (the way Amazon competes in book retailing is different from Barnes & Noble's way and similarly, Addepar[13], Ryanair and Apple play the game in their industries is different from their competitors). It means an innovation in one's business model that leads to a new way of playing the game. **Disruptive strategic innovation** is a specific type of strategic innovation – namely, a way of playing the innovation game that is both different from and in conflict with the traditional way. In characteristic, disruptive strategic innovations emphasize different product or service attributes, and usually start out as small and low-margin businesses, but aim to capture a large share of established markets (when not creating new markets). **Examples** include internet banking, low-cost airlines, direct insurance, online trading, car sharing or crowdsourcing. [Charitou – Markides, 2003]

As the new ways of playing the game are in conflict with the established way, **startups have a significant advantage in outperforming established companies**, therefore the lessons on these fields should be considered: a new combination of tailored activities, supporting processes and cultures are required. [Charitou – Markides, 2003] For **example**, when Lufthansa wants to compete effectively against WizzAir, it must evaluate the discount end of the market and develop the activities and processes required to be successful in it. But the new activities are incompatible with the company's existing activities because of the different trade-offs in the two ways of doing business, which make it difficult for an established company to effectively respond to disruptive innovation.

Over time, innovation strategies must **evolve**. Any strategy represents a hypothesis that is tested against the unfolding realities of markets, technologies, regulations, and competitors. Like the process of innovation itself, an innovation strategy involves **continual experimentation, learning, and adaptation**. [Pisano, 2015] Such activities are never singular. Since they are processes with several phases, behaviours and skills that are relevant during one phase of the process might be superfluous in the following [West, 2006]. For example, creativity is crucial for idea generation but does not help with working out the details of a solution [West, 2002]. A helpful framework used to conceptualize innovation is the **innovation value chain** [Hansen – Birkinshaw, 2007; Roper, 2008]

[13] A financial technology startup, located in Silicon Valley.

4.2.5.1 Innovation value chain

From innovation point of view, all companies are different, all are having unique challenges. Managers have to avoid implementing practices of others'. To avoid such problems, innovation should be viewed as a value chain comprising **three phases**: idea generation, idea conversion and idea diffusion. Six linking tasks are performed across those phases: internal, external, and cross-unit collaboration; idea development and selection; and spread of developed ideas. Any weak link can break the innovation efforts, so focus on pinpointing and strengthening the deficiencies is a must. [Hansen – Birkinshaw, 2007]

If executives tailor their solutions to the right problems, over time, a **weak link** in the innovation value chain will become a strong one – and some other part of the chain will need tending instead. Managers need to monitor each link in the chain constantly in order to continually improve the whole. The concept of the innovation value chain offers a tailored and systematic approach to assess a company's innovation performance and determine which of the practices would be best to adopt. [Hansen – Birkinshaw, 2007] The chain-based view can support executives and managers bringing in lean startup principles to their established organizations and finding new ways of (re)gaining innovative potential.

Another strategy tools to bridge lean startup with corporate innovation are the concept of the **ambidextrous organizations** and the concept of the **innovation horizons**.

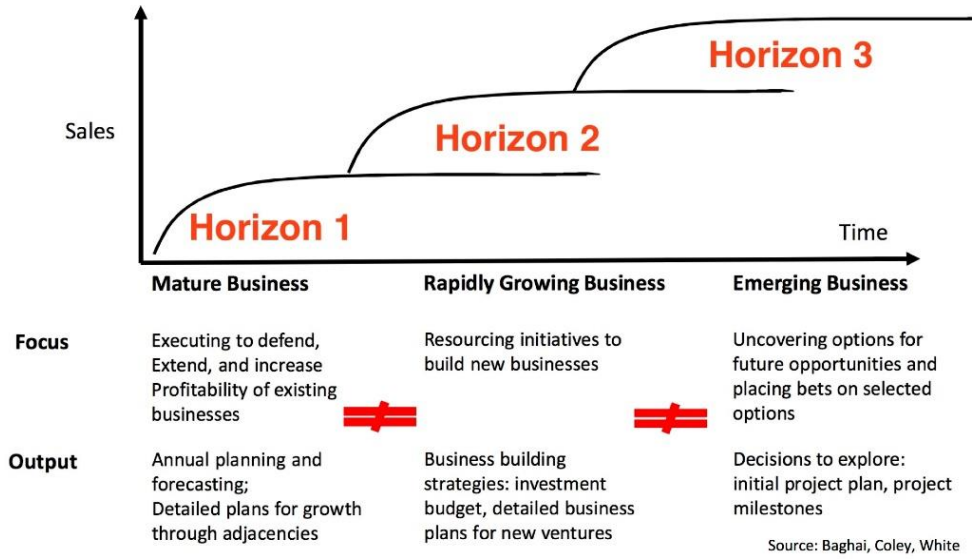
4.2.5.2 Innovation horizons

The method of the three horizons of innovation suggests that companies should allocate their innovation across **three categories** – called horizons:

1. Horizon 1 are mature businesses.
2. Horizon 2 are rapidly growing businesses.
3. Horizon 3 are emerging businesses.

Each horizon requires different focus, management, tools and goals, and produces different outputs.

Figure 23: The three innovation horizons



Source: Baghai el al., 2000

While this theory explains how to think about innovation in an established company, they do not tell how to make it happen. Reframing the theory of the three horizon theory with lean startup practice results in a powerful tool, where [Blank, 2015c]:

- **Horizon 1** is the company's core business, where the **execution of a known business model** happens. Management task is to build repeatable and scalable processes, procedures, incentives and KPIs. The aim is to achieve process innovations.
- In **Horizon 2** the company extends its core business, by looking for new opportunities via **business model innovation**. Management works by pattern recognition and experimentation inside the current business model. The goal is to make continuous innovations.
- **Horizon 3** is where companies put their crazy entrepreneurial colleagues (inside a startup they would be the funding CEOs) with the intention to create potentially **disruptive innovations**. In such a situation the company is essentially incubating a startup. They operate with speed of light and urgency to find a repeatable, scalable and disruptive business model.

When an established company wants to run horizon 2 and 3 projects simultaneously while relentlessly improving the way it executes its current business model and serves its existing customers, an ambidextrous approach is required. *„This happens when the C-level executives share a common strategic intent, a common vision, explicit values and identity, and they are compensated for both execution of the current business model and the search for new ones. They also realize that operating at all three horizons will require them to tolerate and resolve conflicts."* [Blank, 2015c, w/p]

4.2.5.3 Systematizing disruptive innovation

In order **to achieve replicable and effective disruptive innovation**, a study of the renowned ADL company [Härenstam, et al., 2015] indicated several key success factors, including having an explicit innovation strategy with clear and quantified goals, single-point accountability and commitment at top management levels, cross-functional involvement, ring-fenced funding, active corporate entrepreneur roles, agile processes and an actively managed innovation ecosystem. Companies should select the right models to suit the technology-intensiveness of the business, and the novelty of the challenges being tackled.

My observations have not only underlined the necessity of an innovation strategy, or at least an emphasis on innovation in the business strategy, but also showed that setting the focus of strategy on innovation has the highest reward when making a decision about how to become an innovation leader and what actions to take. Having quantified goals also make a difference but focusing on this is not so important. While working with cross-functional teams is more specific for innovation leaders but the difference (compared to moderate innovators) is not significant.

The upcoming chapters will introduce the different aspects and dimensions of using lean startup principles (chapter 4.3) and applying lean startup methods (chapter 4.4) at established companies. As the survey carried out among innovative companies was built up based on the results of these chapters, they count as an **important part** of this dissertation.

4.3 Using lean startup principles at established companies

The Toyota Production System is one of the most advanced management systems of the world. Toyota, as an established and global company, by elaborating and applying the lean methodology, created the most advanced learning organization in history. [Liker, 2004]

Although lean manufacturing is a powerful method for staying efficient and learning fast, entrepreneurs and managers should never forget that those methods are only manifestations of a high-functioning organization that is committed to achieving maximum performance by employing the right measures of progress over the long term. Processes are the foundations upon company cultures can develop. Only on strong enough basics can a great corporate culture be settled. [Ries, 2011]

Furthermore, lean startup works only if it is possible to build an organization as **fast and adaptable** as the challenges it faces. This requires tackling the human challenges inherent in this new way of working (as shown on Figure 24).

Figure 24: Building a (lean) corporate culture

Source: Ries, 2011

While successfully implementing lean startup methods within established companies, there are **four major kinds of issues** to be managed [Ries, 2011]:

1. As a(n internal) startup grows, the entrepreneurs who created the original concept must tackle the challenge of scale.
2. Moreover, the new product or service introduced to the customers becomes part of the public face of the company. This implies changes in PR, marketing, sales and business development.
3. After having established the market for the new product, it is time to combat the inevitable commoditization. In this case, operational excellence becomes important in increasing margins and lowering costs. The shareholders have to recognize that in this stage managers of different types are required: one who excels in optimization, delegation, control and execution.
4. Establishing predictable growth comes together with increasing operating costs and legacy products. Operational excellence is expected in automation and cost reduction. As infrastructure is mission-critical, failure of facilities or the abandonment of loyal customers can derail the whole company.

When heading forward on the **innovation path** (Figure 22) the problem (both for startups and large companies) is that employees often follow the products being developed as they are moving from phase to phase. After reaching product/market fit, talented managers stick to the product and continue working on growth and optimization rather than creating new ones. Since every new innovation competes for resources with established projects, talent becomes a scarce resource and hinders companies come up with new ideas. The way out of this dilemma is to manage the four kind of work differently, allowing strong cross-functional, cross-hierarchical and open teams to develop around each area. When products move phase-to-phase, they are handed over between teams. [Ries, 2011] Since **my research has shown** that there is a

significant difference only in cross-functionality between top and moderate innovators, it is suggested to form such squads when the aim is innovation.

This and the next chapter will show how selected lean startup principles can be applied in practice and will bring examples on this topic. The **related research sub-question** in the focus is: **B2) Are lean startup methods appropriate for unlocking innovation potential?**

4.3.1 Organizational evolution

Digital ecosystems have radically shifted the well-established paradigms enabling **endless possibilities**, adding extra layers of richness and complexity, and dramatically accelerating development timescale. Users all over the world are hungry for new products and services at an increasingly high pace. To serve them effectively the old paradigms have to be surpassed and **new approaches are required**, which enable to lead and build sophisticated capacity for **continuous and validated learning**. The organization has to evolve from hierarchical, verticalised and process-centred to **talent-driven**, where people take the responsibility and are empowered to propose, defend and execute innovation projects with autonomy. The transition to such an organization within an established company can be initialized with small initiatives, which prepares people to make mistakes, perform experiments, learn along the way and constantly improve how things are done. [Jurado – Olano, 2014]

Lean startup is about starting small, aiming high, failing, learning and scaling fast – quickly repeating on the build-measure-feedback loop. It is a package of practices about encouraging the teams to be their own critics because decisions are based not on arbitrary milestones but on market validation and ability to show the validity of key assumptions. This is a great tool to escape the hazards of "innovation by committee" and helps identify alternate options as such, also at established organizations.

It is important to note that **lean startup does not necessarily fit all projects**. Therefore, the risks the project is facing should be checked before initiating the execution. The risks to be checked can be of two types: customer risk and invention risk. In case of projects that have to cope only with invention risk, should leave the research and development talent to do the job. [Jurado – Olano, 2014] In other cases there are some rules which have to be taken into consideration:

- Projects, especially at the beginning, work just with bare minimum resources, and then investment increases as the project progresses with validated learning. As risk decreases, the required budget increases.
- Initiatives that are too early in time, immature or unfocused, should be scaled down while the ones that show traction should be fuelled up.

- Failing fast and cheap and come to the inevitable consequences as quick as possible. This can be achieved by launching smaller size projects and aiming on business and technology feasibility.
- Multidisciplinary and cross-functional teams come first. As studies [Jurado – Olano, 2014; Aalbers, 2013] and **my research** have shown (see chapter 4.2.5) teams like that carry out noticeably better projects.
- Bottom-up approach. It is essential to foster entrepreneurial spirit which results in fresh supply of ideas.
- The art of killing. When projects are not able to find the value proposition, customer's pain, or the right solution in the given amount of time, it is required to kill that project and grant another teams to come up and be successful with other ideas.
- Dealing with corporate politics and processes. Large companies are designed for execution and to serve large-scale requirements – characteristics antithetical to innovation (which would require flexibility, agility and quickness). Therefore, strong and sustained internal support is a must for successful internal venturing.

Diverse teams are more successful at answering complex questions than are homogenous groups, even when the members of such teams are more talented one-by-one than the one of diverse teams. Charles Darwin also discovered something very similar: evolution progressed fastest whenever small groups of species isolated from the main population. Similarly to evolution, small, independent and interdisciplinary teams are critical to organizations, dealing with disruptive innovations. [Page, 2007] With the proper foundation, lean startups can grow to become **lean enterprises** that maintain their agility, learning orientation and culture of innovation even as they scale.

4.3.2 Hypotheses over ideas

New ventures (both startups and new ideas in existing companies) do not start with "ideas", they start with hypotheses (a fancy word for guesses). It is important to understand that the words "idea" and "hypotheses" mean two very different things. For most innovators the word "idea" conjures up an insight that immediately requires a plan to bring it to fruition. In contrast, a **hypothesis** means we have an **educated guess** that requires **experimentation** and data to validate or invalidate.

These hypotheses span the gamut from who is the customer, to what is the value proposition (product/service features), pricing, distribution channel, and demand creation. The lean way of innovation begins with acknowledging that the idea is simply a series of untested hypotheses. What is being built needs to match the hypothesis to be tested. [Blank, 2015b] This is done by rapid experimentation.

4.3.3 Rapid experimentation

Disruptive technologies fuel rapid experimentation by making them **extremely cheap** and close-to-zero risk. There is no need to build and fund an expensive network, even when the product succeeds. Furthermore, these experiments are run on **open platforms** and take place directly at the aimed market with the aimed users, who become collaborators and help to design the next experiment. Failed efforts die quickly and cheaply, while the right combination of components coupled with the right business model triggers disruption. [Downes – Nunes, 2014]

According to CEO Dick Costolo, Twitter development teams can release experimental features to 1 percent of the users whenever they want. *"No legal, communications or CEO approval needed,"* he says [Downes – Nunes, 2014, p. 26.]. This is how a CEO and a corporate culture can promote experimentation. Another critical promoting prerequisite for experimentation is a willingness to fail. Where the internal culture accepts and acknowledges **good failure**, experiments achieve better results and more tangible outcomes.

4.3.4 Culture of failure

As most experiments fail, real progress requires trying out hundreds or even thousands of ideas. The build-measure-learn loop of lean startup is about decreasing the lag time between trials and increasing the knowledge gained from results [Diamandis – Kotler, 2015]. Furthermore, rapidly iterating on this loop is the best strategy for mitigating risk. In such situations, failure is expected and immanent part of the process.

To the contrary, within traditional corporate environments, failure usually has career-related **consequences**, which results in **risk-aversion**. Additionally, sunk-cost bias also kicks in, and despite clear data that an initiative will fail, managers tend to allocate additional resources to avoid the end. But they can only postpone it, causing unnecessary losses. The time of developing products in stealth mode is over. Instead of launching finely polished gems, companies release MVPs, using agile methods, gaining immediate feedback, learning quick and failing fast. Reid Hoffman, founder of LinkedIn said: *"If you're not embarrassed by the first version of your product, you've launched too late"*. [Ismail, 2014, p. 100.]

When failure is not an option[14], innovation-related activities lead to safe but incremental results, with no radical breakthroughs or disruptive novelties. By integrating experimentation into the corporate culture, failures can lead forward and internal innovation emerges. [Ismail, 2014]

[14] "Failure is not an option" was the motto of NASA when conducting aeronautical experiments during their space programme.

4.3.5 Innovate internally

In chapter 3.3.2 I have shown what difficulties mature companies are facing. In software development projects there is always an environment where programmers can play, make experiments try out and test their hypotheses about new concepts and see whether they are working or not. Those environments are usually called a sandbox and the goal of playing there is to learn and gain experience without taking any risk and just spending time on it.

From entrepreneurial point of view, such kind of sandbox where they can play, test hypotheses and learn is also desirable. Experiments about new methods, new ideas and solutions for newly recognized problems can be tested and incubated in the **innovation sandbox**, and then reintegrated into the parent organization. Afterwards a larger team will be needed to grow, commercialize and scale it, but this team will require the continued leadership of the same innovators who worked in the sandbox. It also gives the innovators to train new teammates about how to think lean. Having always new projects, rolling out to the parent company will result in a growing sandbox. This can lead to spreading the lean-virus throughout the organization.

Realising the innovation sandbox within an established organization also means that people in it will work like in a startup. But in a startup situation things constantly go wrong (by nature). When that happens, the team is facing the dilemma summarized by Deming: *"How do we know that the problem is due to a special cause versus a systemic cause?"* What matters is not setting quantitative goals but fixing the method by which those goals are attained. When adopting a new way of working the temptation in this situation will always be to blame the new system for the problems that arise. Learning to tell the difference requires theory because it enables to tell whether the problems that occur when introducing new methods are really problems. [Ries, 2011, p. 259.; Deming, 1986]

Implementing lean startup at established companies will always lead to frictions. Switching to validated learning always feels worse before it feels better. That is because the problems caused by the old methods tend to be intangible, whereas the problems of the new approach are all too tangible. **The lean startup is a framework and not a blueprint of steps to follow.** It is designed to build something that is perfectly suited to company needs. [Ries, 2011]

This approach also helps to keep talented entrepreneurs who are able to use and implement lean startup methods at established companies. Those entrepreneurs should be held accountable via the system of innovation accounting and promoted and rewarded accordingly.

4.4 Applying lean startup methods at established companies

The root reason for established companies' failure to innovate is that managers do not have good tools to help them understand how disruption really happens and how they should harness

exponential technologies. Some of the tools typically used for financial analysis, and decision making about investments, distort the value, importance, and likelihood of success of investments in innovation. [Christensen et al., 2008] Applying lean startup methods can help to get insight into the needs of customers and to build sustainable business around a set of products and services that serve those needs.

The global-size Spanish telecom company, **Telefonica** made a massive lean transformation project in 2014, and achieved various results with applying **lean startup** principles for their innovation projects. They realized, that lean startup allowed them to accelerate on the innovation cycles, through many **short iterations** within their projects. Their traditional waterfall-like way was to create an initial prototype, then test it, then build the new product, with reality checks just at the end of the process. With applying lean methods, they could generate meaningful learning in 1.5 months instead of 4 – a 2.6 time increase, measured in time. Additionally, they could increase the number of innovation projects by 45%, while reducing the medium budget of a project by 48%. At the end of the day the overall risk was also reduced, and the chances of having relevant impact in business within the same timeframe and budget have significantly increased. [Jurado – Olano, 2014]

Another example for measuring innovation outcome could be the US-based **Intuit**, which became an **experimentation machine** by applying lean startup. In 2006 their business unit called TurboTax[15] ran only one customer experiment, in 2012 more than six hundred and by 2013 almost 2,500. The increased number of market experiments then resulted in many successful new products. The number of their mobile apps have increased from zero in 2008 to fifty in 2013, including the very successful SnapTax app, which generated 350,000 downloads in its first three weeks. But the real proof of **extreme success** is that in 2010 Intuit generated $10 million in revenues from products launched in the prior three years. That number jumped tenfold – to $100 million – by 2012.

This section is about how lean startup methods could and should be applied at established companies, which want to stay or be innovative and competitive. The presented methods were filtered and tailored for **my questionnaire** conducted among established companies to survey their innovation methods, the achieved results and the correlation between.

4.4.1 Finding solutions and markets

Creating products or services in startup-way (regardless age and size of the company), has **three stages**:

[15] An application for managing tax declarations.

1. **Problem/solution fit:** This is the stage where companies discover a valid solution for a valid problem worth solving for a sizable population. At this stage, it is important to test users to the right hypothesis on the problem and the solution have been made. This is also a good time to learn how the product should be built.

On Figure 25, Minimum Viable Business (MVB) means that the solution is delivered manually without a product – reducing development time, money, and future failures.

2. **Product/market fit:** The most important and difficult stage out of the three. If the company is able to get pass this stage, then its product is pretty much set. This is the stage where a hypothesis is built to a product that people want and they can be served with a validated business model. No company should focus on getting users before having achieved product/market fit. The suggestion is to work with early adopters and keep tweaking the proposed solution.

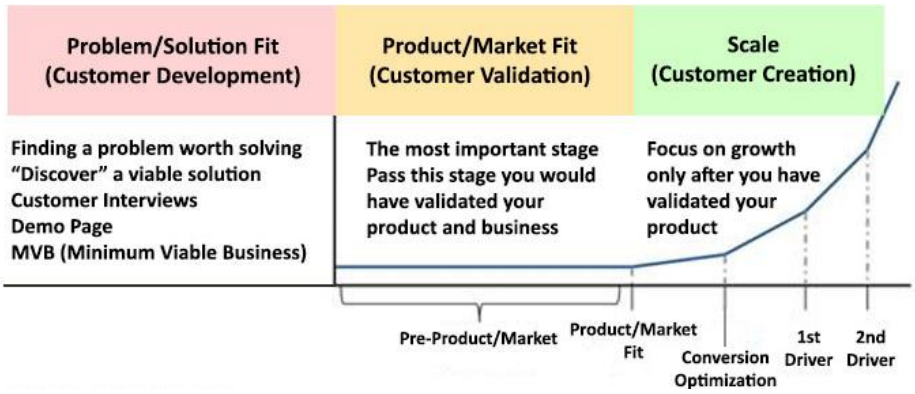
Marc Andreessen, the legendary entrepreneur and investor and one of the fathers of the World Wide Web, coined the term product/market fit to describe the moment when a startup finally finds a widespread set of customers that resonate with its product: *"In a great market – a market with lots of real potential customers – the market pulls product out of the startup. This is the story of search keyword advertising, internet auctions, and TCP/IP routers. Conversely, in a terrible market, you can have the best product in the world and an absolutely killer team, and it doesn't matter – you're going to fail."*[16]

A good way to know whether or not this stage was reached is if at least 40% of users would be very disappointed if they could no longer use the product anymore.

3. **Scale:** After it was validated that a product is a fit for the market, launching it to the mass market follows. As companies and their CEOs are rapidly resolving the uncertainties underlying their project, hypotheses will become facts, unknowns will become knowns, and uncertainties will become certainties. Focus also shifts from effectiveness to efficiency and from learning and innovation to execution and control. Management tools also change which help decision makers not in identifying possibilities and validating hypothesis but in monitoring whether everything goes according to plan.

[16] http://web.stanford.edu/class/ee204/ProductMarketFit.html

Figure 25: Three stages of a startup



Source: Maurya, 2012

4.4.2 Measuring innovation

As innovation – due to its ever-changing nature – is very **hard to measure** [Shapiro, 2006], it is also very difficult to provide recommendation how companies can innovate on a higher level. Many have provided different kinds of frameworks [Dyer – Gregersen – Christensen, 2011; Boly et al., 2014] based on patents, financial premium analysis and percent of revenue from new product. Besides, it is also emphasized that companies should adopt different types of innovation strategies [Jaruzelski – Dehoff, 2007; Pisano, 2015] which would cause mobilizing different kinds of skills at different stages of the innovation chain [West et al., 2006]. Practitioners of innovation often recognize that the main issue with increasing firms' innovativeness is often cultural [Kingdon, 2012].

Furthermore, paying too much attention to the company's most profitable customers and creating new products without asking them, make hard-working managers' in well-run businesses find it impossible to innovate successfully. The **root cause** for this is that in many cases traditional financial-analysis tools are applied in wrong ways. For example [Christensen et al., 2008]:

- Using discounted cash flow (DCF) and net present value (NPV) to evaluate investment opportunities leads to underestimated real returns and benefits of proceeding with investments in innovation.
- Wrongly considering fixed and sunk costs when evaluating future investments results in an unfair advantage of challengers over incumbents.
- Overemphasizing earnings per share as the primary driver of shareholder value creation averts resources from investments whose payoff lies beyond the immediate horizon.

Without judging these tools, it is important to note the way they are commonly wielded in evaluating investments creates a systematic bias against innovation [Christensen et al., 2009].

Therefore, when measuring innovation itself and especially the result of innovation-related activities a **new approach** and a **different mind-set** is required. Using traditional measures for

innovation might be easy but misleading and harmful. Hence, non-traditional KPIs have to be created and introduced which also support reinforcing the autonomy and cultural values that innovation brings to foster technology differentiation and strategic value creation. These **metrics** should take into account that innovation projects are looking for mid/long-term results, so they will be **more qualitative** than quantitative. Not only creating these metrics is crucial but also their internal communication: colleagues and teams have to be aware of the success criteria, so they do not get mistreated comparted to those people who work on the core products of the company. [Jurado – Olano, 2014] Measures applied will differ not only on a project-by-project basis but also on the lifecycle stage of the company.

- Two underlying examples from Telefonica:
    - The time to market and the results achieved by validated learning at innovation projects: the traditional and the lean startup way.
    - The number and cost of innovation projects: achieving more with less.
- Three cases from Intuit:
    - The number of customer experiments and as the result: dramatic increase in finance numbers.
    - Revenue from products launched in the prior three years.
    - Innovation premium: the difference between a firm's market capitalization and a net present value of cash flows within existing businesses. The difference represents the educated guess that the company will be able to generate profitable new growth. The technique is mainly for public companies. Having introduced customer experiments at Intuit also resulted in a 33%-fold increase in its innovation premium just in 4 years.

After the two examples above, let us see the details.

4.4.2.1 Metrics that matter

General and financial management techniques of the last century were planned to be used in **predictable** economic environment – to fine-tune margins and squeeze the highest return on investment out of slow-growing or even dying markets – and thus, applying them to situations governed by extreme uncertainty and frequent pivots (e.g. disruptive innovations) is counterproductive. The standards applied by traditional accounting are invariant to market circumstances, and so its indications are not reliable predictors for companies operating under conditions of extreme uncertainty. This is where metrics comes into the game, which make not only technology-related innovation measurable and quantifiable but also its planning and steering. Continuously monitoring customer behaviour and reactions open the path before validated learning and quick product development. Including lean principles, it **eliminates**

waste by minimizing delivery and development time and efforts. All these make the startup ready to serve customer needs just the right way.

Using the **right metrics**, tracking its changes, finding the causes and having a good grip of the relationships requires a new approach. Innovation accounting is the right tool for selecting, building and applying the right metrics. Moreover, it also helps to establish and validate the business model and convert it to a quantifiable financial plan. That plan provides assumptions about what the business will look like in the future assuming an optimistic scenario. This approach helps to spot the three most important **factors of growth** [Kristóf, 2014]:

1. The profitability of each customer.
2. The cost of acquiring new customers.
3. The repeat purchase rate of existing customers.

One centrepiece of lean strategy is collecting data from the first moment, and concentrating on important questions and functions: initially about the identified problem and its potential market, than about the functions of the product and its possible inception. **My research** has also found significant correlation between innovation excellence and the application of innovation-related metrics (see chapter 5.2.4).

4.4.2.2 Lean analytics and dashboards

Dashboards are driven by analytics, which manipulate data collected throughout the organization and the operation. There is a **historical trade-off** between data collection and running the company. Collecting data about operation and creating statistics takes time, effort and expensive IT. That is why results are usually tracked annually or quarterly.

Today's startups and data-driven enterprises are leveraging technology to gather data about **everything**. They are leveraging wireless devices, the internet and cloud-based applications to track activities online and real time. Given the huge amount of data from customers and employees becoming available, today's companies need a new way to measure and manage their organizations: real-time, adaptable dashboard with all essential metrics, accessible to everyone who is involved. [Ismail, 2014] But data in itself is useless. Information extracted from data is more important in finding the **focus** – not only for startups but also for mature organizations. **Lean analytics** provides the right solution for it.

Managers should know what their position and situation is, where their organization is heading, otherwise their decisions will lead to the desired state only accidentally and not consciously. Focus is not the synonym of tunnel vision or myopia. As the company is evolving, the metrics to be applied will also change. [Croll – Yoskovitz, 2013] Picking the right metrics enables companies to run more controlled experiments quickly and compare the results more effectively, and it also helps to tell the **right questions** and get the answers. With the right

metrics it will be also possible to track and measure advancement and evaporate illusions. As this is done by continuous experiments, it makes the teams more focused. When they are focused on retention, they may be looking at churn, and experimenting with pricing, features, improving customer support, and so on.

Data-driven operation results in continuous feedback and specificity, which are essential for inducing behavioural change and energizing, motivating and driving the company morale and culture. [Ismail, 2014]

Analytics frameworks are critical in managing large-scale growth, which requires proper instrumentation of business and real-time assessments. Without such a function, companies are liable to loosing focus, getting back to "vanity" metrics, or having misguiding KPIs, defining wrong key success factors and forgetting the importance of risk.

4.4.2.3 Key success factors and capabilities of innovation

In the previous sections we learned that there is **no single factor** of innovation success, rather a multitude of them. There is no general rule what can be applied – what needs to be measured and controlled, depends on the situation: the company, the market, the product, the competition and the environment. Based on academic **research** and innovation management **practice**, important factors can be identified, which have various effects on the success of innovations: culture, physical space, people, organization, flexible management of financials and processes. [Leroy, 2014; Jaruzelski – Dehoff, 2010]

All the factors play different roles and have different effects on innovation. While Harvard researchers identified nine critical success factors [Govindarajan, 2011], a Boston-based consultancy firm found that innovation leaders consistently outperformed laggards on **five** manageable **capability areas** [Almquist et al., 2013]:

1. A clear, specific innovation strategy, which includes setting goals and determining investment priorities.
2. An organization with a culture that nurtures innovation, an organization supported by the right people, processes and organizational structure.
3. An effective idea generation and development process to create attractive new offerings, both by generating a broad and diverse set of ideas and, especially, by converting these ideas into profitable business concepts.
4. A diverse innovation portfolio that has the right size, shape and speed. A portfolio aligned with its strategy.
5. An effectiveness at scaling new business ideas, supporting them with the appropriate level and type of resources. It also has to create feedback loops to learn how to reinforce, redirect or (when necessary) kill new ideas.

Being successful requires companies to make innovation a **core** management process. Success comes from focusing the organization on goals, adhering to solid practices in moving toward those goals, and making decisions quickly and effectively.

4.4.2.4 Emerging risk

In general, corporate architectures are set up to withstand risk and change, and corporate planning efforts attempt to scale efficiency and predictability – by creating static environments with the belief of reducing risk. [Ismail, 2014]

It is a cliché to say that the world is more risky than ever before, but few people realize the extent of the **increase in risk** over the past thirty years. More important, they do not understand that greater risk has created the need to change the way most organizations are managed. The challenge of creating a customer is more complex and risky than ever before. To understand that risk, first the **two types of uncertainty** should be characterized:

- Technological uncertainty: can a desirable solution be made? It results from uncertainty regarding the technologies that might emerge or need to be created for a new solution to appear.
- Demand uncertainty: will customers buy it? It results from unknowns about customer preferences and behaviour.

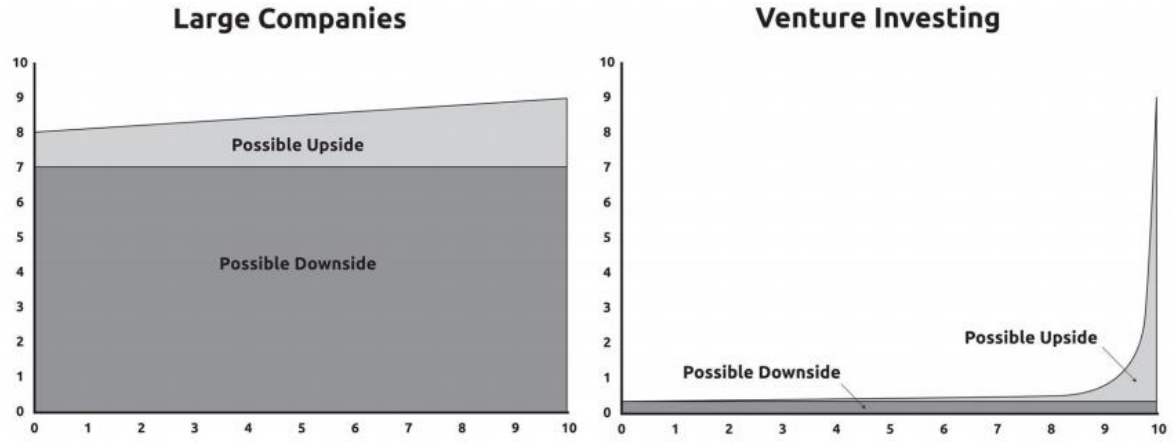
Uncertainty arises from the unknowns associated with solving any problem, which are sometimes called "unknown unknowns," such as hidden customer preferences or undiscovered elements of a technical solution. In the last decades this uncertainty was mainly powered by **two disruptive technologies**: the personal computing and the internet. Another key is the emergence of capitalism in the BRIC countries[17] and the rise of 1 billion potential entrepreneurs, enjoying lower technical barriers to entry (with open source and cloud technologies), lower capital barriers (with the growth of venture capital, angel funding and crowdsourcing), lower production barriers (with the adoption of 3D printers and global suppliers), and lower distribution and marketing barriers (with the internet and social media) resulting in considerably more competitors than ever before. These changes have increased risk to a **tipping point**, beyond traditional methods used in organizing and managing corporations will no longer work to sustain growth in the future. [Furr – Dyer, 2014a]

As long as small companies can afford to take bigger risks and take chances introducing a disruptive idea to their market, established companies with more at stake, including more investors and a larger audience and client base, tend to stay safe by sustaining their company

[17] BRIC refers to: Brazil, Russia, India and China.

with new but incremental ideas. This is in relation with predictability: as long as incremental steps are predictable, real disruption is not. Achieving it requires experimentation, quick learning (fast fails) and continuous feedback. **The different risk profile of startups and established companies** determines the possible upsides and downsides of innovation-related investments. This is shown on Figure 26.

Figure 26: Possible upsides and downsides at established companies and venture-backed startups



Source: Ismail, 2014

In today's fast changing world the biggest risk is not taking risk. Lean startup method provides **appropriate answers** for handling it with business model canvas, validated learning, rapid experimentation and innovation accounting.

4.4.3 Innovation accounting

To foster innovation in a large organization, open minded managers usually decide to build cross-functional teams. To hold them accountable they do not choose the traditional way of organizing the company into strict functional departments. Instead they measure progress based on so-called **learning milestones**. If they plan to do so, it is pretty sure that the first feedbacks both from employees and shareholders will be that the new process will reduce productivity. The involved people will probable suggest to keep the old way of working, in which they had the opportunity to "stay efficient" by working in larger batches and passing work between departmental silos. [Ries, 2011]

Lean startup represents a **new way** of developing innovative products while emphasizing fast iteration, customer insight, quantified goals and great vision, – all at the same time. For quick achievements it asks people to **measure** their productivity differently, so their priority task is to avoid creating products nobody wants, to figure out the right thing to build, and learn from failures as quickly as possible. Measuring this progress desires a new kind of accounting, which is called **innovation accounting**.

According to the definition, a startup is a temporary organization designed to search for a repeatable, scalable and profitable business model. Its job is to rigorously measure where it is

right now and then carry out experiments to learn how to move the business numbers closer to the ideal ones stated in the business plan. When we are talking about innovation at established companies, the aim of the activity is the same. The only difference is in the frame: as long as a startup needs to find that business model for an entire company, at established organizations it is only true for the new product or service – the startup happening inside the business. Innovation accounting is about providing **support** for this activity.

4.4.3.1 Accountability framework

At companies, accounting is the **necessary evil** used to prepare reports and support audits. But it is also a tool for exerting centralized control over the company and its divisions. It enables to set financial milestones and hold managers accountable in reaching that goals. Furthermore, it can also be used to measure how efficient a department is. Unfortunately, startups are too unpredictable to rely on the planning possibilities provided by the traditional accounting. This kind of uncertainty is also true for the whole process of innovation. If somebody wants to apply traditional accounting for startups or for innovation projects, makes a mistake.

Making measurable milestones is not enough. But then, how is it possible to know that the changes made are strongly correlated to the results experienced? How can a company be sure if it is drawing the right lessons from the changes? To answer these questions, **innovation accounting** is required, which is geared specifically to disruptive innovation: it **enables data-driven decision making** at companies by offering an intuitive way to present complex information in a simple a cogent way. [Ries, 2011]

Furthermore, innovation accounting enables to measure how learning within the organization happens. Metrics than enable to judge whether progress is made, and it is made in the right direction – towards a sustainable business. Moreover – which was also shown by **my research** – it also supports to quantify the corporate and innovation strategy, the experiments carried out and all the efforts made towards introducing something new.

The first step of innovation accounting is to turn business hypotheses into a quantitative financial model. As it will be detailed in chapter 4.4.4.1, every business plan has a business model in the background and tells what the business will look like at a successful point in the future. The accountability framework makes it clear when the company is stuck and needs to change direction (make a pivot) and search for new learning opportunities.

4.4.3.2 Three learning milestones

Learning milestones are **alternatives** to traditional business and product milestones. Learning milestones are useful for entrepreneurs as a way of assessing their progress accurately and objectively. Accounting innovation means repeating a loop consisting of **three steps** [Ries, 2011]:

1. **Establish the baseline:** Using a minimum viable product to establish real data on where the company is right now. It gives a clear picture of the current status and draws a line in the sand from which progress can be measured. As the MVP is used to test assumptions, and if the company wants to maximize learning efficiency it is not a question to test the riskiest assumption and see whether it can be mitigated.
2. **Tune the engine:** Tuning the engine means carrying out experiments to see if the company can improve metrics from the baseline towards the ideal. It means minor changes in its value proposition, targeted at improving one of the drivers of its growth model.
3. **Pivot or persevere:** In case the progress towards the ideal status is sufficient, it means that the company learns appropriately, so it is worth to continue. Otherwise the conclusion should be that the current product strategy is flawed and needs serious change, it means a pivot is required. When a company makes a pivot than everything starts from the beginning: a new baseline is drawn, and tuning the engines happens again.

4.4.3.3 Metrics that matter: actionable, accessible, auditable

Companies (of any size or age) often commit a fault and rely on the wrong kind of metrics to guide their actions. These metrics show the rosiest possible picture, and that is why they are called **vanity metrics**. Building and applying the right metrics are the inputs of innovation accounting. If vanity metrics are used than innovation accounting will not work. The alternative is such kind of metrics which can be used to judge the real status of the business and the learning milestones.

Performance measures are very dependent on the stage of the business. In a startup or in the case of a new product, after the first several months, the metrics change and then, after several additional months, they change again. Regardless the stage, metrics should have the following **characteristics**:

1. **Actionable:** an actionable metric must demonstrate clear cause and effect (otherwise it is a so-called vanity metric). In practice it means that reports built up of actionable metrics and used to judge the learning milestones have to make it extremely clear what actions are necessary to replicate the results (while vanity metrics fail this criterion). The situation is known: when the numbers go up, everybody thinks that the improvement was caused by their actions. But when the numbers go down, everybody says that it is somebody else's fault. Actionable metrics are the antidote to this problem: when cause and effect is clearly understood, people are better able to learn from their actions, and are more accountable.

2. **Accessible:** many decision makers face the problem of report proliferation. The result is that decisions will not be based on facts. The solution is that reports should be made as simple as possible so that everyone understands them. The easiest way to make reports comprehensible is to use tangible and concrete units. The gold standard of learning metrics are the cohort-based reports which tell that among the people who used the product in a given period, how many of them exhibited each of the behaviours which are important. Furthermore, accessibility also refers to widespread access to the reports. This can be achieved also by the design of the report but also technologically making it available.
3. **Auditable:** the data used in metrics or reports have to be consistent with reality. It means that it should be possible to test the data by hand, by talking to customers. This is the only way to be able to check if the reports contain true facts. Systems that provide this level of auditability give managers and entrepreneurs the opportunity to gain insights into why customers are behaving the way the data indicates.

These rules are clearly understandable but **I see** that applying them makes the real challenge for businesses – and especially established companies which already have an implemented accounting system aiming at fulfilling the regulatory obligations. But quantifying innovation-related targets and relying on numbers when making decisions pays off: **my research has also highlighted** that it gives a significant advantage for companies which are quantifying their business targets and measuring their progress. The details are in chapter 5.2.

4.4.3.4 Learning comes first

It was observed by John Brown and John Hagel [Brown – Hagel, 2013] that although most large organizations are set up to scale efficiencies, in the age of disruption what they actually need to **scale** is **learning**. And while some very good business intelligence systems exist on the market, they are set up largely to measure scaling of efficiency. What is needed now are new metrics that measure the learning capability of organizations. Measuring learning is about tracking for **example** [Ismail, 2014]:

- How many (lean startup) experiments or A/B-tests did the company run last week?
- How many innovative ideas have been collected over the past year? How many have been implemented?
- What percentage of total revenues is driven by new products from the last three years? The last five years?

Learning is the central activity in making progress towards successful innovations. While measuring disruptive innovations it should be taken into consideration that traditional accounting was designed to record linear activities, but disruption is exponential.

This approach **helped me** to include learning-related questions into my survey. The above example about total revenues driven by new products from the last three years was used to measure and compare innovation performance of the observed companies.

4.4.3.5 Tools that make innovation accounting work

In the upcoming paragraphs, the most popular and useful innovation accounting **tools** are summarized, suggested by the lean startup method [Ries, 2011]:

- **Net promoter score:** In a 2003 Harvard Business Review article entitled "One Number You Need to Grow", Fred Reichheld introduced the concept of a Net Promoter Score (NPS), which measures the loyalty that exists between a provider and a consumer. [Reichheld, 2003] The net promoter score is a great source of actionable metrics about what customers really think of a certain product. This is a kind of measure which is very stable over time. Since it is measuring core customer satisfaction, it is not subject to minor fluctuations. It registers only major changes in customer sentiment. The metric is based on a single question posed to customers: How likely are you, on a scale of 0 to 10 (from not at all likely to extremely likely), to recommend this product or service to a colleague or friend? A product's NPS is the percentage of promoters (those who score themselves 9-10) minus the percentage of detractors (scores 0-6). An NPS that is positive (i.e., higher than zero) is considered good, and an NPS of +50 is excellent.
- **Smoke test:** Before building any prototype, a smoke test might be performed. This is an old direct marketing technique in which customers are given the opportunity to pre-order a product that has not yet been built. A smoke test measures only one thing: whether customers are interested in trying a product. By itself, this is insufficient to validate an entire growth model. Nonetheless, it can be very useful to get feedback on any assumption before committing more money and other resources to the product.
- **Cohort analysis:** This is one of the most important tools of startup analytics. Although it sounds complex, it is based on a simple premise. Instead of looking at cumulative totals or gross numbers such as total revenue and total number of customers, one looks at the performance of each group of customers that comes into contact with the product independently. Each group is called a cohort. The analysis shows e.g. the conversion rates of new customers who joined in each indicated month. Each conversion rate shows the percentage of customer who registered in that month who subsequently went on to take the indicated action.
- **Split (or A/B) tests:** A split (or A/B) test experiment is one in which different versions of a product are offered to customers at the same time. By observing the changes in behaviour between the two groups, one can make inferences about the impact of the different variations. This technique was pioneered by direct mail advertisers.

- **Continuous deployment:** The approach attempts to design, develop and ship new features at a time, taking advantage of the power of small batches. It requires that instead of working in separate departments, engineers and designers work together side by side on one feature at a time. Whenever a feature is ready to be tested with customers, a new version of the product is released, and going live for a relative small number of people. It also makes the team able to immediately assess the impact of their work, evaluate its effects on customers and decide what to do next. For tiny changes, the whole process might be repeated several times per day.
- **The five whys:** The core idea of the five whys (developed by Taiichi Ohno) is to tie investments directly to the prevention of the most problematic symptoms. The system takes its name from the investigative method of asking the question "Why?" five times to understand what has happened (the root cause). At the root of every seemingly technical problem is a human problem. Five whys provide an opportunity to discover what that human problem might be.

Despite the suggestions of Ries, **my opinion** is that the difficulties applying these tools are twofold: operational and cultural. While operational difficulties are mainly rooted in the lack of data, it is harder to make them as an everyday tool to make innovation accounting work.

4.4.4 Business modelling

Business model is "a term of art" [Lewis, 1999]. It is used to describe and classify businesses, especially in an entrepreneurial setting, but it is also used by managers inside companies to explore possibilities for future development [Baden-Fuller – Morgan, 2010]. Business modelling is the activity creating business models which are used for a broad range of informal and formal descriptions to represent core aspects of a business.

4.4.4.1 Business plan and business model

Business plans are still the **major planning tools** for startups and also for established companies. In the case of startups before investment it is requested by possible future investors, and in case of established companies it is demanded by stockholders.

There is a debate whether the existence or the quality of the business plan (measured by business plan competitions) have positive impact on the firm's performance or the possibility of getting funded. [Carland – Carland, 2003; Heriot – Campbell, 2004; Ripsas et al., 2008]

The problem with business plans is that they are based on **assumptions** that **everything is known** upfront. Business plans are static documents, created in isolation before the idea owner has even begun to build the product, and therefore contain a large number of **untested hypotheses** which sum up to a very high risk. In case one assumption turns to be not true it can affect the whole plan and erode its value. [Mullins – Komisar, 2009] Accordingly, the famous

citation by General Douglas MacArthur: *"No plan ever survives its first encounter with the enemy"* was translated to business plans by Steve Blank: *"No business plan survives first contact with a customer"*. [Blank, 2010b, w/p]

It does not mean that operating plans or business-related forecasts are useless. Instead **business models** [Osterwalder, 2010] should be used for organizing the thinking about the fundamental hypotheses and **collecting facts** about that hypotheses in order to keep or reject them, and so summarize the early hypothesis around an innovation. Writing the business plan should be followed only after.

Business models **capture the value** of innovation and are considered an eminent means to commercialise new ideas [Chesbrough – Rosenbloom, 2002; Chesbrough, 2010; Teece, 2010; Schneider – Spieth, 2013] by describing the rationale how an organization creates, delivers and captures value [Osterwalder – Pigneur, 2010]. Furthermore, it serves as a structural template of how a focal firm (being a startup or an established one) transacts with customers, partners and vendors, and how it interacts with the surrounding markets [Zott – Amit, 2003]. It is also called as a *"proactive way to experiment with different models"* [Chesbrough, 2010, w/p]. Today, it is widely used by researchers, scholars and practitioners, not only in conducting business but in finding new opportunities in different sectors such as government, research and development, and education.

4.4.4.2 Business model canvas

Business plans of startups or any innovation-related new product often face **pressure to change** when introduced to customers. It is mainly because of the uncertainty and unpredictability of disruptive innovation and exponential technologies, thus the related business plans are very unlikely to be accurate. Such plans are good fit only in situations where the company exactly knows what needs to be done: in situations where the market, the customer, and their needs are all evidences.

Startups (which are not smaller versions of big companies) are not about executing but searching for a repeatable, scalable and profitable business model. They go from failure to failure while adapting and changing their plans. Consciously looking for learning opportunities is something very different from focusing on avoiding failure, which is an established company characteristic. In terms of business planning, the focus for a startup is in the uncertain future, while established companies have the luxury (and curse) of having historical data which they can use to create future plans [Kawasaki, 2004].

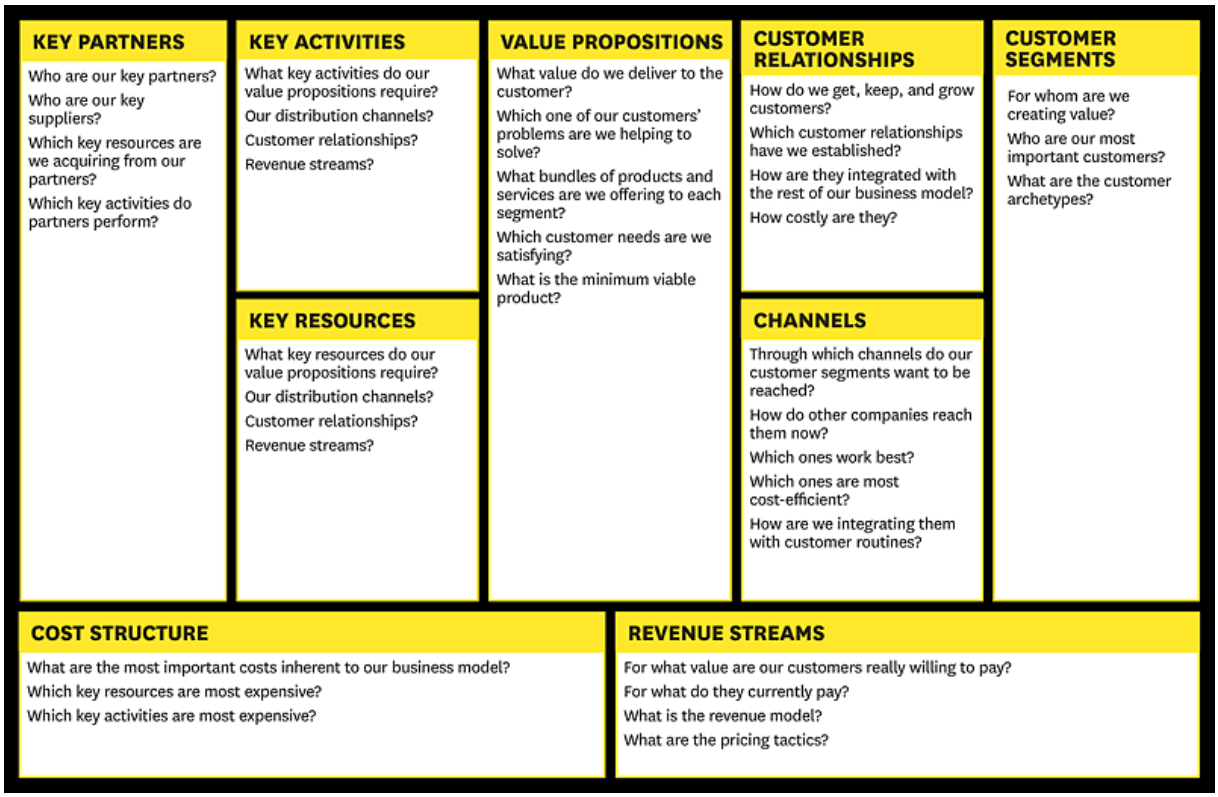
The aim of elaborating a business plan for a startup slightly differs that for a company. The goal of the "lean" business planning process is to produce three outputs:

1. First, is a single slide that the startup will use to define its business model and the underlying hypotheses.
2. Second, is a short presentation for partners and investors.
3. Third, is the mission, vision, and values statement.

The business model is best understood as a **diagram** that shows all the **flows** between the different parts of the company. This includes how the product gets distributed to customers and how money flows back into the organization. It also illustrates the company's cost structures, how each department interacts with the others and where the company can work with other companies or partners to implement the business. It centres the value proposition by appointing what pains are solved, what value is delivered and which needs are satisfied.

For **visualizing and representing** the business model of an innovative idea, the **business model canvas** can be used. It is a strategic management and lean startup template for developing new or documenting existing business models. It is a visual chart with elements describing a firm's or product's value proposition, infrastructure, customers, and finances. It assists firms in aligning their activities by illustrating potential trade-offs. It has **nine building blocks**, which summarize the business model in a simple one-page format – as shown on Figure 27.

Figure 27: The Business Model Canvas



Source: Blank, 2013

Osterwalder's work and thesis [2010; 2004] propose a single reference model based on the similarities of a wide range of business model conceptualizations. With his business model

design template, an enterprise can easily describe their business model, with assisting them in aligning their activities by illustrating potential trade-offs.

4.4.4.3 Business model innovation

In 2001 Apple launched its iconic iPod brand of portable media player. The device works in conjunction with iTunes software that enables users to transfer music and other content from the iPod to a computer. The software also provides a connection to Apple's online store so users can purchase and download content. With creating the iPod, Apple just assembled available technology and offering in new way, never known before. They were neither the first portable music player manufacturers nor the first online media content retailers.

But how could Apple so quickly disrupt a whole industry? It competed with a very different business model. On the one hand, it offered users a seamless music experience by combining the distinctively designed iPod devices with the iTunes software and the iTunes online store. Apple centred easy search, buy and enjoy digital music as its value proposition. On the other hand it negotiated with all the major record companies to create the world's largest online music library. The company was able to achieve **scalability** by turning their organization inside out.

Firms like Apple, GE or IBM are well-known examples of established firms which have successfully innovated their business models. Their renewed success in the market cannot be explained by the mere introduction of new products or services alone but rather by their novel way of doing business as a whole. The companies have managed to develop distinct innovative business models that set them apart from other firms and create additional value for their customers and partners. As the examples illustrate, **business model innovation** is a **powerful tool** for a firm to achieve superior performance and, as such, a desirable goal. The business model innovation process consists of the following four steps [Frankenberger et al., 2013]:

1. **Initiation:** activities which focus on the understanding and monitoring of the surrounding ecosystem and the current business model of the innovating firm. The two main challenges in this step are to understand the needs of the players within that ecosystem, and to identify the change drives.
2. **Ideation:** focuses on the generation of ideas for potential new business models. The three main challenges of this step are: difficulty to overcome the current business logic, difficulties to think in business models, there are no systematic tools to develop new business model ideas.
3. **Integration:** puts emphasis on the development of a new business model based on promising ideas identified in the ideation phase. The two related difficulties are: integrate all pieces of the business model, and the involvement and management of partners.

4. **Implementation:** involves huge investments to be made and risks to be taken. The two related challenges are to overcome internal resistance, and to manage the chosen implementation approach.

My opinion is that over time, an established business model begins to determine the types of value propositions an organization can and cannot deliver. In other words, once the pieces of a business model have coalesced to deliver a particular value proposition, the causality of events begins to work in reverse – only value propositions that fit the existing resources, processes, and profit formula of the organization can be successfully taken to market. This is the **root cause of innovation inabilities of technologically advanced firms**: despite their R&D teams present breakthrough technologies, their business model is only capable to market existing solutions. Besides focusing on creating new products, they have to concentrate also on **continuously renew their business models**.

4.5 Practical establishment

In this chapter I provided an overview and a detailed introduction about the **practical establishment** of the lean startup approach at mature companies. The focal sub-questions of the research got the answers summarized in Table 14 below, which also contains the evaluation of the attainment of the research sub-objectives.

Table 14: Findings of and contributions to Practical establishment

Research sub-questions and findings	Research sub-objectives and contributions
B1) What established companies can learn from startups in the fields of innovation management?	**To provide practical distinction between startups and established companies, and a detailed description about their innovation management practices and strategies.**
The most important lesson is that while businesses are turning from startups to established companies, they (usually unintentionally) begin to ignore the principles behind their initial success: not making a difference between early adopters and mainstream customers and relying on vanity metrics. Similarly painful is the fear of failure culture of companies, which makes them unable to learn how to search for new business models and opportunities. Their linear organizations are built to continuously get bigger and take advantage of economies of scale – but this will rarely disrupt their own products or services, so somebody else will come up with such offers. Furthermore, the reason for their failure to innovate is that they usually do not dispone over good-enough tools for understanding how disruption really happens and how	The main difference between a startup and an established company is whether the organization has found a repeatable, scalable and profitable business model or not. From activities point of view search versus execution is what makes the difference. Established businesses already know the answers about their core activities. In areas of high certainty, existing business processes have been optimized to be efficient at answering such questions. But innovation is about asking new questions, trying new ways and searching for new opportunities – activities all associated with high-risk, and thus unusual for established organizations. Innovation strategies are very similar to innovation itself. They mean innovation in business models which equals a new way of playing the innovation game. Disruptive strategic innovation is a specific type of strategic innovation – namely, a way of

Research sub-questions and findings	Research sub-objectives and contributions
exponential technologies should be harnessed. The same is true for measuring innovation. The related difficulties are that financial management techniques of the last decades were planned to be used in a predictable market environment, to fine-tune margins and squeeze the highest return on investment. Applying them to uncertain and unpredictable situations (which is immanent to disruptive innovation) is counterproductive. Another important lesson is that they should be aware of the differences between traditional and entrepreneurial management and to know what methods to apply and what time. Experimentation, discovery, generalist staff, horizontal teams, flexible routines, embraced errors, and avoidance of fixed costs are the most important slogans.	playing the game that is both different from and in conflict with the traditional way. In characteristic, disruptive strategic innovations emphasize different product or service attributes, and usually start out as small and low-margin businesses, but aim to capture a large share of established markets (when not creating new ones). My summary about the differences between startups and established companies brought **additional approval and understanding** to the conclusions of Kawasaki [2004, 2015], Blank [2012, 2013] and Furr – Dyer [2014a].
B2) Are lean startup methods appropriate for unlocking innovation potential?	**To present lean startup principles and methods from the specific perspective of getting them used and applied at established organizations.**
While companies turning to established ones, need to balance between size and flexibility, otherwise they will feel disruptive change extremely difficult. In practice it means balancing between exploration (i.e. creation of new business, search) and exploitation (i.e. development of existing business, execution). The corresponding integration of incremental and disruptive innovation can basically be achieved by building lean startup capabilities. Results from Harvard researchers has shown that lean startup means an appropriate method for unlocking innovation potential in the phases of building solutions and business models – it means in creating the minimum viable product and validating the go-to-market strategy. It is important to note that lean startup does not necessarily fit all projects. It has its greatest added value in case of extreme uncertainty, where experimentation is emphasized over planning, customer feedback over intuition, and iterative design over business plan building. The mentioned cases of GE, Telefonica and Intuit have also shown that the lean startup methods have found their ways to established companies, and provided examples about	The digital transformation has dramatically accelerated the development timescale. Customers all over the world are thirsty for novelties. To serve them effectively, new approaches are required, which enable to lead and build sophisticated capacity for continuous and validated learning. Businesses have to evolve to talent-driven organizations, where people take the risk of failure, and are empowered to propose, defend and execute innovation projects with autonomy. Lean startup principles show what testing hypotheses means and how this approach should be used when making rapid experiments. Focusing on validated learning evolves the culture of accepting and even rewarding failure as the inexhaustible source of new knowledge. Furthermore, lean propagates an original approach for measuring innovation itself and especially the result of innovation-related activities, because using traditional measures for innovation might be easy but misleading and harmful. Innovation accounting is the right tool for selecting, building and applying the right metrics. Moreover, it also helps to establish and validate the business model and convert it to a quantifiable financial plan. That plan provides assumptions about what

Research sub-questions and findings	Research sub-objectives and contributions
how the selected tools could and should be applied.	the business will look like at a successful point in the future. The lean startup is not a blueprint of steps to follow, but serves as a framework for measuring progress towards a repeatable, scalable and profitable business model. But companies have to be aware: their business model will determine the types of value propositions they can and cannot offer for their customers. In other words, once the pieces of a business model have coalesced to deliver a particular value proposition, the causality of events begins to work in reverse – only value propositions that fit the existing resources, processes, and profit formula of the organization can be successfully taken to market. Besides focusing on creating new products, they have to concentrate also on continuously renewing their business models. With giving an overview about lean startup in practice, I could also provide **new extensions** to the general knowledge about the topic. This knowledge was utilised when I was collecting the methods for being surveyed at startups and established companies, while finalizing the questionnaire and translating the various methods to clear questions.

Source: own design

The next chapter will present the outcomes of my research and their evaluation based on the results of the theoretical foundation and practical establishment.

5 Towards innovation excellence and disruption

"Not all problems have a technological answer, but when they do, that is the more lasting solution."

Andy Grove

The research presented in this dissertation is aimed at increasing the understanding of applying lean startup methods at established companies to intensify innovation performance, and to show the effects of managerial intervention for improving disruptive potential. I have studied the consequences of applying various methods, both at operative level as well as at strategic level, and additionally in a disruptive dimension.

After specifying the topic (chapter 1), presenting the research methodology (chapter 2), laying down the theoretical foundation (chapter 3) and elaborating the practical establishment (chapter 4) of traditional and lean innovation management, this chapter presents the **results of the empirical research** by giving answers on the **sub-questions** related to **C) Managerial implication**.

The objective of this part is to **create a conceptual roadmap** which shows the way towards innovation excellence and disruptive ability. This objective was planned to be attained through analysing innovative companies while ascertaining their general and innovation profile, exploring the innovation management tools and methods applied by them, and measuring their innovation performance – supported by a sample-based survey, and by targeting the **sub-objectives** summarized in Table 15.

Table 15: Sub-questions and sub-objectives related to Managerial implication

Sub-question	Sub-objective
C) Managerial implication	**To create a conceptual roadmap which shows the way towards innovation excellence and disruptive ability.**
C1) How top and moderate innovators are different from innovation management point of view?	To specify the significant differences between top and moderate innovators and their innovation performance.
C2) How startups and established companies are different from innovation management point of view?	To specify the significant differences between startups and established companies and their innovation performance.
C3) What are the enabling factors of being a disruptive innovator?	To deliver a holistic understanding of the key facilitators (factors) enabling the capacity and capability to pursue potentially disruptive innovations.
C4) What are the enabling factors of being a top innovator?	To identify the most important capabilities that spur innovation performance and lead to excellence.

Sub-question	Sub-objective
C5) What actions to take on strategic and operational level to be a successful and disruptive innovator?	To convert the knowledge (gained during this research) into systematic management actions on strategic and operative level to reach innovation excellence and enhance disruptive ability.

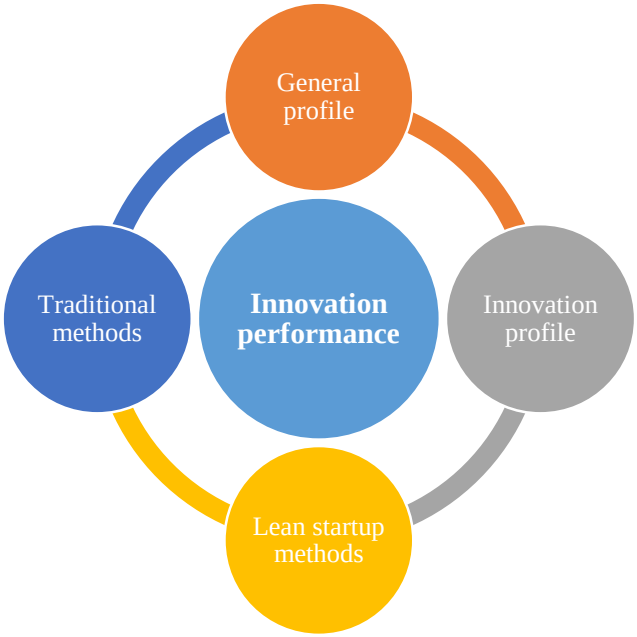
Source: own design

Since this was a qualitative and explorative research, the aim was rather to conceptualize new meanings, interpret them, and thereby significantly contribute to the general understanding of the topic, than to oppose and collide meanings drawn by known theories and theorists.

5.1 Survey elaboration and execution

Appropriately elaborating the online form required the conversion of the research question and sub-questions to survey questions. Such survey questions were required to be formulated which helped to explore the general and the innovation profile, to gain insight into the applied innovation methods (with making a difference between traditional and lean startup methods) and to measure the innovation performance. The structure is shown on Figure 28.

Figure 28: Questionnaire form design – question categories

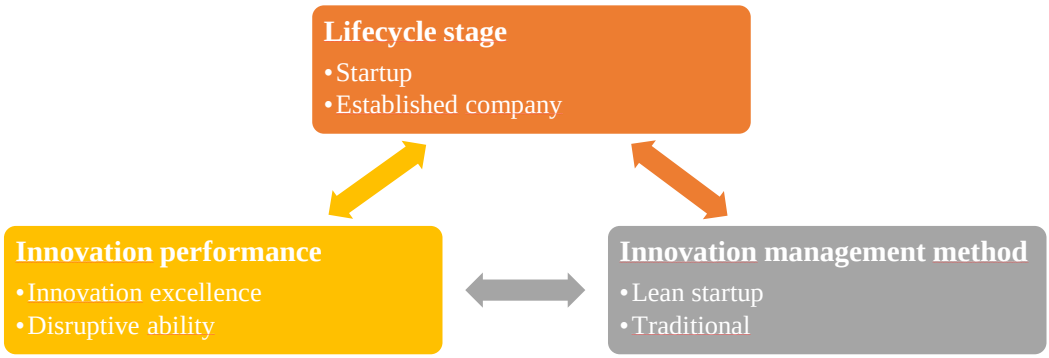


Source: own design

In the questionnaire, various questions were asked, aiming at the general and innovation profile of the companies, and asking about the lean startup and traditional methods they are using. Differentiating between the two groups of methods has happened based on the findings of the theoretical foundation and practical establishment parts of this dissertation. The purpose of designing the questionnaire likewise was to create the opportunity for uncovering the interrelatedness of the innovation management methods belonging to one of the two groups of methods and their correlations with the lifecycle stage (startup or established company) and the innovation performance of the interviewed companies. While the analysed relationships are

presented on Figure 29, Table 24 in the appendix (page 156) summarizes all the question categories with the related questions.

Figure 29: Interrelatedness of lifecycle stage, innovation management method and performance



Source: own design

Since the questionnaire was focused on innovative companies, and no list exists about the population, **purposive (judgmental) sampling** was used. This is a type of nonprobability sampling in which the companies to be observed are selected on the basis of the researcher's judgment about which ones will be the most useful or representative.

The list of contacted companies were put together from the following **sources**: members of the Hungarian Association for Innovation, Hungarian Association of IT Companies, an own extract from the so-called kaleidoscope database of the National Research, Development and Innovation Office, a list of the Institute of Informatics, Corvinus University and an own collection.

My **online questionnaire** was available between May and November 2015. The total number of contacted companies in this period was almost 1000, out of which 120 filled the form, from which 7 were excluded (due to invalid or fake data). The final sample contained **113 valuable responses**.

The next chapter will go into the details, using various statistical methods to gain new insight and knowledge about startups and established companies, about lean startup and traditional innovation methods and the innovation performance achieved by them, using different tools and techniques.

5.2 Managerial implication

After having gathered appropriate number of responses with the online questionnaire, the exploration and analysis of them aimed at drawing conclusions for **managerial implication**. During the statistical analysis, the methods listed below were used. A reference to the related chapter name and number is also given.

1. Main tendencies: chapter 5.2.2 Simple characteristics.

2. Crosstab analysis: chapter 5.2.3 Basic correlations.
3. Cluster analysis: chapter 5.2.4 Innovation leaders and laggards.
4. Factor analysis: chapter 5.2.5 Different to be.
5. Bivariate correlation: chapter 5.2.6 Innovation excellence and disruptive ability.

5.2.1 Sample exploration

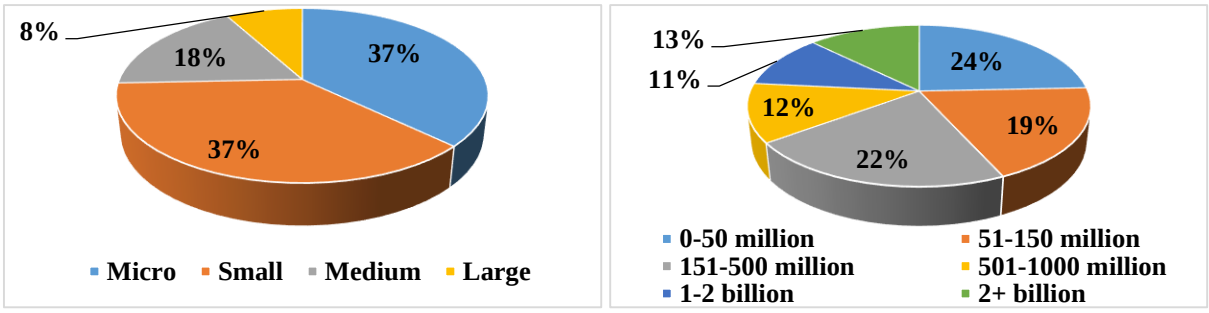
Exploration of the applied innovation management tools and methods took place by asking specific questions about day-to-day activities and processes, while measuring innovation performance was mainly based on financial and business data and partially on self-evaluation. Ascertaining lifecycle stage occurred based on the self-assessment of the company.

Interpreting the results of the analysis has happened with the expectation of a more clear **understanding of the correlations between the lifecycle stage, the applied innovation management tools and methods, and the innovation performance**. Categorizing the companies into two groups of startups and established companies, and classifying innovation management tools and methods as traditional and lean startup, opened the opportunity of comparing the dependencies within and the relationships between the two groups. Multivariate statistics and data analysis tools were applied in order to explore the dominant differences within the database, and so within the companies being present – and to achieve my objectives.

5.2.2 Simple characteristics

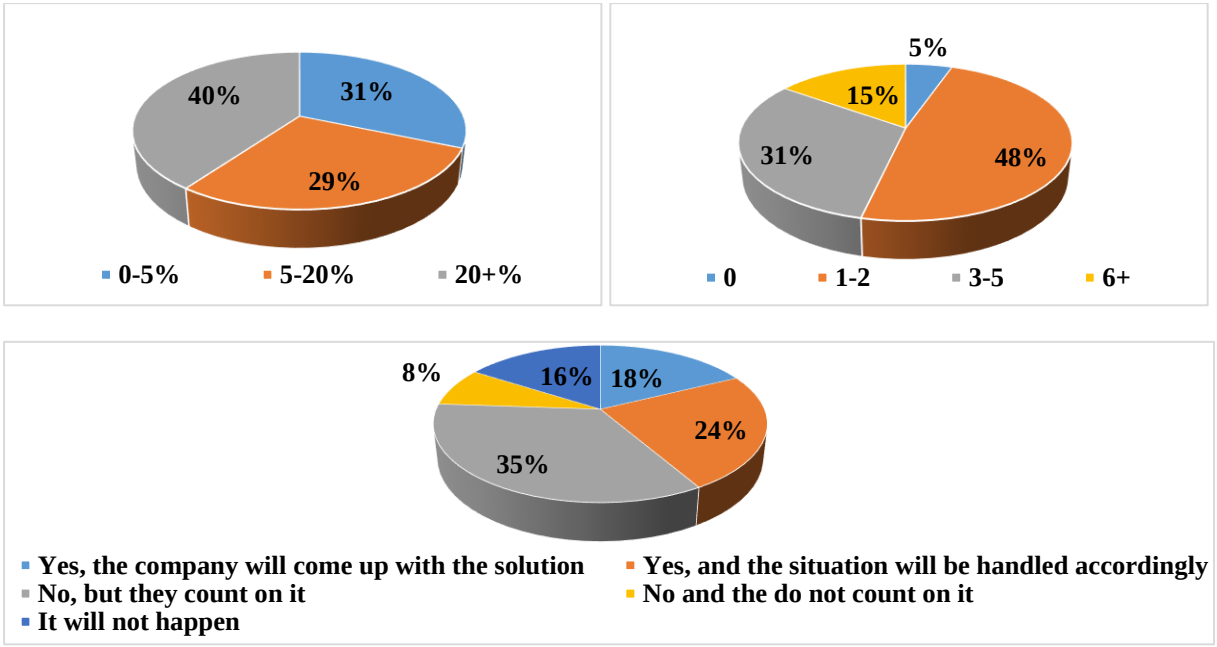
First, with the help of **pure frequency tables and charts** the **main tendencies** of the final set of respondents have been discovered. In the case of the measurable variables, mainly scored on a 5 grades Likert scale, the number of respondents, the average, the median, the mode and the standard deviation were calculated. Being aware of these basic characteristics supported to better understand the distribution pattern and helped to determine the possible groups for further analysis. The most important specialities are shown on Figure 30 and Figure 31.

Figure 30: Distribution of company size (left) and revenue (right, in HUF)



Source: own data and design

Figure 31: Ratio of revenue coming from new services/products (introduced in the last 3 years) to the total revenue (upper left); Number of new services/products introduced in the last 3 years (upper right); Readiness for a substitute/competitor offer on the most important market, with 2x performance and ½ price – at innovation leaders and at innovation laggards (lower)



Source: own data and design

Understanding the elementary characteristics helped to shed light on the relationships between the variables.

5.2.3 Basic correlations

In the next phase, some variables were selected a priori, to see the **optionally existing relations** throughout the questions, which could reveal certain correlations and differences. In the **crosstab analysis** the significant difference was determined by taking into account the three criteria of the significance expectation:

- chi-square score equal or less than 0.05 (as the fundamental and strongest element),
- the minimum expected count equal or greater than 1, and
- the ratio of the cells with expected count equal or lower than 20% (the two latter elements are weaker expectations because of the relatively low number of respondents).

In the case of scaled questions one-way ANOVA was used to find statistically significant differences. The basic assumption for this method is the normal distribution and the non-existence of the kurtosis. It is well-known that these criteria are robust, therefore even in the case of non-compliance, the F test can be a relevant measure. Not every variable's normal distribution or kurtosis were checked, simply the ANOVA for the cases of the equal variances assumed and not assumed were controlled. For the former one the Levene's test, for the latter one the Welch test was performed. In total the difference if the Levene's test was equal or greater than 0.05 or the Welch test equal or lower than 0.05 and the ANOVA p score equal or lower than 0.05 was accepted.

The first step towards uncovering dependencies between company lifecycle, the applied innovation management practices and the innovation performance was the crosstab analysis for the **cases with significant (at 5% level) differences**. This was valid for the situations detailed in Table 16, where I also gave a description about why the significant relationship of the two variables was found relevant. The detailed results of the crosstab analysis are presented in the appendix (chapter 8.2.1).

Table 16: Crosstab analysis (significant cases)

Variable "A"	Variable "B"	Relevance
Organizational framework for innovation	Company size	At larger organizations it is more typical to have an organizational role or unit responsible for innovation
Expected success rate of innovation projects	Revenue	-
Organizational framework for innovation	Ownership structure	At private and multinational organizations it is more typical to have an organizational role or unit responsible for innovation than at state owned entities
Ratio of research, development and innovation[18] expenditure to revenue	Age of the company	Younger companies relatively spend a higher ratio of their revenues on RDI
Ratio of RDI expenditure to revenue	Reasons for founding the company	The expenditure gets higher when the company was founded based on innovative technologies and a validated customer needs than only based on innovative technologies or validated customer needs
Size of the company	Age of the company	Size is highly influenced by age
Revenue of the company	Age of the company	Revenue is highly influenced by age
Revenue change to last year	Age of the company	The volatility of revenue change of younger companies is much higher

Source: own data and design

Revealing basic correlations was a necessary step before making a distinction between top and moderate innovators.

5.2.4 Innovation leaders and laggards

Continuing the examination, **cluster analysis** was applied. In data clustering the number of clusters to be created is a frequent problem. My basic question was if the two groups of top innovators and moderate innovators can be clearly identified or not. By pursuing the objectivity, first a hierarchical cluster analysis was applied to determine the number of clusters. The following four variables were involved into the analysis:

[18] Hereinafter referred as RDI.

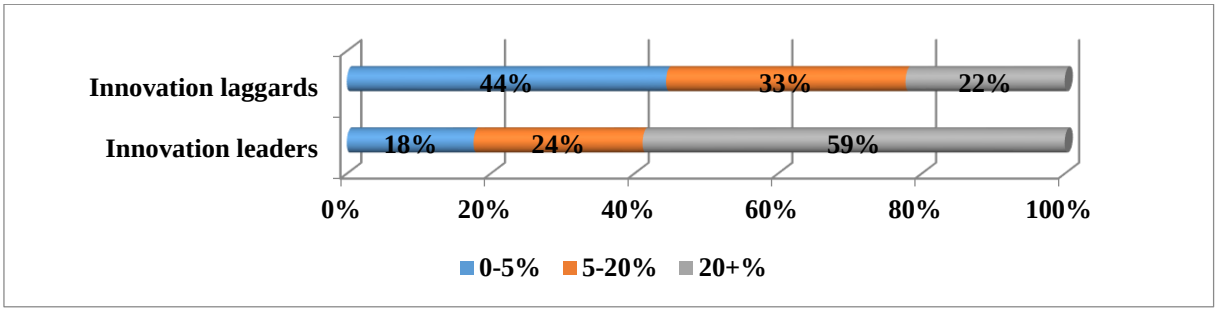
1. The ratio of the net sales revenue deriving from the new products/services[19] to the total net sales revenue of the last business year.
2. The changes in the company's product/service portfolio in the past three years – number of innovations introduced in the last 3 years.
3. The general evaluation of the company's innovation-related performance – based on self-evaluation.
4. The potential preparedness to a substitute (killer) product/service appearing on the main market of the company in the upcoming three years (which one's price is at least half and with a performance more than double of the current one).

In my dataset, these were the most important questions regarding innovation performance, thus could been used in the identification of the different innovation profiles. Ward's method with the squared Euclidean distance was deployed, but the agglomeration schedule did not suggest any reasonable classification number (less than 5). Therefore, this tool was rejected, and instead K-mean analysis based on professional estimation was applied. As already described above, **two clusters were created**, taking into consideration the distorting function of the sample size, namely that the method creates two groups with almost the same number of cases, which means that belonging to a cluster can differ by increasing the number of respondents. Nonetheless these restrictive elements, the existence of these two groups (at least by their tendencies) seemed to be highly plausible, and all of the four variables' ANOVA showed that they were appropriate for cluster analysis. The two groups created in this way were named **innovation leaders** (or top innovators) and **innovation laggards** (or moderate innovators).

The **most eye-catching differences** between the two groups was found in the field of innovation performance. A higher ratio of revenue coming from new services/products (introduced in the last 3 years) to the total revenue is typically much higher for innovation leaders than innovation laggards. Almost 2/3 of the leaders have a revenue from new services/products more than 20% – only 1/3 of the laggards can tell this about their revenue structures (Figure 32).

[19] New means introduced in the last 3 years.

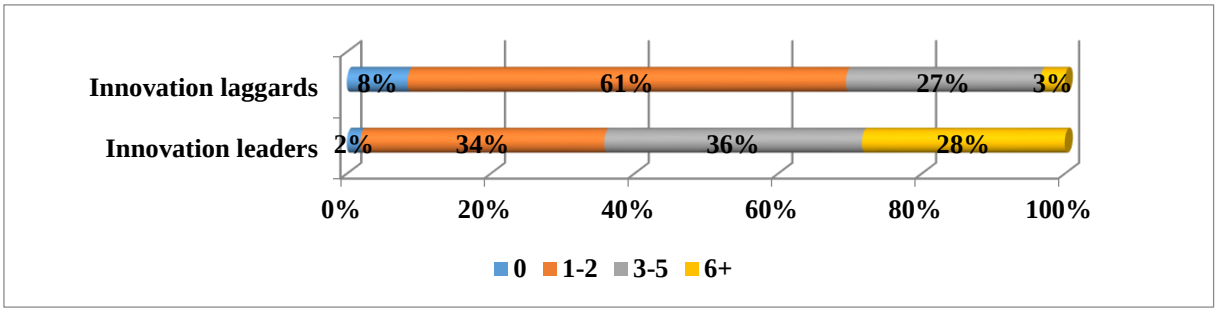
Figure 32: Ratio of revenue coming from new services/products (introduced in the last 3 years) to the total revenue – at innovation leaders and at innovation laggards



Source: own data and design

When comparing the two clusters, I found that at top innovators the number of new services/products introduced in the last 3 years is significantly higher than at their moderate counterparts. In practice it means that the chance of having introduced at least 6 new products/services in the last 3 years is almost 9x bigger at leaders than at laggards.

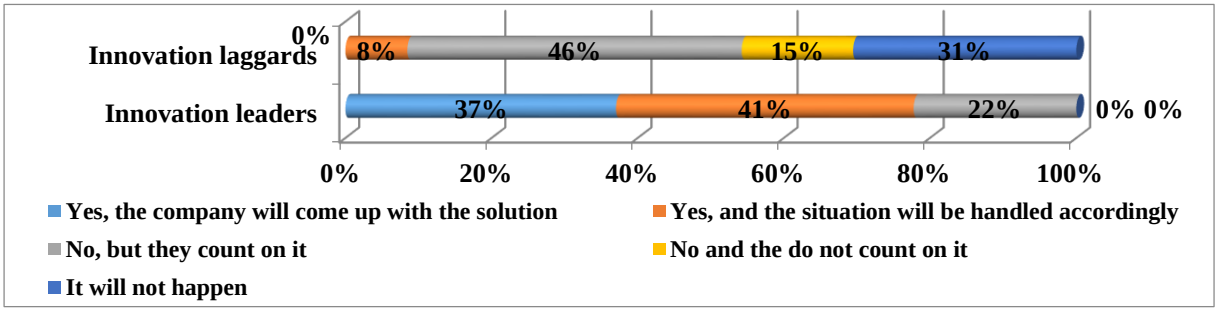
Figure 33: Number of new services/products introduced in the last 3 years – at innovation leaders and at innovation laggards



Source: own data and design

Every established company is exposed to disruptive innovation. To measure their attitude towards this threat, I asked them to assess their readiness for a substitute/competitor offer on their most important market, with 2x performance and ½ the price. Perhaps the most meaningful are the answers of innovation laggards: none of them thinks that the particular competitor will be themselves, and almost 1/3 do not think that such situation will happen. Those companies simply ignore the general view that if they do not disrupt themselves then somebody else will. Among the leaders no one shares this opinion – however 37% says that they will be their own disruptors.

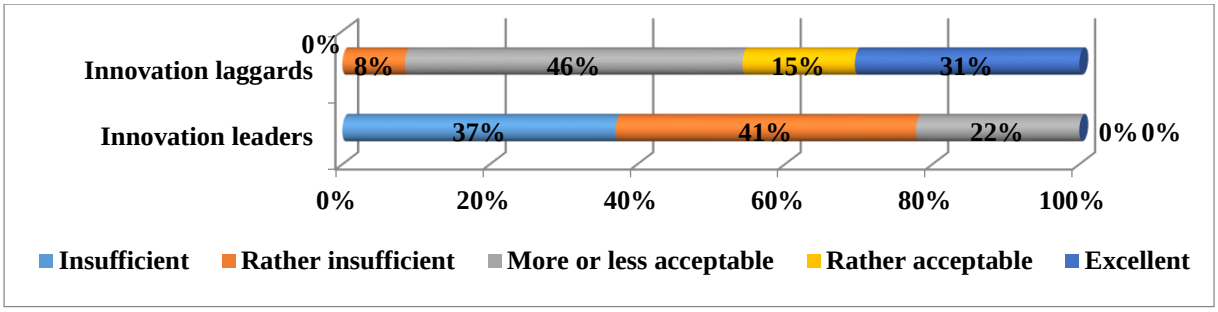
Figure 34: Readiness for a substitute/competitor offer on the most important market, with 2x performance and ½ price – at innovation leaders and at innovation laggards



Source: own data and design

When measuring and judging the innovation performance of companies, an essential information is how they see themselves on this field. The questionnaire contained a question related to the self-evaluation-based innovation performance of the surveyed companies. The most important finding seemed to be **controversial**: none of the innovation laggards have rated its innovation performance as insufficient, and none of the innovation leaders have rated its innovation performance as rather acceptable or excellent. This talkative fact has shed light on their motivation and reality-consciousness. Top innovators think that they are not enough good, experience fierce competition and count on disruptive forces. To the contrary, moderate innovators think just the opposite, and therefore they are not motivated to get better, and do not realize that they are lagging behind.

Figure 35: Innovation performance (based on self-evaluation) of innovation leaders and innovation laggards



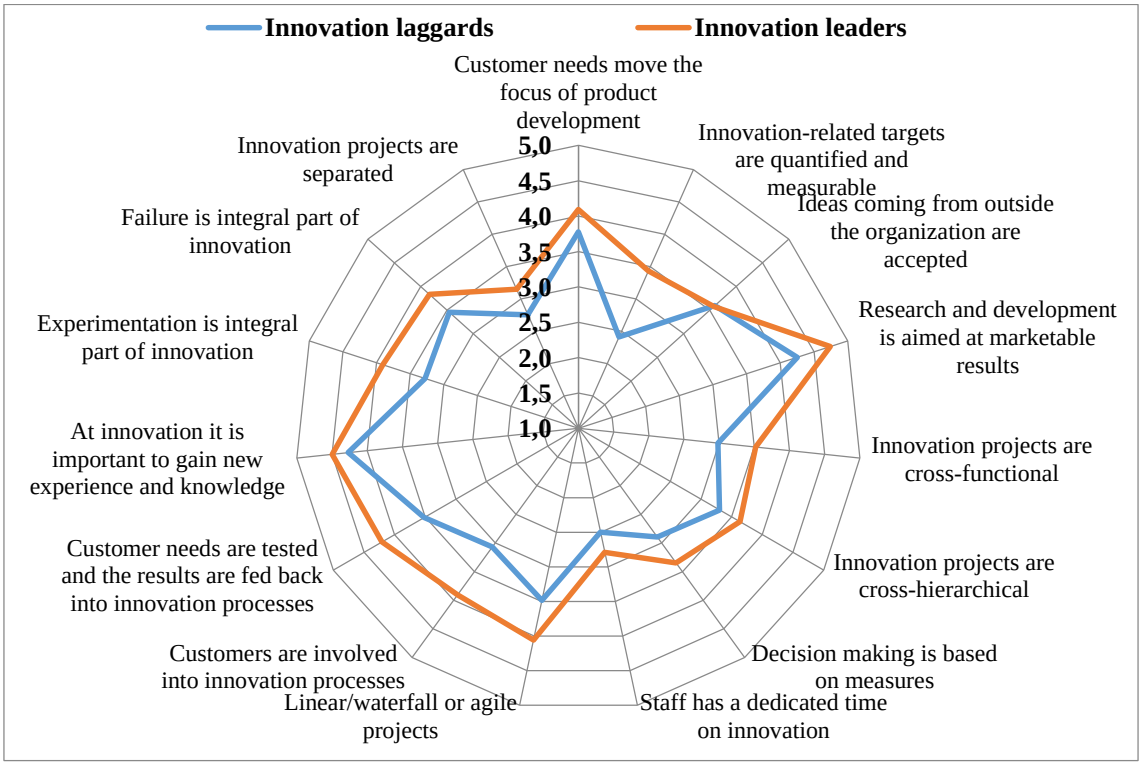
Source: own data and design

Further analysis **uncovered** that innovation leaders perform significantly better in increasing their year-by-year revenues (but it also shows a much higher volatility), have higher ratios of RDI expenditure to revenue and are more conscious in their innovation-related strategies. The detailed results are shown in the appendix, chapter 8.2.2.

The cluster analysis has shown that there is a real (and significant at 5% level) difference between innovation leaders and innovation laggards from **innovation performance** point of view. But the question is rather **how top and moderate innovators are different from innovation management point of view** – as it was asked in the **research sub-question C1**.

To answer this question, **first** the related innovation management methods were categorized as lean startup methods and traditional innovation methods (see Table 24 in Appendix 8.1). **Second**, to survey how these methods are used, questions were formulated and put into the questionnaire. The respondents could rate themselves on a scale of 1-5. **Third**, the above detailed cluster analysis made the basis for the comparison of the ways how these methods are applied by innovation leaders and innovation laggards. While Figure 36 shows the average scores of the applied lean startup methods, Figure 37 shows the same for traditional procedures.

Figure 36: Lean startup methods applied at innovation leaders and innovation laggards



Source: own data and design

It is seen on the figure that innovation leaders outperform laggards at almost every category. **Significant (at 5% level) difference** is found at the methods showed in Table 17. The table also contains the average score of the various methods.

Table 17: Lean startup methods applied at innovation leaders and innovation laggards – with significantly different average scores (measured on a scale of 1-5)

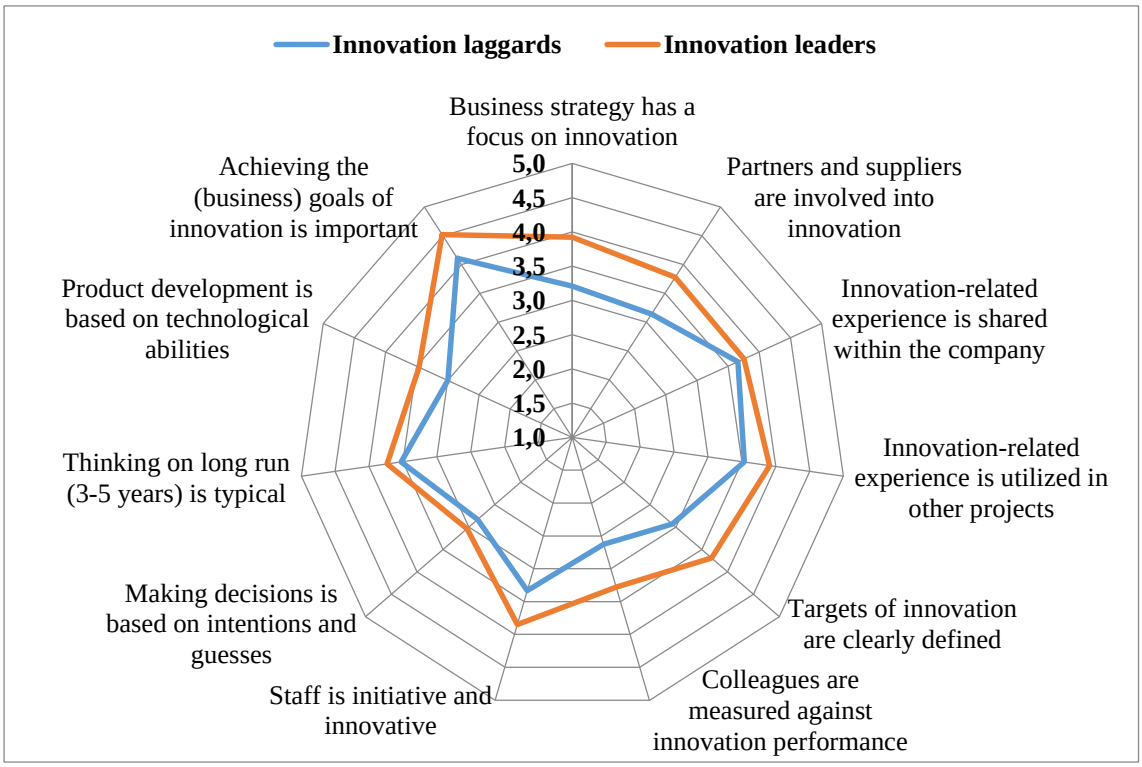
Method	Leaders	Laggards	diff. ↓
Innovation-related targets are quantified and measurable**	3.43	2.41	1.02
Customers are involved into innovation processes**	3.91	3.07	0.84
Customer needs are tested and the results are fed back into innovation processes**	4.21	3.52	0.69
Experimentation is integral part of innovation	3.91	3.28	0.63
Linear/waterfall (1) or agile projects (5)	4.06	3.48	0.58
Innovation projects are cross-functional	3.52	2.98	0.54
Research and development is aimed at marketable results**	4.74	4.25	0.49
Decision making is based on measures	3.35	2.90	0.45

Source: own data and design ***: found significant even on 1% level*

These results show that most of the lean startup methods are applied by top innovators on a much higher level then by their moderate peers. Excelling these techniques, they reach **significantly higher innovation performance**. High differences can be found at quantifying and measuring innovation-related targets, involving customers, experimenting on a regular basis, and cross-functionality – which are the main pieces of the lean approach, suggested by many academics and practitioners [Ries, 2011; Blank, 2012; Croll – Yoskovitz, 2013].

Next, the traditional innovation methods were compared in the extent on what level they are used (measured on a scale of 1-5). The method of the comparison was the same as in the case of lean startup methods.

Figure 37: Traditional innovation methods applied at innovation leaders and innovation laggards



Source: own data and design

At every category, laggards are outreached by innovation leaders. The **significant differences** are listed in Table 18.

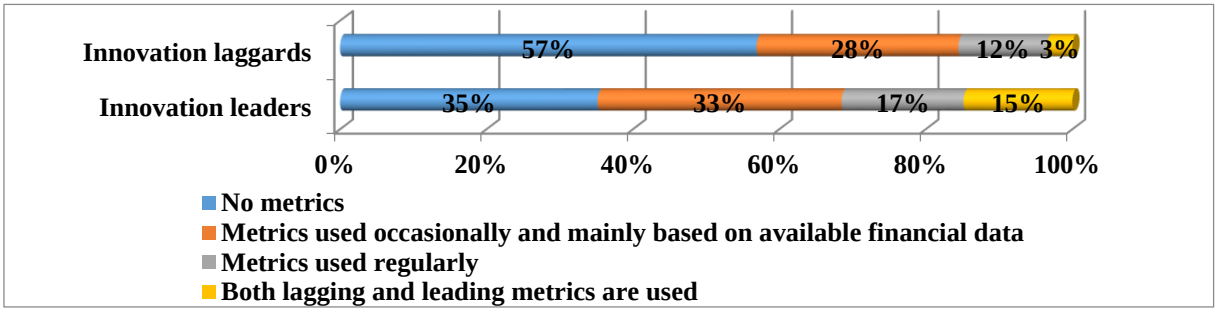
Table 18: Traditional innovation methods applied at innovation leaders and innovation laggards – with significantly different average scores (measured on a scale of 1-5)

Method	Leaders	Laggards	diff. ↓
Targets of innovation are clearly defined**	3.69	2.93	0.76
Business strategy has a focus on innovation**	3.92	3.21	0.71
Colleagues are measured against innovation performance**	3.28	2.63	0.65
Partners and suppliers are involved into innovation**	3.78	3.14	0.64
Staff is initiative and innovative**	3.85	3.33	0.52
Product development is based on technological abilities	3.46	3.00	0.46
Achieving the (business) goals of innovation is important**	4.52	4.11	0.41
Innovation-related experience is utilized in other projects	3.91	3.53	0.38

Source: own data and design ***: found significant even on 1% level*

A key element in the lean startup methodology is using the right metrics for measuring progress. There is a notable (significant on 5.5% level) difference between leaders and laggards in the metrics applied for measuring innovation and progress.

Figure 38: Types of metrics used by innovation leaders and innovation laggards



Source: own design

The **conclusion** is that mastering traditional innovation methods also play significant role in being an excellent innovator. Especially important is to have clearly defined innovation targets, while the business has to relentlessly focus on innovation. The colleagues are required to be motivated for coming up with new ideas (which rely on the available technological abilities), and this activity needs to be acknowledged, and the gained experience shared.

Assuming that the proportion of sales from innovative products is a proxy for the quality of innovation, **my results** are extending prior studies, using patent citation rates for the US semiconductor and biotechnology sectors [Sørensen – Stuart, 2000] and a wide range of manufacturing sectors [Balasubramanian – Lee, 2008].

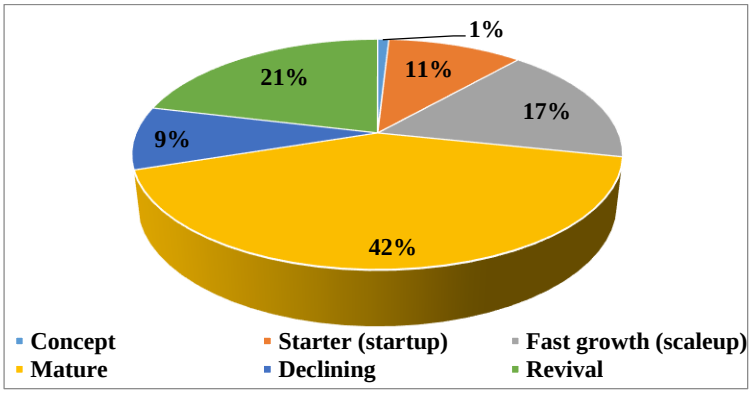
The cluster analysis delivered the answer to research sub-question **C1) How top and moderate innovators are different from innovation management point of view?** It has highlighted that innovation leaders significantly overtop innovation laggards in innovation performance, namely in the ratio of revenue coming from new services/products (introduced in the last 3 years) to the total revenue; the number of new services/products introduced in the last 3 years; the readiness for a substitute/competitor offer on the most important market, with 2x performance and ½ price; and the self-evaluation-based innovation performance. Regarding the innovation management practices, innovation leaders outreach innovation laggards in 8 out of 15 lean startup methods and in 8 out of 11 traditional innovation methods, and thus it can be declared that the two groups significantly differ in their applied innovation management methods listed in Table 17 and Table 18.

Regarding the sub-objective **C1) To specify the significant differences between top and moderate innovators and their innovation performance**, my findings – as a **novel extension** – have shown that being a top innovator requires the application of an **innovation management mix**, containing both lean startup and traditional methods.

The cluster analysis has revealed that there is a real (and significant) difference between innovation leaders and innovation laggards from innovation performance and methods point of view. This finding arises another question that **how startups and established companies are different from the aspects of innovation management, methods and performance**.

In the survey I asked the companies to categorize themselves according to their lifecycle stage. The following values were considered as startups: concept, starter (startup), fast growth (scaleup), revival; and as established companies: mature, declining. The distribution of the companies in the various lifecycle stages is shown on Figure 39.

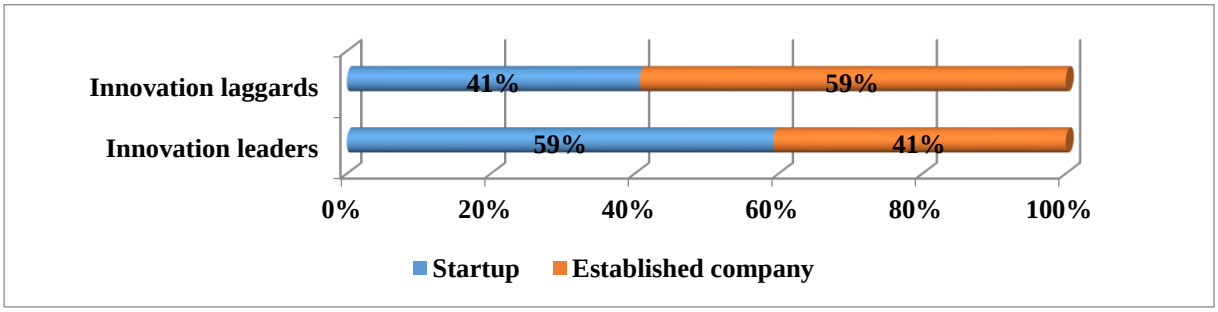
Figure 39: Distribution of lifecycle stages in the sample



Source: own data and design

Diving deep into the data gathered during the survey has shown that **among innovation leaders the presence of startups is significantly higher (on 5% significance level) than the presence of established companies**. Despite this fact, a generalizing statement that startups equal leaders (and thus, established companies equal laggards) cannot be made because the disjunction of the two types of companies is 59:41 in the two clusters (as it is shown on Figure 40), which is not satisfactory. Therefore, their innovation performance and the applied management methods cannot be judged.

Figure 40: Ratio of startups and established companies among innovation leaders and at innovation laggards



Source: own data and design

This result provided only a **partial answer to** research **sub-question C2) How startups and established companies are different from innovation management point of view?** by **confirming** the opinion that being a startup is not dependent on lifecycle stage, and that startups

are not smaller versions of large companies. Furthermore, these results also say that not every startup is successful and not every established company is unsuccessful.

Since the detachment of startups and established companies (as shown on Figure 40) is not satisfactory, the other part of the answer could be given when having more detailed data and more companies in the sample.

Similarly, **sub-objective C2) To specify the significant differences between startups and established companies and their innovation performance**, was also partly achieved. Despite the presence of startups is significantly higher among innovation leaders, their ratio is not sufficient high to make the generalization of being equal to them.

Despite having found a grounded answer to research sub-question C1 and a limited answer to C2, a new question arose that then **what makes the real difference** between the two groups. This was answered using factor analysis, which made it possible to identify the factors enabling disruption and innovation leadership.

5.2.5 Different to be

To **dense the different scaled questions' score**, the tool of **factor analysis** was invoked. Before this step the reliability of the respondents' answers was checked with the help of the Cronbach's Alpha test. This is used to check the consistency of different questions regarding the same argument, but strictly characterized by identical scale scores. In general, the test values above 0.7 are good, and above 0.8 extremely good from the reliability's point of view. On professional basis two theoretical groups were created regarding the questions about traditional innovation methods and lean startup methods. The Cronbach's Alpha scores are the following: 0.717; 0.744. Therefore, these groups are quite consistent.

In the next step the number of factors got determined. Without exclusion all of the above mentioned variables were involved into the factor analysis. The applicability of the factor analysis is based on the assumption that the variables are inter-correlated – which is basically demonstrated with the Cronbach's Alpha. In the first run Varimax rotation was carried out, without any further restrictions. The result suggested to create 8 new variables with eigenvalues greater than 1 and with 65.1 R^2 score, which means that these new 8 variables explain the 65.1% of the variance of the 26 original ones. Despite the explanatory power is really high, it did not meet the professional requirements, since it did not create the interpretable number of new variables, even taking into consideration the number of respondents. Moreover, when having created 6 or more new variables, these included only 2-3 methods, which also showed that having too many factors was not plausible.

From practical point of view, 2-5 new variables could have been acceptable. In such cases, using the scree plot (see Figure 54 in the appendix) helps determining the number of factors:

the point where the slope of the curve is clearly levelling off the "elbow". Despite it is not a facilitating tool, it helped to make the decision based on interpretability and explicability and not accepting the eigenvalues' role.

After several attempts, 3 new variables were identified. Being plausible, the anti-image correlations should be above 0.5 in general and the ratio of anti-image covariance scores greater than 0.09 (except the diagonal) should not exceed 25%. The results showed a covariance percentage of only 6.3%. The correlation was good, and so the factorability of the variables was non-questionable. Furthermore, the Kaiser-Meyer-Olkin test for sampling adequacy was 0.762 with a Bartlett's test score of 0.000, which proved the applicability of the factor analysis. The final explanatory power was 40.38%. [Sajtos – Mitev, 2007] The **three new variables** were named:

1. planning and execution measurability,
2. learning and disruptive ability,
3. strategic and organizational consciousness.

The results of the factor analysis supported the response on research sub-question **C3) What are the enabling factors of being a disruptive innovator?** Furthermore, it might answer also the question about what make innovation leaders better in almost every innovation management method than innovation laggards.

The factors and the condensed methods are summarized in Table 19 (for numerical details see appendix Table 28 and Table 29).

Table 19: Identified factors of innovation capability

Factor	Included innovation management methods
Planning and execution measurability	• Making decisions is based on intentions and guesses (negatively) • Business strategy has a focus on innovation* • Thinking on long run (3-5 years) is typical • Staff has a dedicated time on innovation • Colleagues are measured against innovation performance* • Decision making is based on measures* • Innovation-related targets are quantified and measurable* • Targets of innovation are clearly defined*
Learning and disruptive ability	• Innovation-related experience is shared within the company • Staff is initiative and innovative* • Ideas coming from outside the organization are accepted • Innovation projects are handled separately (negatively) • Customer needs are tested and the results are fed back into innovation processes* • Linear/waterfall (1) or agile (5) projects* • At innovation it is important to gain new experience and knowledge • Failure is integral part of innovation

Factor	Included innovation management methods
	• Innovation-related experience is utilized in other projects*
Strategic and organizational consciousness	• Innovation projects are cross-hierarchical • Partners and suppliers are involved into innovation* • Innovation projects are cross-functional* • Research and development is aimed at marketable results* • Customers are involved into innovation processes*

Source: own data and design **: significant method*

Since in the **first factor** the methods related to long-run thinking, setting targets, handling human resources and decision making appear, all in a context of getting them measured, it got the name **planning and execution measurability**.

Iterating fast on the build-measure-learn-feedback loop, failing frequently and cheap and getting out of the building are the cornerstones of lean startup and disruptive innovation. [Ries, 2011; Blank, 2013] Most of the methods related to these principles show up in the **second factor**, which mean that they are correlated, and thus, as enablers, fundamentally designate the **learning and disruptive ability** of companies. This result suggests that if the founders/managers of an established company want to develop their organizations' disruptive possibilities, they need to share the experience among their initiative colleagues, gained from their separated innovation projects, while relentlessly testing various hypotheses about customer needs, and utilizing the experience gained. Furthermore, fast and agile iterations are required and failure should be an option. **These are the enabling factors of being a disruptive innovator – the answer to research sub-question C3.**

Similar elements of disruptive ability have been identified by various researchers: continuous customer analysis [Reihardt – Gurtner, 2011], handling innovations in a separated project portfolio [Thomond, 2004], accept failure [Choudary, 2016]. The shortage of these researches is their fragmentation which means that they are concentrating only on the effect of only one particular element. To the contrary **I have shown that the identified elements are correlated**, and jointly affect the learning and disruptive ability of a company. Therefore, the attainment of the research **sub-objective C3) To deliver a holistic understanding of the key facilitators (factors) enabling the capacity and capability to pursue potentially disruptive innovations**, has brought a **novel extension** to the general knowledge.

The **third factor** contains such methods which are about involving different players into the innovation process, arranging the organizational setup likewise and aiming at marketable results. Thus, this factor was called **strategic and organizational consciousness**. In practice it implies that being a strategically and organizationally conscious company significantly contributes to innovation success.

Condensing the original variables (methods) into three new factors emerges the question how the two groups (innovation leaders and innovations laggards) differ regarding this aspect that is **C4) What are the enabling factors of being a top innovator?**

Factor analysis standardises and creates scale-free and independent values with 0 expected value and normal distribution. Comparing the values within the two groups created by cluster analysis resulted in the following factors and factor scores:

Table 20: Identified factors of innovation capability

	Innovation leaders	Innovation laggards
Planning and execution measurability*	0.195	-0.179
Learning and disruptive ability	0.153	-0.140
Strategic and organizational consciousness*	0.508	-0.465

Source: own data and design **: found significant at 5% level*

The numbers show that **innovation leaders and laggards significantly differ** in how they measure their activities related to planning and execution, and how conscious they are in strategic and organizational aspects.

In practice it means that these are the most important capabilities a company should concentrate on when the aim is to spur performance and achieve innovation excellence. Besides this result provided the answer to research sub-question C4, as a **new extension**, it supported the attainment of research sub-objective C4.

The **relative similarity** of leaders and laggards in the dimension of learning and disruptive ability seemed to be surprising. The latest article by Clayton Christensen (the facilitator of the term disruptive innovation) highlighted that **excellence in innovation is not equal to being disruptive**, and vice versa. They mean two very different things. [Christensen et al., 2015]

My findings have **confirmed**, that being an excellent innovator is rather a status, while **disruption is a rather process** and refers to the evolution of a product or service over time. Such disruptions usually begin their lives as small-scale experiments. Most of them fail, but the few ones' movement from the fringe (meaning the low end of an existing market or a new market) to the mainstream erodes first the incumbents' market share and then their profitability. This outcome contributed to research sub-questions and sub-objectives **C3** and **C4**.

After having shown how companies can be different, the next chapter will shed light on the required actions to be taken, when the aim is innovation excellence and disruptive ability.

5.2.6 Innovation excellence and disruptive ability

Last, the tool of **bivariate correlation** was applied to score and rank the selected innovation methods based on their potential effect on innovation performance. During this exploration, two types of categorizations were used:

- First, the variables were divided into two groups based on which management level they can be primarily applied: operational or strategic.
- Second, all the methods were picked (and compared) which can contribute to the creation of disruptive innovations, and thus, a disruptive ability.

In both cases I calculated the sum of the correlation scores multiplied by the average values of the variables. Sorting these elements likewise showed the total potentiality of the increase of the innovation performance by improving on a single element. Parallel, the same methodology was applied but excluding the average value of the given variable, which show the potentiality of the performance increase in relation to other elements. Therefore, both methodologies are useful to identify which elements to focus on when the aim is to improve innovation performance. This approach can serve as a **roadmap** showing the way towards innovation excellence and disruptive ability.

The fact that **being an excellent innovator and being disruptive are independent** indicates that succeeding as a disruptive innovator (or defending against a disruptive challenger) do not automatically implies to every successful company in a changing market. The problem with conflating disruptive innovation with any breakthrough novelty that changes an industry's competitive patterns is that different types of innovation require different approaches. **Three type of** such **approaches** will be introduced next. Since they show and give suggestions about **which innovation methods should be excelled** to gain most benefits on operational level, strategic level, and in the disruptive dimension, the approaches seemed to be appropriate for answering the research sub-question **C5) What actions to take on strategic and operational level to be a successful and disruptive innovator?** Furthermore, ranking the selected innovation methods was also required, so the companies applying them know which ones to focus on if they want to gain significant innovation performance improvement.

To operationalize this recommendation, first, the variables were divided into two groups based on which management level they can be primarily applied: operational or strategic. Afterwards, all those methods were picked (and compared) which can contribute to successfully create disruptive innovations.

Scoring the methods has happened by summing the correlation scores (of the particular method with the other methods within the set) multiplied by the average value of the variables. The **rank** of an element shows the total potentiality of the increase of the innovation performance by improving the examined element. Parallel, the same methodology was applied but without the average value of the given variable. The results show the potentiality of the performance increase related to other elements. The relevance of the latter scores lies in that, if the average of the selected method is high than it is more difficult to improve on it – e.g. if customer needs

are not recurrently tested (meaning a score 2 on a 1-5 Likert scale) it is more easy to improve this ability, against when the score is 4. The two scores and ranks are labelled in the tables below with the headings “with itself” and “without itself”.

First, the operative methods were selected and measured against each other. Operative are the methods **which can be applied in the day-to-day operation of the company** when the aim is to increase innovation performance. Table 21 shows the six methods with the highest scores.

Table 21: Operative innovation methods to focus on (methods with a rank of 1-6)

Operative methods*	Score		Rank	
	With itself	Without itself	With itself	Without itself
Colleagues are measured against innovation performance**	14.44	11.50	1	2
Staff has a dedicated time on innovation	14.37	11.73	2	1
Customer needs are tested and the results are fed back into innovation processes**	13.58	9.72	3	5
Ideas coming from outside the organization are accepted	13.49	9.91	4	3
Innovation-related targets are quantified and measurable**	12.64	9.73	5	4
Innovation projects are cross-functional**	12.17	8.93	6	6

Source: own data and design **: Only the methods with a rank 1-6 are listed here. For the whole list see Appendix 8.2.4.*

***: Significant method*

If a company wants to **excel innovation on operative level**, first it is suggested to concentrate on how to measure its colleagues against innovation performance, second to dedicate the people a certain time to come up with new ideas (as Google did it for many years by allowing people to spend 20% of their working hours on elaborating anything prospective, even crazy-looking ideas). Third, it is suggested to relentlessly focus on testing customer needs, learn from the lessons and feedback the experience gained. Afterwards, it is important to accept ideas originated outside the organization and parallel overpass the “not invented here” syndrome. Fifth, the companies should quantify innovation-related targets and measure the fulfilment of them. Last but not least innovation projects should contain cross-functional teams to secure achievement.

Second, the strategic methods were selected and measured against each other. The strategic methods are those ones **which unlock innovation potential on strategic level**. Table 22 contains strategic innovation methods with ranks of 1-6.

Table 22: Strategic innovation methods to focus on (methods with a rank of 1-6)

Strategic methods*	Score		Rank	
	With itself	Without itself	With itself	Without itself
Business strategy has a focus on innovation**	14.98	11.43	1	1
Staff is initiative and innovative**	13.92	10.34	2	3
Customers are involved into innovation processes**	13.89	10.43	3	2
Partners and suppliers are involved into innovation**	13.54	10.10	4	5
Targets of innovation are clearly defined**	13.50	10.22	5	4
Research and development is aimed at marketable results**	13.12	8.63	6	6

Source: own data and design **: Only the methods with a rank 1-6 are listed here. For the whole list see Appendix 8.2.4.*

***: Significant method*

The key to **innovation excellence on strategic level** is primarily a business strategy tightly focused on innovation. The second enabler is rooted in human resources: an initiative and innovative staff. The suggestions of the open innovation theory are reflected also on this level: not only the customers but also the partners should be involved into the innovation processes. While setting quantified and measurable innovation-related targets on operative level is the necessary, setting clearly defined aims on strategic level is the sufficient condition of innovation primacy. The two go hand in hand. Finally, the marketability of R&D results should be also put on the wall of all corporate labs.

As written above, **being excellent in innovation and being disruptive are two different things**. The problem with disruption is that in theory it seems to be very easy, but in practice it is very hard to do, and especially achieve. To make it happen, the below **high-level approach** is suggested to be followed [von Tobel, 2013]:

1. **Identify a big problem.** The solution should address the cause (what incumbents in the field are doing or have done in the past), those suffering the most from the problem (the sweet spot of the market), and others who are trying to solve it (the competitors).
2. **Build the best team.** A disruptive team has to be driven not by immediate returns but by the thrill of building something new and outstandingly better.
3. **Get feedback and go quickly back to the drawing board.** A constant stream of feedback from customers is required to build the right product for them.
4. **Be flexible.** There are a lot of channels which can be used to build a disruptive business. Though the big idea should be hold tightly, willingness is required to adapt and adjust on the details.
5. **Live your brand.** It is critical to develop a company culture around the brand.

Perhaps the most defining characteristic of disruptive innovation is the great uncertainty that it creates for leaders, organizations, and entire industries. The companies operating in the quickly broadening field of information enabled industries have been forced to experiment and introduce new technologies and business models, not just to compete, but to survive. While most organizations possess a general awareness of the importance and necessity of disruptive innovation and change in general, there is a gap when it comes to understand the qualities necessary for driving them. To bring disruption closer on daily basis and to address the inherent uncertainty, methods based on the subsequent **principles** should be applied [Kaplan, 2012]:

- **Listen.** Disruptive leadership is not about analysing customer needs, creating specifications to meet each need, and building great products and services to meet them. It is lot more about creating new needs, which is achieved by experimentation, testing, and failing many times.
- **Explore.** Disruptive innovators know that uncertainty contains as much opportunity as it does risk. But to make this mindset practical, it is essential to push personal, team, and organizational comfort zones by getting out of the building, exploring customer and partner needs, and push for new knowledge and experience.
- **Act.** Paradoxically, leading disruptive innovation involves simultaneously focusing on own motivations to make a difference. Disruptive leadership involves putting a flexible stake in the ground around a specific opportunity, and then taking a series of actions to intentionally challenge assumptions and rapidly change direction as many times as necessary. Steps with the greatest impact are required.
- **Persist.** Leading disruptive innovation involves taking action in the face of uncertainty, seeing results, learning from them, and modifying assumptions and behaviours based on these results. Even when the results are “negative”, the goal is to persist in using the insights gained from the experience.
- **Seize.** The path to disruptive innovation is rarely predictable or linear. Rather more it is a process fundamentally laden with surprise, the core essence of uncertainty – two things seen by companies as preventable and avoidable. Recognizing the potential power of surprise when unexpected shocks to corporate strategies, plans, and assumptions arise, allow to respond with purposeful agility – versus dismiss surprises as problems while concurrently disregarding the insights or messages they may contain.

Based on the above detailed high-level approaches and low-level principles it turned to be possible to classify the examined **innovation management methods** according to **which could be applied to make disruption happen**. As the result, the methods listed in Table 23 were categorized as disruptive ones. The scores calculated with bivariate correlation, and the rank based on these scores are also shown.

Table 23: Disruptive innovation methods to focus on (methods with a rank of 1-6)

Disruptive methods*	Score		Rank	
	With itself	Without itself	With itself	Without itself
Customer needs are tested and the results are fed back into innovation processes**	12.81	9.58	1	1
At innovation it is important to gain new experience and knowledge	12.81	8.31	2	6
Innovation-related experience is utilized in other projects**	12.67	8.36	3	4
Customers are involved into innovation processes**	12.03	8.40	4	3
Linear/waterfall (1) or agile (5) projects**	12.01	8.46	5	2
Failure is integral part of innovation	11.80	8.34	6	5

Source: own data and design **: Only the methods with a rank 1-6 are listed here. For the whole list see Appendix 8.2.4.*

***: Significant method*

More and more established companies (and their leaders) recognize that they must proactively disrupt, otherwise they will be the ones being disrupted. **Leading disruptive innovation** involves adopting mainly such experience and ideologies that fall outside the traditional training of managers, so **new leadership competencies** are required. This means persistently coming up with new ideas about previously uncovered needs, testing them and feeding back the knowledge gained into the innovation process. The results (showed in the table above) also strengthen the view proposed by the lean startup methodology that progress with a disruptive innovation can predominantly be measured by achieving different **learning milestones**. On one hand this requires an agile approach and insistently iterating on the build-measure-learn-feedback loop as fast as possible. On the other, failure should be viewed as integral to innovation: failure is not an error but rather a stepping stone towards learning and making progress. Companies should concentrate on excelling these methods if they want **disruptive innovation happen by design** and not by exception.

My results have shown **what actions are recommended on operational and strategic level to enhance the innovation performance of a company – which was asked in research sub-question C5**. These actions aim at the introduction or the improvement of various innovation management methods which can be applied on the given management level. Since the methods are not only ranked but scored, the decision makers can create a preference order and focus the available resources accordingly. While this helps them in making their choices, it enhances the efficiency of utilizing scarce assets.

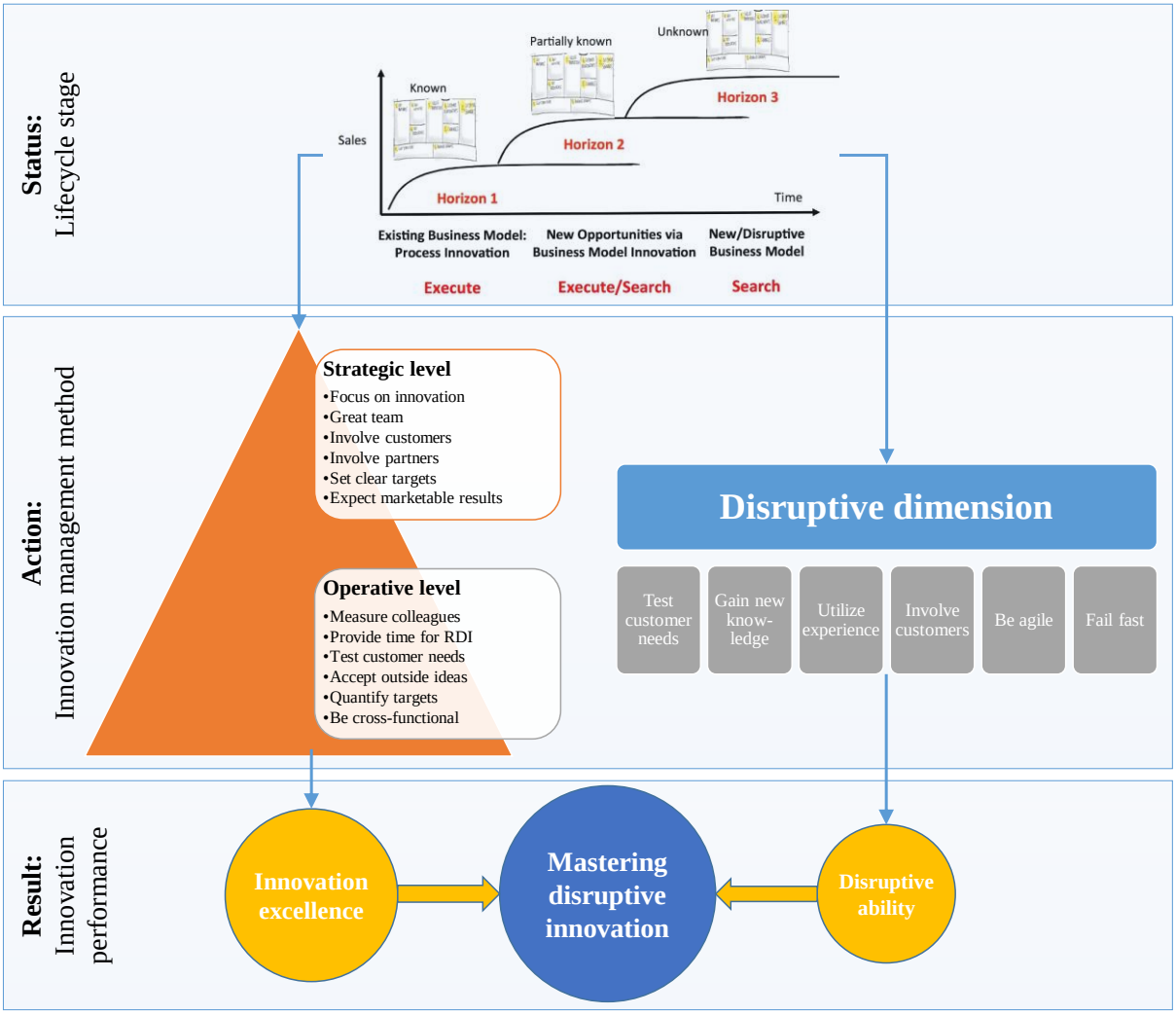
Nevertheless, this part has provided important insights about **advancing the disruptive ability** of an organization by categorizing the innovation management tools and ranking them based on their potential impact on innovation performance. This has happened by invoking other

researchers' findings and utilizing their results in the dimensions of my research. The outcome can be applied as a best principle when the goal is to gain disruptive ability.

5.3 Roadmap for excellent and disruptive innovators

The previous sub-chapters have delivered the basic answers on the sub-question group **C) Managerial implication**. **The results count as the primary and most significant contributions of the dissertation and the research in behind.** Since all new findings are valued according its utilization, it is important to provide also the details about their adaption in practice. To fulfil this requirement, based on the findings and results, a **conceptual roadmap** was elaborated which shows the way towards innovation excellence and disruptive ability, and means a possible scenario for **mastering disruptive innovation**. The roadmap is detailed on Figure 41.

Figure 41: Innovation excellence and disruptive ability roadmap



Source: own design

The suggestions of the **three innovation horizons** method have shown that companies should allocate their innovations across three categories, which require different focus, management, tools and goals, and produce different outputs. The focus differs mainly based on the horizon

stage of a company. Distinguishing two such stages means whether being a startup or an established company – and a transitive stage in between. **Horizon 1** companies are executing a known business model, while they are mainly focusing on process innovations. **Horizon 2** companies are the ones in transition. Their business model is partially known and they are switching between searching for their repeatable, scalable and profitable business model and its execution. For them, the main source of opportunities lay in business model innovation. **Horizon 3** organizations' business model is unknown – they might be the ones coming up with new and eventually disruptive business models.

The **innovation management methods** can be similarly twofold: lean startup methods and traditional innovation management methods. The next swim lane of the roadmap shows what management actions to take on operative and on strategic level on one hand, and also provides a suggestion for actions to be taken in the disruptive dimension, on the other.

Finally, the **output** can be dual as well: innovation excellence and an enhanced disruptive ability. Innovation excellence is achieved when the various methods are mastered on operative and strategic level. This makes the sufficient condition of becoming a disruptive master. The necessary condition is fulfilled when excellence is achieved also in the disruptive dimension.

The roadmap is a synthesis of these approaches and the findings of the survey-based research. It suggests that first the **status** should be ascertained. It is important to know in which **horizon stage** the company is. Since no accurate answer can be given, providing an approximate judgement is acceptable. Afterwards the **suggested actions** can have an effect both on strategic and operative level, and in the disruptive dimension. The **expected results** are **innovation excellence** on one hand, and an **enhanced disruptive ability** on the other. All these lead to the possibility of **mastering disruptive innovation**.

Accordingly, the roadmap converts the knowledge gained during this research into systematic management actions on strategic and operative level to reach innovation excellence and enhance disruptive ability. Therefore, the attainment of sub-objective **C5** means a **novel extension** to the knowledge.

6 Summary and conclusions

My survey revealed a clear correlation between the performance of a company and how successful it is in applying various lean and traditional innovation management methods. It also showed that despite companies consider innovation to be a top strategic priority, and measure their progress in this endeavour, many have a lot of room for improvement.

If companies really want to embrace innovation and achieve the same growth enjoyed by the most innovative companies, they need to stop focusing solely on how to change the way they serve existing customers and markets, which might make existing product portfolios increasingly complex. Instead, they need to start expanding the reach of their existing products and services, and investigating completely new business ideas. [Nilsson et al., 2010]

The most innovative companies are ably demonstrating what most companies already know – that reinventing their products and services is critical to top- and bottom-line growth. My results will help all the other companies to follow their footsteps.

6.1 Research questions, objectives, findings and contributions

It is increasingly important for established companies to be able to deliver a pipeline of excellent and disruptive innovations in order to respond to emerging competition, exponential technologies, and increasing customer power. For example, in three years' time, 76% of the companies in my survey expect a disruptive competitor or product to appear, but only 18% will be the ones coming up with such solutions (see Figure 31). What will happen to those companies (in total 58%) which count on it but will not come up with an appropriate answer?

In order to achieve **repeatable disruption and constant innovation excellence**, my survey indicated two **factors to focus on**, including planning and execution measurability, and strategic and organizational consciousness. Since no one-size-fits-all model exists for how best to achieve these criteria, established companies should select the right methods to suit the technology-intensiveness of the business, and the novelty of the challenges being tackled.

My explorative and qualitative research resulted the following, **general contributions**:

1. It uncovered the correlation between the applied tools and methods, and the outcome of innovation-related activities and efforts.
2. It probed the potential context dependency of determining factors of applied innovation management tools and methods.
3. It brought together the literature on traditional innovation management and the lean startup methodology.

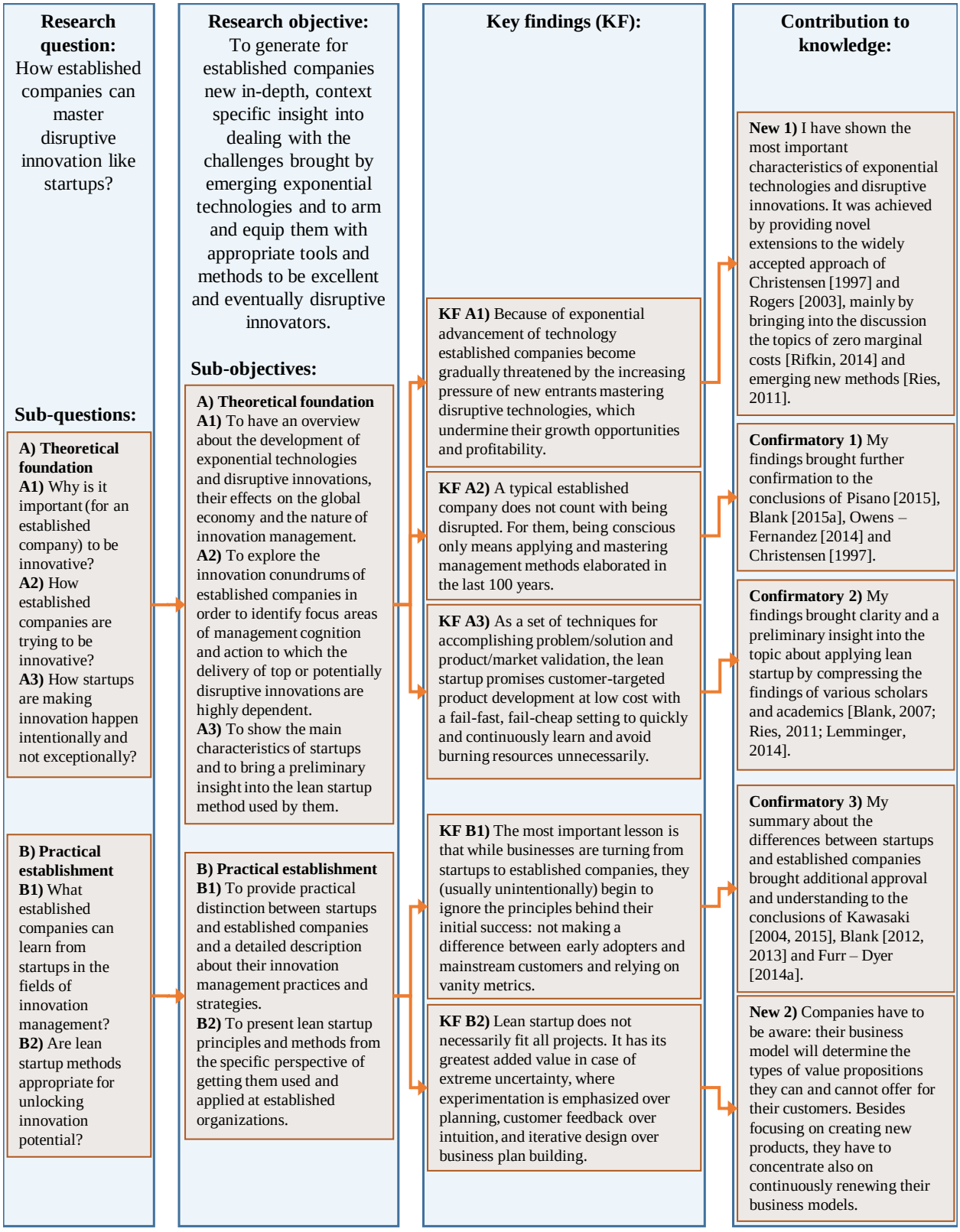
4. It contrasted the ability of startups to capture returns from innovation and exponential technologies with that of established companies, and argued that this ability differs considerably.
5. It promoted to the limited research about the applied innovation management tools and methods of established companies dealing with exponential technologies and disruptive innovations.
6. It introduced a new way of comparing startups and established companies with an emphasis on the applied innovation tools and methods, and the outcome of commercializing innovations.
7. It extended the today retrained understanding of what stimulates productivity under conditions of extreme uncertainty.
8. It elaborated a roadmap for established companies to reach innovation excellence and to improve disruptive ability.

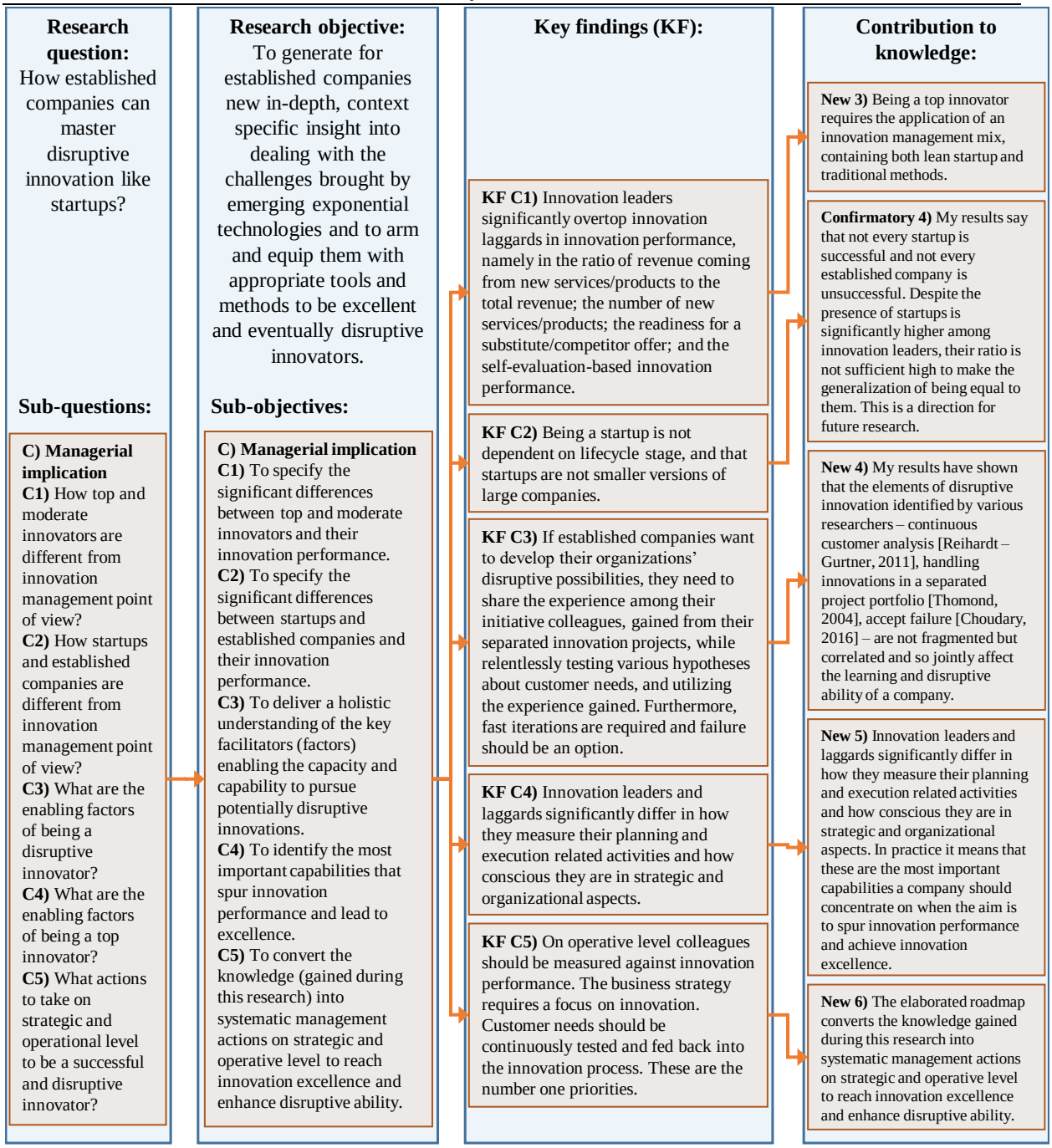
By deeply and widely analysing, introducing and using the theories of innovation management, exponential growth and lean startup, relying on practical cases extended with own experience, and understanding the cause and effect between innovation efforts and results, the research presented a **new comprehension** of the reasons and effects of applying lean startup methods at established organizations. This was achieved by a **logical verification and validation**, using scientific research methods and experience-based tools.

By providing insight into the subject, it delivered a **roadmap** for mature businesses, which are planning to introduce lean startup methods with the intention of making disruptive innovation happen inside their organizations on one hand, and to reach innovation excellence on the other – not by chance but by design.

The following swim-lane figure gives a comprehensive and detailed **summary of the research questions, objectives, findings and the particular contributions to the knowledge**.

Figure 42: Summary of research questions, objectives, findings and contributions





Source: own data and design

In this research I was searching the answer to one research question which was broken down into 3 research sub-questions groups containing 3+2+5=**10 research sub-questions**. Analogically, I had one research objective, with 3 research sub-objective groups with 3+2+5=**10 research sub-objectives**. These resulted in total **10 key findings**, out of which **4 counted as confirmatory**, and **6 counted as new results** and novel extensions to the knowledge.

In total the findings and the results show that the difference between being an excellent and disruptive innovator is caused not by the difference between being a startup or an established company but rather more applying an appropriate combination of lean startup and traditional

innovation management methods. Concluding with such an answer the relevant question might be the following: **How to achieve innovation excellence and disruptive ability?**

Strictly speaking, **my dissertation gave general and particular answer to this question**. This is how it achieved the research **objective** while generating for established companies new in-depth, context specific insight into dealing with the challenges brought by emerging exponential technologies, and arming and equipping them with appropriate tools and methods to be excellent and eventually disruptive innovators.

6.2 Generalizability and limitations

Although research about applying lean startup at established companies still might be described scientifically as underdeveloped, at the same time I believe that theory can truly help to enhance comprehension of innovation excellence and disruptive ability. I also believe that **my dissertation contributes** to this objective by exploring some of the much needed empirical in-depth data, and by pointing out several correlations and factors that contribute to the effective transfer of innovative knowledge. Yet, I am well aware that my study has various **limitations**, affecting the generalizability of the results.

In the first place, I have only studied a limited (N=113) number of firms, selected on purposive sampling. This was enough to carry out multivariate statistical analysis, but working with a known population (of all the innovative companies) on one hand, and elaborating case studies on the other could have resulted in a more clear understanding of the intra and inter organizational interdependence of the applied innovation management methods, the lifecycle stage and the innovation performance.

In the second place, regarding the focus of the survey, the lessons learnt whilst the research could have been helpful and could have shed more light on the covered correlations and could have contributed to find more and stronger correlations, which could have resulted in a better understanding of the levers of innovation performance.

In the third place, the lean startup method itself is having its limitations. Easiest to follow is for software companies and in information-based environments, because iteration is much simpler. For a hardware company, it is much harder to iterate. And at fields outside the IT industry, even much more: nobody would not want to iterate and fail fast when building a spaceship or a nuclear plant.

Despite these limitations, the results show a clear road for companies striving for innovation primacy and disruption. For them, my **roadmap** is a highly valuable and applicable tool whilst creating strategies and executing plans.

6.3 Directions for future research

In the era of exponential technological advancement, generating new ideas and successfully executing them remains a core competence entrenched in human cooperation. But **collaboration is essential** in securing further enhancement into a successful innovation in terms of sponsorship, improvement, realization and market entry. [Ibarra – Hunter, 2007; Obstfeld, 2005; Ibarra, 1993] The way in which collaboration networks are organized and managed, is closely correlated to innovation performance measured by market success. [Aalbers, 2012] Furthermore, the degree to which the individuals within an organization are integrated into intrapersonal networks, also affects the extent of overall innovation. The highest rate of innovations come from such **organizational cultures** which motivate collaboration. [Albrecht – Ropp, 1984]

In spite of the wide acceptance about the fundamental role of intra-organizational collaboration networks in innovation performance (meaning both organizational and individual outcomes), the way how these networks evolve over time and how they can be controlled is indefinite. [Balkundi – Kilduff, 2005]

At established companies, innovation projects are mainly carried out by multi-disciplinary teams, dealing with increasingly complex technical knowledge from different sources. [Griffin, 1997] Researches have shown that the failure rate of innovative projects is high: in general, only one out of ten product innovations reaches the market and generates profit. [Cooper et al., 2004] It implicates that there are huge reserves in making innovative projects more successful, which is closely related to the success of the team elaborating it. Therefore, access to diverse information, understanding and knowledge provided by cross-ties may be critical for team performance and innovativeness [Blindenbach-Driessen – Van den Ende, 2010].

A recent empirical research by Aalbers [2012] has highlighted the difference between horizontal cross-unit ties (crossing unit-boundaries) and vertical cross-hierarchy ties (crossing hierarchical levels) and their effect on innovation performance. While horizontal cross-ties provide teams with diverse information and knowledge crucial for being innovative, vertical cross-ties mainly provide access to (political) influence that is vital for support and resources [Atuahene-Gima – Evangelista, 2000; Haas, 2010]. The two types of ties contribute differently to the success of established companies, and both are mastered by fast-growing startups.

Project teams that perform well have more cross-ties in general and vertical cross-ties in particular. Not only the number of cross-ties plays a significant role but its concentration: the cross-ties should be concentrated in the hands of a few team members and be a specialized task for some of them. This implies that proper formation of project teams increases the chances of

achieving better innovation outcomes. [Aalbers, 2012] The methods related to **controllability** could be useful in forming and managing such teams.

Defining innovation as the development of ideas to improve products and services or develop new ones, the **innovation network** is the pattern of social relations to exchange and support these new ideas [Albrecht – Ropp 1984]. Controlling information flow within such networks is important in one's immediate network environment, but extended control over the flow of information in the full network is even more a central issue [Aalbers, 2012].

Control within innovation networks plays a significant role not only on individual but also on team level. Decision makers should be aware which individuals play central role in stimulating information flow. **Network analysis** is a tool to be used to identify the key players and to organize successful innovation teams with the aim of increasing probability of achieving successful innovation outcomes. Applying **controllability theory** can provide a clear view about how internal collaboration networks should be designed, shaped and managed to induce the proper and desired flow of information and knowledge, and increase innovation performance.

As it was written in the introduction, innovation is chaotic, messy and uncertain. It needs radically different tools for measurement and control. From one side, it requires the tools and processes uncovered in this dissertation. From the other side, as companies are human institutions, all their activities are based on human interactions. These interactions can be diagnosed and quantified by **organizational network analysis**. At this point I expect that having a clear picture about the cooperation landscape and its controllability, and applying the lean startup method in the way as it was proposed by my **roadmap**, leads to an **increasing innovation performance**.

In the **upcoming stages of the research**, collaboration networks will be analysed and compared to enlighten control points. Network controllability theory will be applied to lead the transition towards a learning organization, which puts data before intuition, tests before execution, customers before business plans, and which runs continuous experiments to reduce risk and optimize results.

The **aim** is to uncover the correlation between the organizational (collaborative and cooperative) network topology and dynamics, and the innovation performance.

6.4 Epilogue: Should it be built?

In the age of disruption and exponential technologies the world needs the creativity and vision of entrepreneurs – who are internally driven to make big changes – more than ever. They have an idea, but it is secondary to change. In spite of making mistakes, being wrong, failing often,

they relentlessly pursue their ambitions. They actually take the vision out of the equation, and add it only after they win.

Such journeys usually begin with a sharp recognition and a vision. At established organizations, critical about innovative projects is not that they are routinely green-lighted more on the basis of intuition than facts. The root cause of the problem is rather what happens next. Too many innovation teams engage in success theatre, selectively finding metrics that support their vision rather than exposing the elements of their objectives to fact-based experiments. Instead of aiming at validated learning, they stay in stealth mode forever, and create a data-free zone for unlimited experimentation, avoid customer feedback and refuse external accountability of any kind. Demonstrating cause and effect by placing highlights on a graph of gross metrics only distorts their reality perception. The problem is the very limited understanding of what stimulates productivity under conditions of extreme uncertainty.

Despite the elaboration of the lean startup method has largely contributed to having new insights about handling uncertainty, the innovation conundrums of established companies remained mainly untouched. When making decisions about innovation at such companies, it is not the resources what mean a constraint, since their productive capacity greatly exceeds the ability to know what to build. The big question for them is not "Can it be built?" but "**Should it be built?**". Even though reaching supreme efficiency, they experience their operations incredibly wasteful because of building products nobody wants and so wasting human creativity and potential. Thus, most of them feel that innovation can only happen by exception and not by design.

In the last half decade it also turned to be clear that lean startup does not necessarily fit all projects and organizations. The roads to innovation excellence and disruptive ability are different, but both are paved with mastering various types of innovation management methods. On one hand, it is required to relentlessly measure all the activities related to planning and execution, and to be sharply conscious on both strategic and organizational level. On the other hand, experimentation-based learning should be continuously practiced.

It is critical to note however, that we are still at the very beginning of the age of disruption. The exponentially accelerating technologies – mentioned several times throughout this dissertation – will continue to grow in the next decades as well. Soon, innovation cycles on new products will go from years, to months to weeks, bringing new challenges for companies, governments and societies.

In this dissertation I provided a manual for understanding singularity, and a roadmap showing the way towards innovation excellence and disruptive ability. I invite you to start down this path today.

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8 Appendix

8.1 Questionnaire

Table 24: Question categories and related questions of the questionnaire

Question category	Question
General profile	Industry
	Size (revenue, number of employees, change of revenue)
	Ownership structure
	Company age
	Field and seniority of the respondent
	Founding reason
	Lifecycle stage (embryonal, startup, scaleup, mature, backsliding, renascent, dying)
Innovation profile	Ratio of RDI expenditure to revenue
	Respondent's time spend on RDI
	Organizational structure of innovation
	Importance of innovation within the strategy
	Occurrence of innovation-related topics on management meetings
	Number of discontinued services/products in the last 3 years
Traditional innovation methods	Exact definition of innovation-related aims
	Colleagues are measured against innovation performance
	Promoting new ideas and innovations by colleagues
	Challenges to be solved by innovation
	Innovation orientation of the business strategy
	Making decisions is based on intentions and guesses
	Thinking on long-run (3-5 years)
	Product development is based on technological skills and abilities
	Linear vs. agile development
	Involving suppliers and partners into product development
	Achieving the (business) goals of innovation projects is important
	Reusing knowledge and experience gained from innovation projects is important
Lean startup innovation methods	Measure-based definition of innovation-related aims
	Openness for new ideas coming from outside the company
	Making decisions is based on actionable metrics
	Colleagues have dedicated time-share on innovation
	Product development is based on validated customer needs
	At research and development projects it is expected to result in marketable products
	Agile (5) vs. linear (1) development
	Cross-functional teams at innovation projects
	Cross-hierarchical teams at innovation projects
	Involving customers into products development
	Continuously testing the assumed needs of (potential) customers and reusing the experience in innovation processes
	Gaining new knowledge and experience is important in innovation projects
	Making experiments is inherent part of innovation
	Failure and making errors are inherent parts of innovation
	Using metrics for measuring innovation-related activities

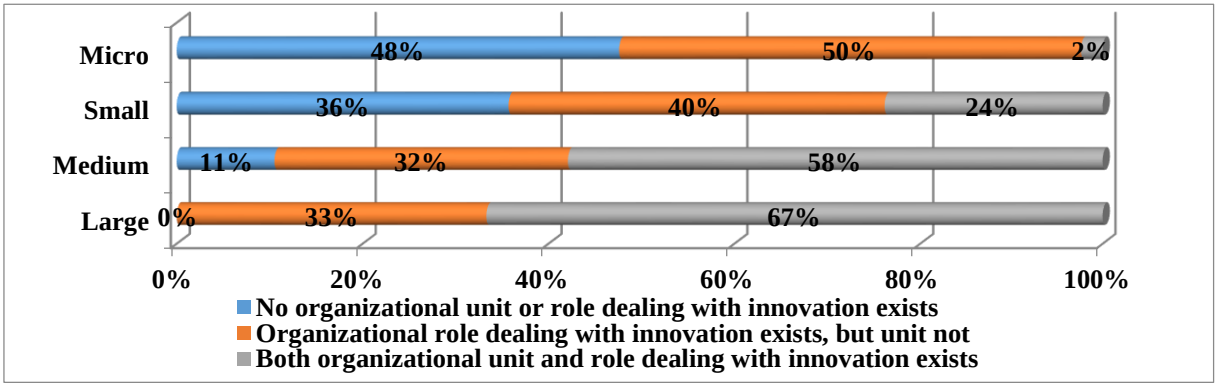
Question category	Question
Innovation performance	Ratio of revenue coming from new services/products (introduced in the last 3 years) to the total revenue
	Number of new services/products introduced in the last 3 years
	General innovation performance based on self-evaluation
	Readiness to appearance of a competitor service/product on the most important market, with 2x performance and ½ price

Source: own design

8.2 Consolidated survey results

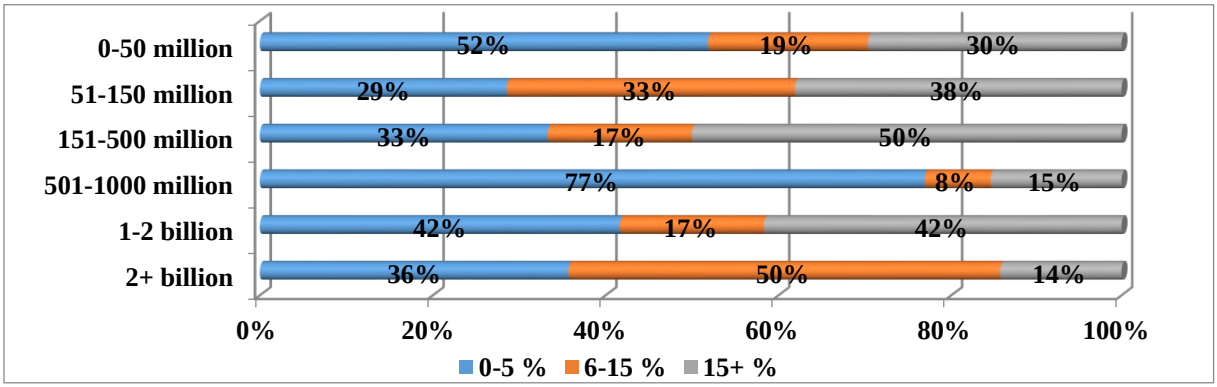
8.2.1 Crosstabs

Figure 43: Crosstab of Organizational framework for innovation (X) and Company size (Y)



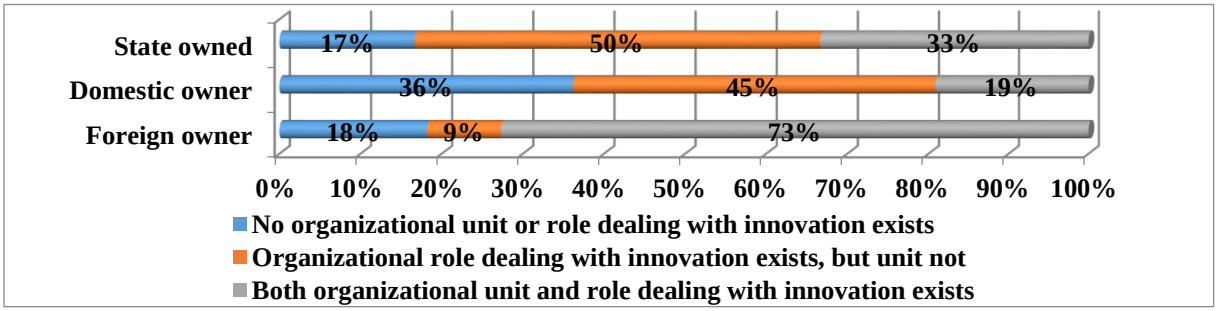
Source: own data and design

Figure 44: Crosstab of Expected success rate of innovation projects (X, in HUF) and Revenue (Y)



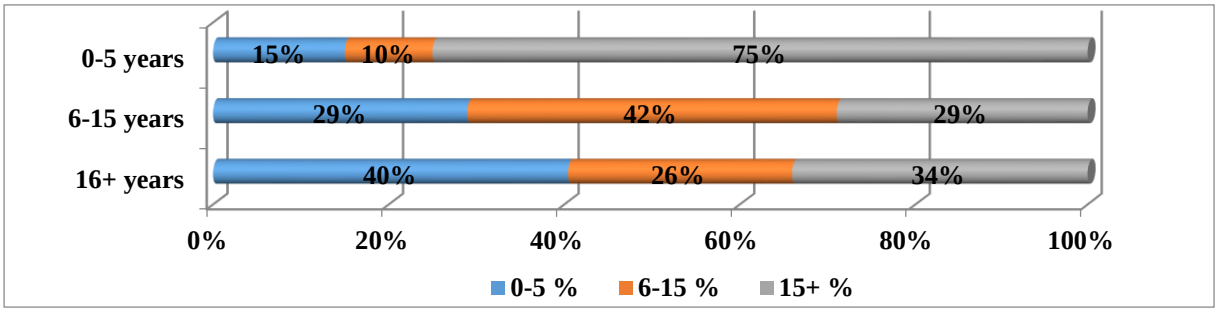
Source: own data and design

Figure 45: Crosstab of Organizational framework for innovation (X) and Ownership structure (Y)



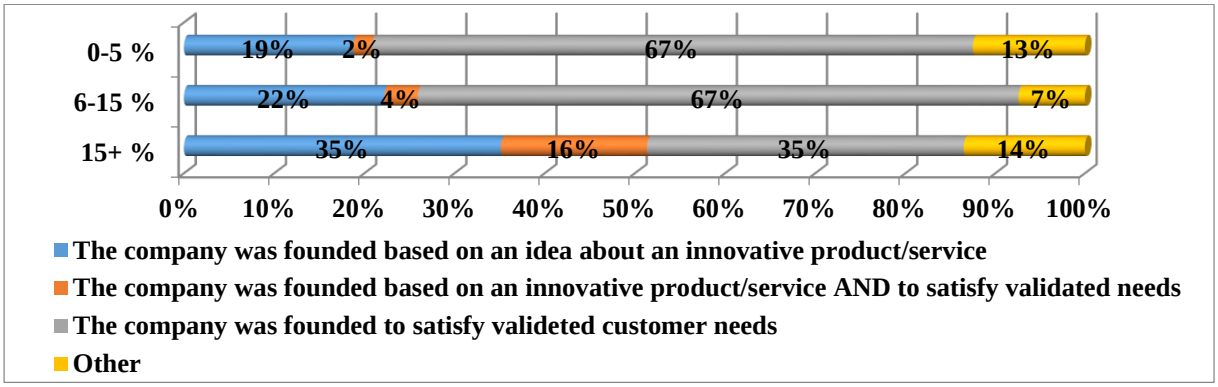
Source: own data and design

Figure 46: Crosstab of Ratio of RDI expenditure to revenue (X) and Age of the company (Y)



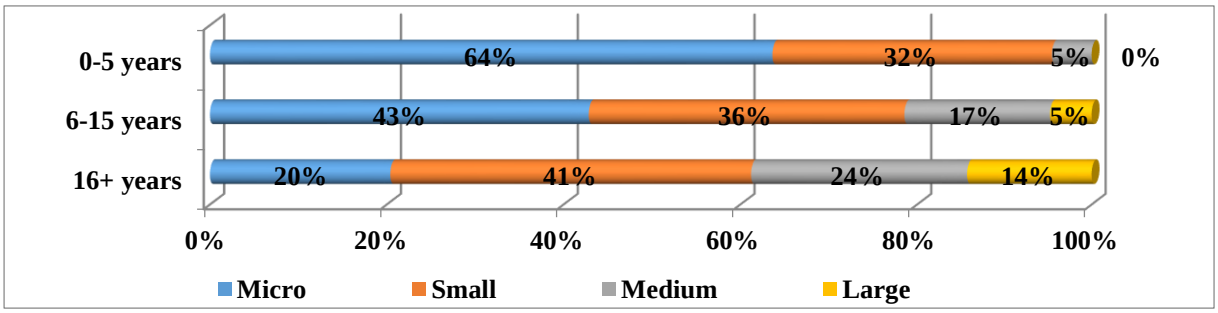
Source: own data and design

Figure 47: Crosstab of Reasons for founding the company (X) and Ratio of RDI expenditure to revenue (Y)



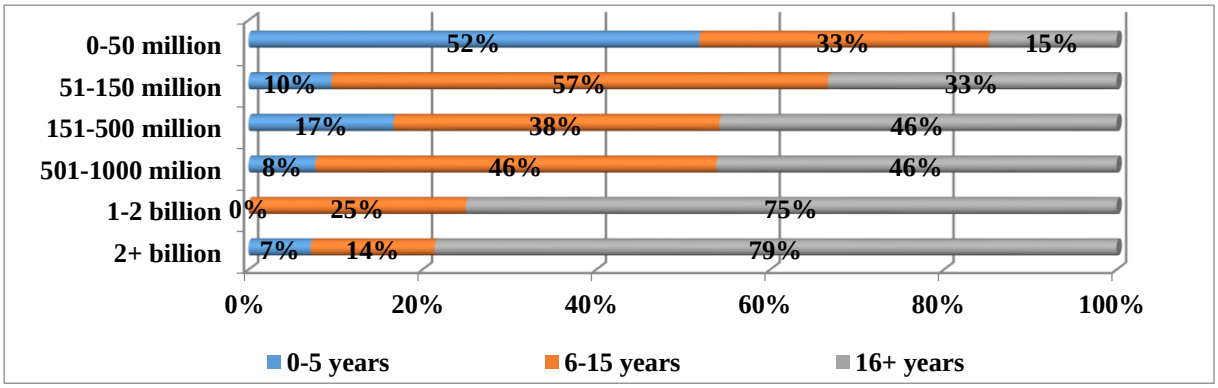
Source: own data and design

Figure 48: Crosstab of Size of the company (X) and Age of the company (Y)



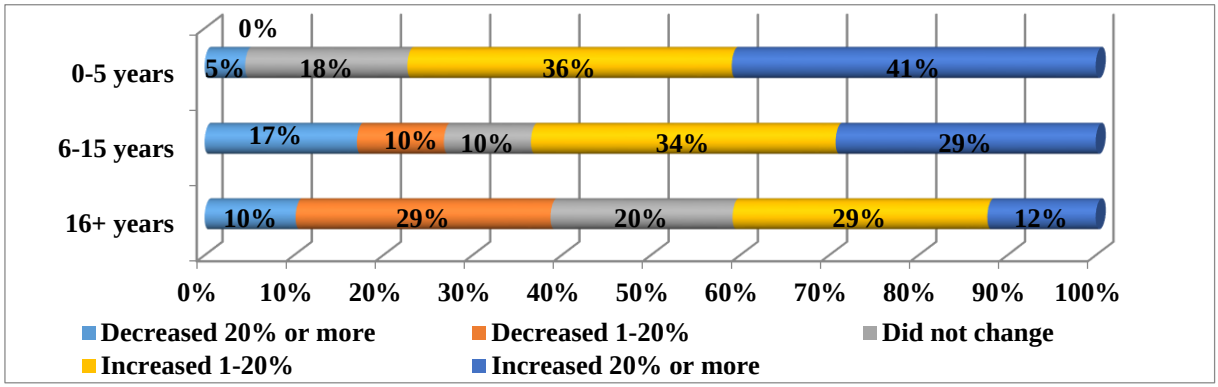
Source: own data and design

Figure 49: Crosstab of Revenue (X, in HUF) and Age of the company (Y)



Source: own data and design

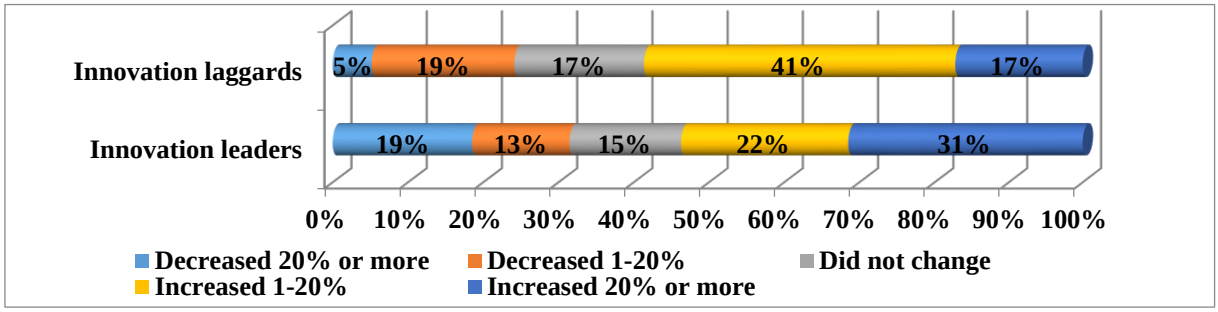
Figure 50: Crosstab of Revenue change to last year (X) and Age of the company (Y)



Source: own data and design

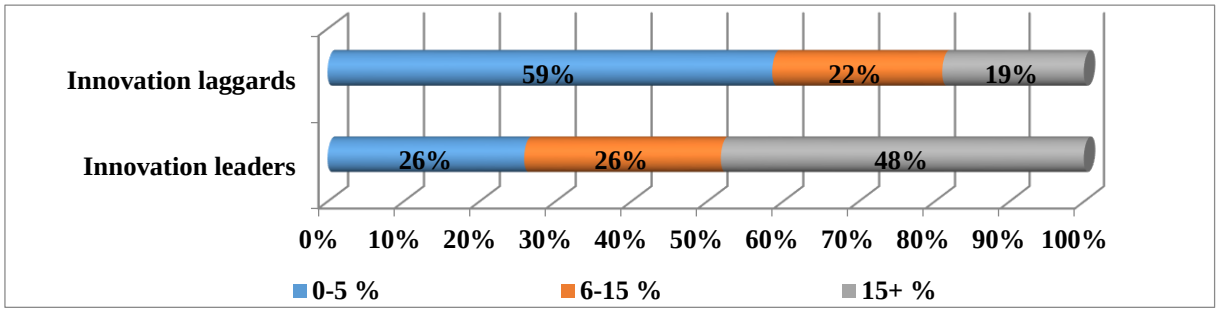
8.2.2 Significant cluster characteristics

Figure 51: Changes in the revenues of innovation leaders and innovation laggards (compared to last year)



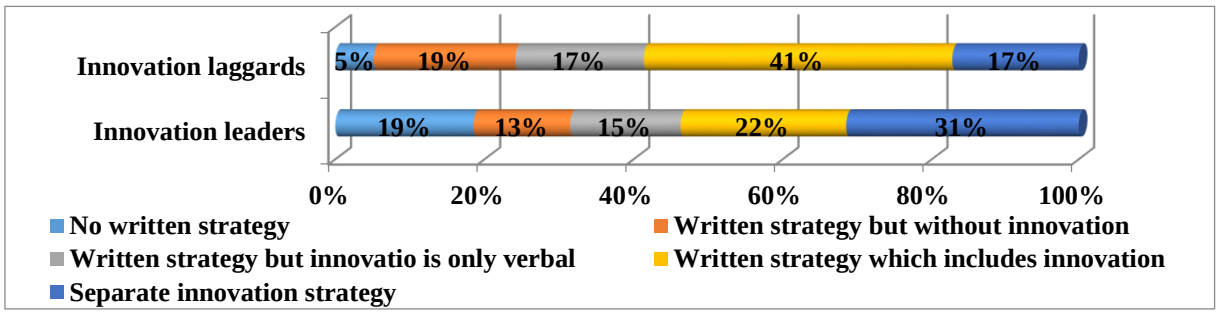
Source: own data and design

Figure 52: Ratios of RDI expenditure to revenue of innovation leaders and innovation laggards



Source: own data and design

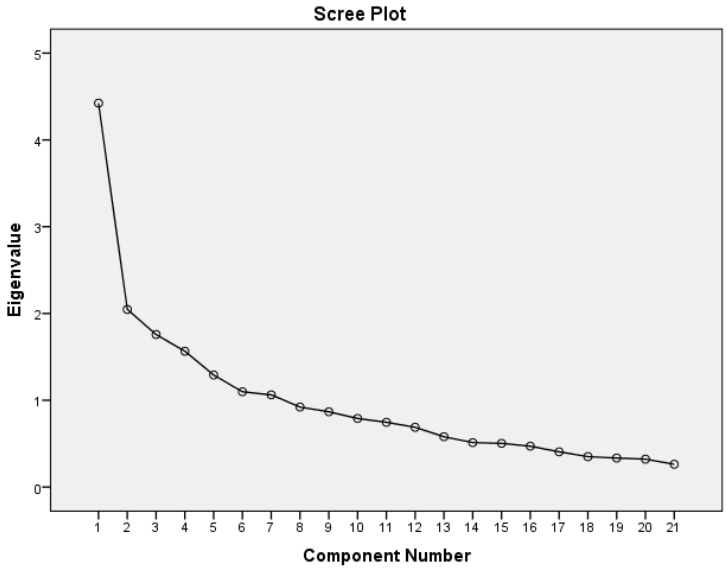
Figure 53: Importance of innovation within the strategy at innovation leaders and innovation laggards



Source: own data and design

8.2.3 Factor analysis

Figure 54: Factor scree plot



Source: own data and design

Table 25: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,762
Bartlett's Test of Sphericity	Approx. Chi-Square	900,704
	df	325
	Sig.	,000

Source: own data and design

Table 26: Total variance explained

#	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var	Cum %	Total	% of Var	Cum %	Total	% of Var	Cum %
1	6,028	23,186	23,186	6,028	23,186	23,186	3,649	14,036	14,036
2	2,536	9,752	32,938	2,536	9,752	32,938	3,590	13,809	27,845
3	1,934	7,440	40,378	1,934	7,440	40,378	3,258	12,533	40,378
4	1,687	6,490	46,868						
5	1,418	5,453	52,321						
6	1,228	4,723	57,044						
7	1,105	4,249	61,293						
8	1,001	3,851	65,145						
9	,917	3,528	68,673						
10	,877	3,372	72,045						
11	,799	3,075	75,120						
12	,742	2,855	77,976						
13	,678	2,607	80,582						
14	,636	2,445	83,028						
15	,572	2,200	85,228						
16	,520	2,002	87,230						
17	,479	1,841	89,070						
18	,442	1,698	90,768						
19	,422	1,624	92,392						
20	,387	1,490	93,882						
21	,362	1,394	95,276						
22	,327	1,259	96,535						
23	,258	,991	97,526						
24	,247	,949	98,475						
25	,227	,873	99,347						
26	,170	,653	100,000						

Source: own data and design

8.2.4 Bivariate correlation tables

Table 27: Operative innovation methods to focus on (all methods)

Operative methods	Score		Rank	
	With itself	Without itself	With itself	Without itself
Colleagues are measured against innovation performance	14.44	11.50	1	2
Staff has a dedicated time on innovation	14.37	11.73	2	1
Customer needs are tested and the results are fed back into innovation processes	13.58	9.72	3	5
Ideas coming from outside the organization are accepted	13.49	9.91	4	3
Innovation-related targets are quantified and measurable	12.64	9.73	5	4
Innovation projects are cross-functional	12.17	8.93	6	6
Experimentation is integral part of innovation	11.93	8.33	7	8
Linear/waterfall or agile projects	11.92	8.17	8	9
Failure is integral part of innovation	11.77	8.14	9	10
Decision making is based on measures	11.62	8.52	10	7
Innovation-related experience is shared within the company	11.45	7.75	11	11
Innovation projects are cross-hierarchical	11.19	7.73	12	12
Customer needs move the focus of product development	9.72	5.79	13	13
Making decisions is based on intentions and guesses	8.43	5.50	14	14
Innovation projects are handled separately	7.87	4.93	15	15

Source: own data and design

Table 28: Strategic innovation methods to focus on (all methods)

Strategic methods	Score		Rank	
	With itself	Without itself	With itself	Without itself
Business strategy has a focus on innovation	14.98	11.43	1	1
Staff is initiative and innovative	13.92	10.34	2	3
Customers are involved into innovation processes	13.89	10.43	3	2
Partners and suppliers are involved into innovation	13.54	10.10	4	5
Targets of innovation are clearly defined	13.50	10.22	5	4
Research and development is aimed at marketable results	13.12	8.63	6	6
Achieving the (business) goals of innovation is important	12.38	8.07	7	7
At innovation it is important to gain new experience and knowledge	11.99	7.61	8	9
Innovation-related experience is utilized in other projects	11.71	8.00	9	8
Thinking on long run (3-5 years) is typical	8.58	4.95	10	10
Product development is based on technological abilities	5.57	2.35	11	11

Source: own data and design

Table 29: Disruptive innovation methods to focus on (all methods)

Disruptive methods	Score		Rank	
	With itself	Without itself	With itself	Without itself
Customer needs are tested and the results are fed back into innovation processes	12.81	9.58	1	1
At innovation it is important to gain new experience and knowledge	12.81	8.31	2	6
Innovation-related experience is utilized in other projects	12.67	8.36	3	4
Customers are involved into innovation processes	12.03	8.40	4	3
Linear/waterfall or agile projects	12.01	8.46	5	2
Failure is integral part of innovation	11.80	8.34	6	5
Innovation-related experience is shared within the company	10.70	6.32	7	9
Experimentation is integral part of innovation	10.57	7.13	8	7
Ideas coming from outside the organization are accepted	10.22	6.93	9	8
Customer needs move the focus of product development	9.46	5.88	10	10
Innovation projects are handled separately	-0.49	-4.21	11	11

Source: own data and design

8.3 Strategic partners

The following **companies** have filled out my questionnaire, providing also their names. I appreciate their help and the data provided.

ASC Vezetői és Informatikai Tanácsadó Kft., BSIS9 Kft, Cardnet Zrt., Cellum Group, Comforce Zrt., Csanádi Csoport Kft., Dyntell, Enterprise Communications Magyarország Kft., ESRI, ETIT[nwpro] Kft., FALCON-VISION Zrt., Femtonics Kft., Geoview Systems Kft., Global Innovation Kft., HyperTeam, INNOSKART IKT Klaszter, Inntek Nonprofit Kft., Ispiro Consulting Kft., Kapos Ternero Kft., LipidArt Kft., M.I.T. Systems Kft., Maform Kft., MAPI Konzult Kft., Mevid Zrt., NEXON, Nextent Informatika Zrt., NOVOFER Távközlési Innovációs Zrt., Omixon Biocomputing Kft., PANNON Pro Innovációs Szolgáltató Kft., Pelso Media Kft., Podiart Kft., Precognox Informatikai Kft., R&R Software Zrt., RCISD, RT 5 Taxi Holding Kft., Scriptum Informatika Zrt., SEARCH-LAB Kft., Siemens Zrt., Solvo Biotechnologiai Zrt., SpringTab, SZÁMADÓ Kft., Tesco Tanácsadó Kft., TRAVELMINIT, TREBAG Szellemi Tulajdon- és Projektmenedzser Kft., TRL Hungary Kft., Webstar Csoport, Webuni.