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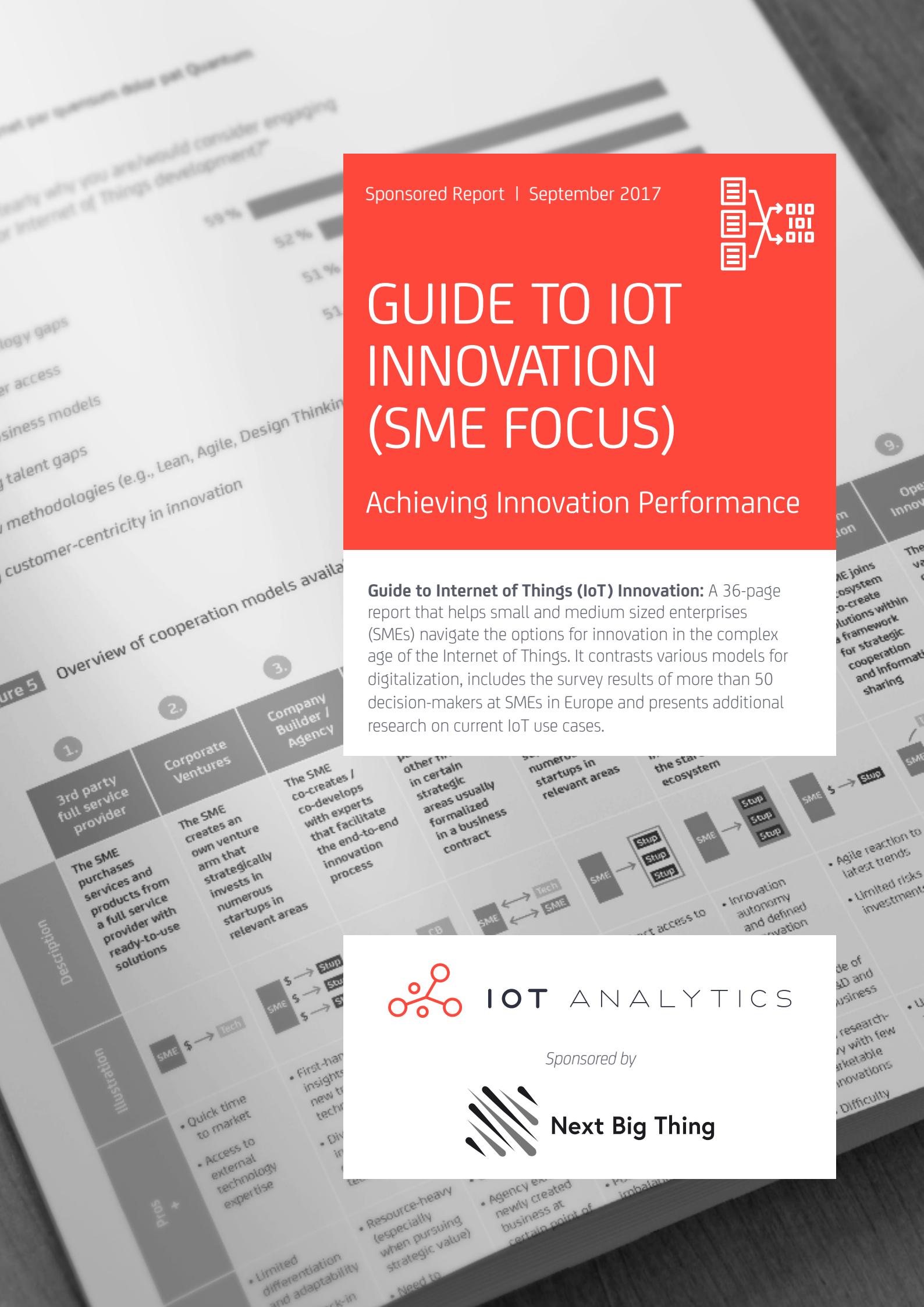
GUIDE TO IOT INNOVATION (SME FOCUS)

Achieving Innovation Performance

Guide to Internet of Things (IoT) Innovation: A 36-page report that helps small and medium sized enterprises (SMEs) navigate the options for innovation in the complex age of the Internet of Things. It contrasts various models for digitalization, includes the survey results of more than 50 decision-makers at SMEs in Europe and presents additional research on current IoT use cases.



IOT ANALYTICS

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Achieving Innovation Performance

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September 2017

TABLE OF CONTENTS

WHY READ THIS PAPER?

Internet of Things (IoT) solutions are primed to revolutionize the way we do business. Digitized processes, products and services create a new level of efficiency and enable completely new business opportunities. Companies need to follow these trends in order to stay competitive and thrive in their respective markets.

While large and multinational corporations generally have sufficient human, financial and development resources to create these new digital and IoT-based solutions, small and medium-sized businesses (SMEs) don't possess the same options. Nevertheless, SMEs face a plethora of choices of external innovation from building corporate ventures to using company builders all the way to accelerators.

This report sets out to guide SMEs to find not only a fitting model for digitalization but furthermore to help navigate the options for innovation in the even more complex age of the Internet of Things.

MAIN OBJECTIVES:

- Identify the most relevant issues facing SMEs that develop new IoT based services and adopt IoT into their company
- Identify IoT innovation models currently observed in the market by showcasing a set of select IoT project examples
- Develop a perspective on key success factors of successful IoT collaboration and innovation models

INSIGHTS:

The insights are based on IoT Analytics' existing market research and expertise on the Internet of Things, the results of more than 50 interviews, and research on several IoT use cases in Europe.

Research findings include:

- The majority (70% of respondents) of SME's are using IoT technology to improve current products and 52% are aiming for new service-based business models
- 46% of businesses see lack of internal talent and 40% lack of technology expertise as an obstacle to innovation.
- Internal innovation such as R&D as the only form of innovation is not sufficient anymore and startups are used in nearly all collaboration forms as an important source of innovation
- Getting to markets faster is the strongest reason to engage in collaboration (59% of respondents)

Note: This paper is based on independent research carried out by IoT Analytics. All views expressed are those of IoT Analytics and not the paper sponsor, Next Big Thing AG.

1. INTRODUCTION

Digitalization and innovation in IoT – moving slowly is no option

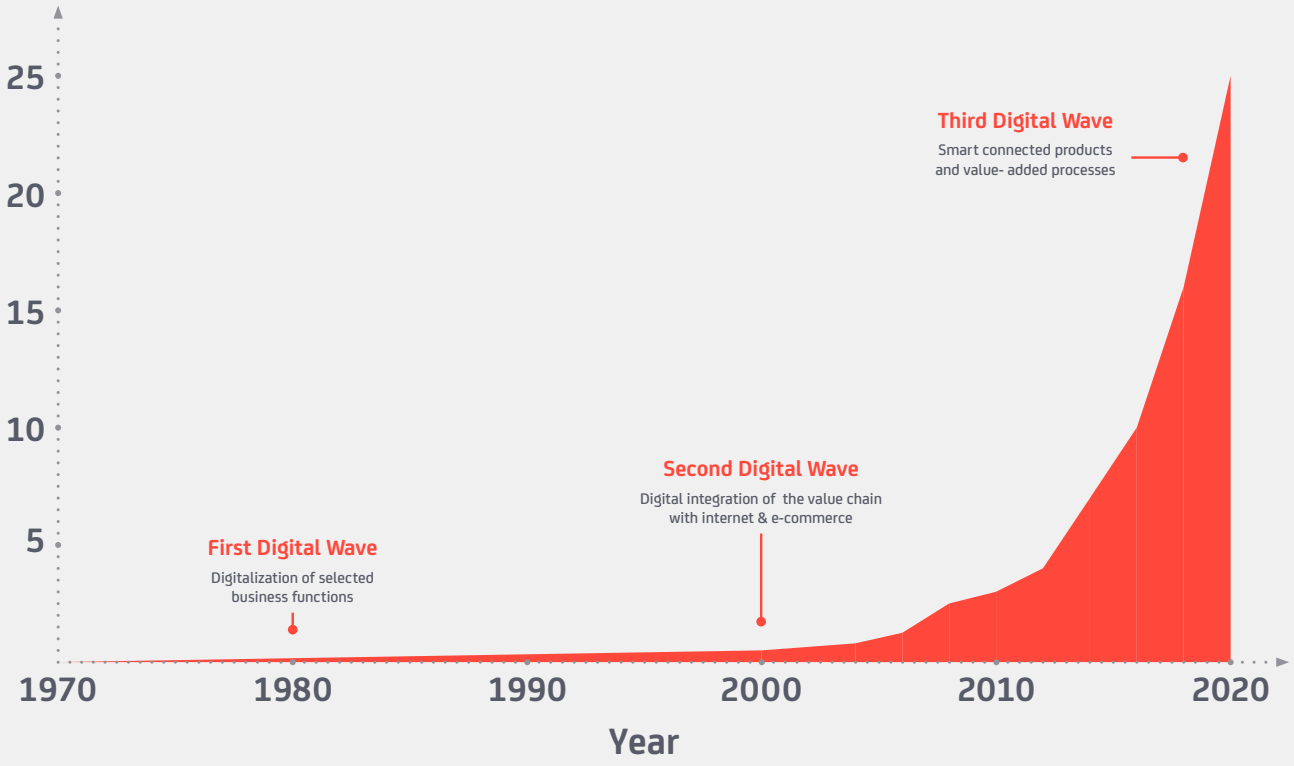
Highlights: IoT enables the third wave of digitalization and presents an $11 trillion business opportunity. 70% of SMEs surveyed plan to use IoT to improve current products but many struggle with a lack of internal talent (46%) and a lack of technology expertise (40%)

Internet of Things (IoT) solutions are primed to revolutionize the way we do business – but how can small and medium sized companies (SMEs) who do not have the necessary skills in their enterprise and are limited by budgets, location, or means of innovation apply IoT technology?

A look at the history of digitalization to date shows that the number of connected devices is growing exponentially which leads to the technological progress speeding up.

Figure 1 Number of Internet Capable Devices and Digitalization Waves

(connected PCs, smartphones, tablets and other objects in bn)



Information technology has been fundamentally transforming the business environment in the last fifty years with waves of digitalization and exponentially increasing numbers of connected devices (see Figure 1). The "1st Wave" began with the introduction of PC's and laptops in some functional areas within organizations. The IT focus then shifted increasingly cross-functional and cross-company through the evolution of the internet and e-commerce. The emergence of smartphones led to the "2nd Wave" resulting in huge economic potential for early adopters and new innovative startups. Currently, we are witnessing the "3rd Wave" of digitalization driven by adoption of IoT which is expected to have an immense impact not only on our personal life, but also on the way firms do business.[1]

It is not surprising that IoT is the next big thing as it offers exponential opportunities to overcome traditional product boundaries by creating completely new service driven business models. As an INSEAD report pointed out: "We are currently experiencing the 3rd Wave of IT-driven competition and the Internet of Things is the next megatrend with a broad range of strategic choices."[2]

At its most basic level, IoT is the idea of connecting physical objects, or "things", to the Internet. These objects deliver information or data that can be used to create new experiences and improve the way we live and work. The vast implications of billions of interconnected devices are driving a major technological disruption today.

More and more data is being generated by "things" rather than by people, largely due to continuously declining costs of sensors, bandwidth, and storage. At the same time, new ways to analyze this massive data are becoming available in the market.[3]

> ***Most of the innovation coming out of our Internet of Things testbeds is centered around the effective and valuable use of IoT-generated data.***
>
> K. Eric Harper, Member of the Steering Committee at Industrial Internet Consortium

McKinsey estimates the potential impact of IoT to be an aggregated $11 trillion business opportunity over the next ten years – equivalent to about 11% of the world conomy.[4]

Companies are starting to make strategic investments into IoT technology

Organizations across all industries are realizing the huge IoT potential and are thus making strategic investments. In a survey, 96% of senior business leaders revealed their companies would be using IoT in some way within the next 3 years, while 68% said their companies are already investing budgets in IoT solutions.[5]

1 Tresmo White Paper/April 2017: Erfolgreiche IOT-Geschäftsmodelle

2 ##500 Corporations: How do the World's Biggest Companies Deal with the Startup Revolution?, http://cdn2.hubspot.net/hubfs/698640/500CORPORATIONS__How_do_the_Worlds_Biggest_Companies_Deal_with_the_Startup_Revolution_-_Feb_2016.pdf?t=1454307105225

3 Goldman Sachs (2014), IOT primer, http://www.goldmansachs.com/our-thinking/outlook/internet-of-things/IoT-report.pdf

4 McKinsey (2015), report: "Unlocking the potential of the Internet of Things", http://www.mckinsey.com/insights/business_technology/the_internet_of_things_the_value_of_digitizing_the_physical_world

5 PSFK (2014), report: "A Brief History Of The Internet Of Things", http://www.psfk.com/2014/03/internet-of-things-infographic.html

BCG claims that the IoT's real value from the customer's perspective are IoT services, IoT analytics, and IoT applications and predicts that these areas will capture 60% of future IoT spending.[6]

If you don't innovate, your competitors will!

As Clayton Christensen's stated in his famous book The Innovator's Dilemma: "If you don't innovate, your competitors will".[7] The costs of inaction will put the whole business at risk as competitors may capture market share very quickly. IoT has seen some early examples already:

- IoT-based car-sharing services like Car2Go or DriveNow are disrupting urban mobility
- IoT-based smart thermostats (e.g., Nest, Tado) are competing with existing market leaders like Danfoss
- New low-power telecommunication standards (e.g., Sigfox) are challenging established carriers like Deutsche Telekom or Vodafone.

The two central questions for any SME are: "How can I be that innovator?" and/or "How can I avoid being challenged?" Maybe even "How can we move from vision to implementation?"

In order to answer these questions, companies should consider learning to change "the art of the possible", as the bar on "best-in-class" customer experience will be raised quite significantly.[8]

> ***In the last years, we have improved our process of regularly screening and engaging with startups. The advantage is huge: We feel certain not to miss any disruptive trends around our core business.***
>
> Thorsten Schaeuble, Head of Business Development Smart Factory at TRUMPF GmbH + Co. KG

Looking back at the 2nd wave of digitalization, established companies were very slow to adapt their core skills and build the needed capabilities for successful digital businesses. Consider how firms like Amazon or Zalando disrupted the retail landscape through new e-commerce models, while for example Borders Group, the international book and music retailer, sold their online business to Amazon and later ended up filing for bankruptcy in 2011.

In comparison to such internet services, the ecosystem for IoT is even more complex, more expensive, and technologically more difficult to deploy. SMEs have additional disadvantages because they often lack monetary resources or the ability to attract global talent that would allow them to credibly engage with a new technology trend such as IoT.

The answer to many of these challenges can be seen in "external innovation". Pioneers that engage in various forms of external innovation report increasing satisfaction and first results – as will be explored in the upcoming chapters.

6 BCG (2017), report:" Winning in IoT: It's All About the Business Processes", https://www.bcgperspectives.com/content/articles/hardware-software-energy-environment-winning-in-IoT-all-about-winning-processes/

7 Christensen (1997): „The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail"

8 Porter/Heppelmann (2014): HBR: How Smart, Connected Products Are Transforming Competition

INVESTMENTS IN DIGITAL TRANSFORMATION – WHERE ARE SMES NOW?

Several studies have assessed the status of SMEs' IoT readiness. As an example according to a recent VDE study only 3 out of 10 SME's are "riding the waves of IoT".[9] An Accenture survey confirms these findings with a survey among 1,400 C-suite decision-makers and found out that while companies might see and believe in the Internet of Things potential it is not really translating into actions.[10]

For our own analysis, we have only engaged with SMEs that are developing or are planning to develop IoT-based products and services.

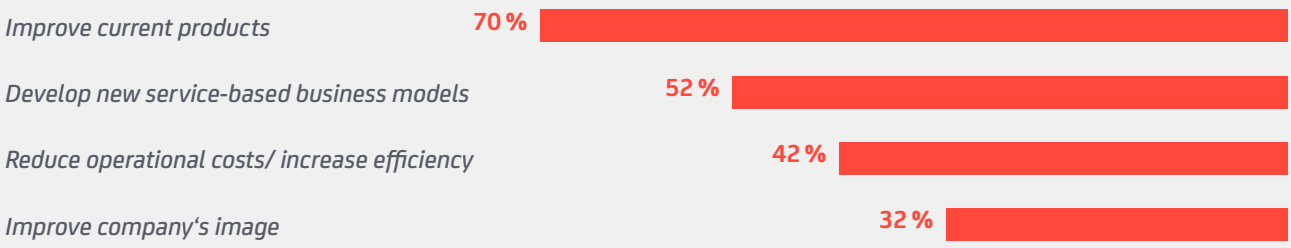
The results suggest that companies lack a comprehensive vision of where IoT will take them and their industry.

The results suggest that many firms do not have a comprehensive vision where IoT will take them

The majority (70%) are using IoT technology to improve existing products. Interestingly, 52% of respondents indicate that new service-based business models are the reason for performing Internet of Things based innovation. In light of the disruptive potential of IoT, the focus on current products is understandable but could turn out to be not far-reaching nough.

Figure 2 Most SMEs utilize IoT technology to improve current products

Question: *„What is/are the main reason/reasons you are developing IoT-based products/services?"*



9 VDE-Trendreport 2016: Internet der Dinge / Industrie 4.0, https://shop.vde.com/en/vde-trendreport-2016-internet-der-dinge-industrie-40

10 Accenture CEO Briefing 2015: From Productivity to Outcomes, - Using Internet of Things to drive future business strategies, https://www.accenture.com/t20150527T211103__w__/frfr/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Local/fr-fr/PDF_5/Accenture-CEO-Briefing-2015-Productivity-Outcomes-Internet-Things.pdf

Furthermore, companies that want to reap the full potential of IoT through in-house innovation must overcome a variety of inhibitors and obstacles that are slowing down IoT adoption considerably:

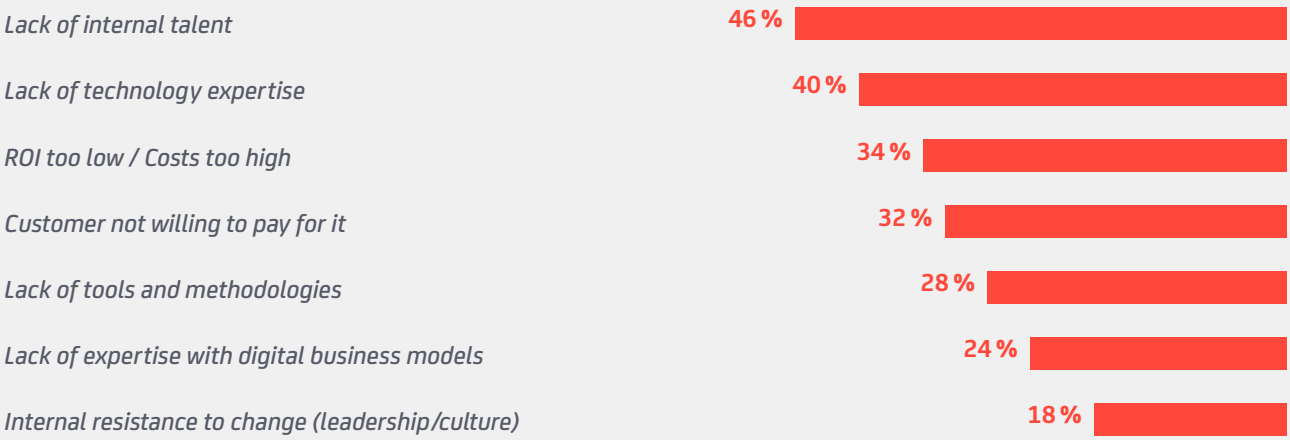
SMEs lack talent to innovate

The biggest obstacles for SMEs today is the lack of internal talent (46%) and lack of technology expertise (40%). Both would be a must-have for internal development. SMEs looking to find talent and expertise in IoT immediately compete on a global scale - a competition they seem unlikely to win as many SMEs are located in lesser known areas with less attractive settings for a globalized workforce.

In order to develop new and potentially disruptive services in an increasingly service-driven environment, experts in digital transformation, innovation, and IoT are needed. A lack of talent and expertise would otherwise lead to a lack or at the very least a detrimental delay of products and services for the future. To avoid delayed innovation, many SMEs opt for external means of transformation and innovation.

Figure 3 Lack of internal talent and technology expertise are holding SMEs back

Question: *„What are the biggest obstacles for you to effectively adopt to Internet of Things?“*



2. MODELS FOR EXTERNAL INNOVATION

Highlights: By going outside the organization for innovation, companies hope to get to market faster (Number 1 reason) and close existing technology gaps (Number 2 reason). Out of the 9 innovation models identified (see Figure 5) SMEs do not have a clear favorite. 1. "Third party services" (49%), 2. "Corporate Venture Capital" (49%), and 3. Strategic Partnerships (48%) are seen as the most important collaboration models – most firms bet on a combination of models involving larger tech vendors, other third parties, and startups.

WHY CHOOSE EXTERNAL INNOVATION?

On top of competing for the same global resources for digital and IoT innovation, companies need to answer the classical outsourcing question: What part of the innovation should be delivered by internal means and what parts should be outsourced to suppliers and partners?[11] [12]

Traditionally, key reasons for external innovation have been lower costs, higher efficiency, and decreased likelihood of failure (risk mitigation).

Many large companies perform R&D externally, often creating new centers far away from the core business

Based on research such as Christensen's "Innovator's Dilemma", companies have increasingly recognized that in-house R&D will not be the most efficient and effective way to build new, digital capabilities (such as IoT).

Many large companies perform R&D externally, often creating R&D centers far away from the core business. Within the IoT solution space, for instance, spin-offs or subsidiaries are emerging that are both physically, as well as organizationally detached from their core R&D center e.g. Bosch Software Innovation in Berlin, GE Digital in San Ramon, California, Trumpf Axoom in Karlsruhe.

The reasons to collaborate for IoT innovation are compelling

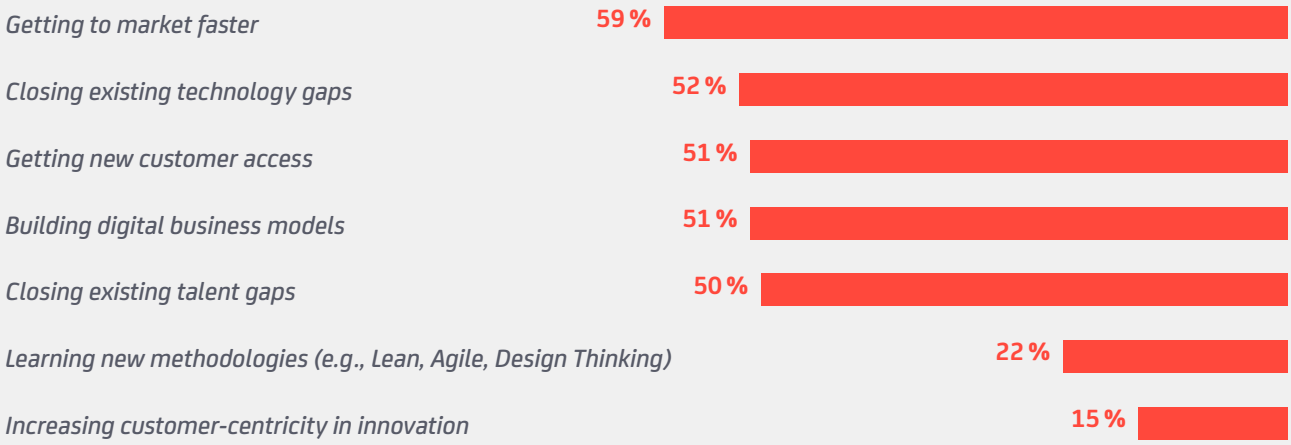
Separate digital or IoT R&D entities aside, SMEs have compelling reasons to undertake collaboration. In our survey participants consider engaging in partnering for IoT development due to the following reasons:

11 Bain (2016): „Defining the Battleground of the internet of things"

12 Porter/Heppelmann (2014): HBR: How Smart, Connected Products Are Transforming Competition

Figure 4 Companies partner to accelerate time-to-market

Question: *„Can you state clearly why you are/would consider engaging in partnering for Internet of Things development?“*



Getting to market faster (59%) is the strongest reason to engage in partnering. Developing a full IoT solution from idea to roll-out takes time and skilled resources. In light of gaps, it is better to partner and thus achieve product commercialization in less than a year.

By partnering up, some firms accelerate the time to market for their IoT solution by a factor of 10x

Some firms claim that by partnering up, they can accelerate the time to market for their IoT solution by a factor of 10 compared to the traditional in-house approach.

The second most important aspect for SMEs is “Closing existing technology gaps” (52%). Among those gaps, SMEs often lack understanding of state-of-the-art cloud architectures, new communication protocols and transmission systems (used to connect devices), and lastly the knowledge to develop end-to-end IoT applications. Respondents also mentioned “Getting new customer access” (51%) and “Building digital business models “(51%) as further important reasons to look for partners outside of the organization. This is in line with the aforementioned intent to develop new, digital and IoT-enabled services.

VEHICLES FOR EXTERNAL IOT INNOVATION

There is an array of collaboration models available to any SME. These include one-off events (e.g., Pitch events, Hackathons), start-up support models (e.g., free tools, coaching and co-working space), and joint development activities in newly founded legal entities / spin-offs. The type of innovation ranges from equity-based collaboration to more co-creation of long-term business models. Figure 5 summarizes the key cooperation models including a short description and Pros & Cons.

Some SMEs are testing various forms of innovation in a speedboat approach

No survey respondent has tried all 9 identified models of innovation. However, some SMEs are using a "speedboat approach" which means they are testing various forms of innovation at the same time in the format of small projects. These models get evaluated after a couple of months to understand which model fits best. It is often based on trial and error in accordance with the agile methodology. Risk and cost of failure are relatively small.

Buying Third party services (44%), Corporate Venture (36%) and Company Builder/Agencies (36%) have been most widely used for collaboration in the past. Corporate Ventures are most often used by larger firms as it requires a certain investment volume and a dedicated organizational unit. SME's also worked with digital agencies and company builders who are helping to facilitate the end-to-end IoT innovation process.

Working with Thrid Parties and engaging into Strategic Partnerships, are seen as the most successful models for innovation

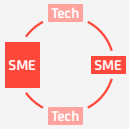
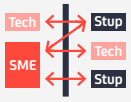
When asked what would work best for SMEs, respondents perceived Third Party Services (49%), Strategic Partnerships (49%) and Corporate Ventures (48%) as the most successful forms of IoT-based innovation in the coming years.

Accelerators/Incubators (40%), Innovation labs (35%), and ecosystem innovation (29%) also scored considerably higher compared to the models that had been used in the past. (See Figure 6 for details)

Working with startups is part of the winning formula

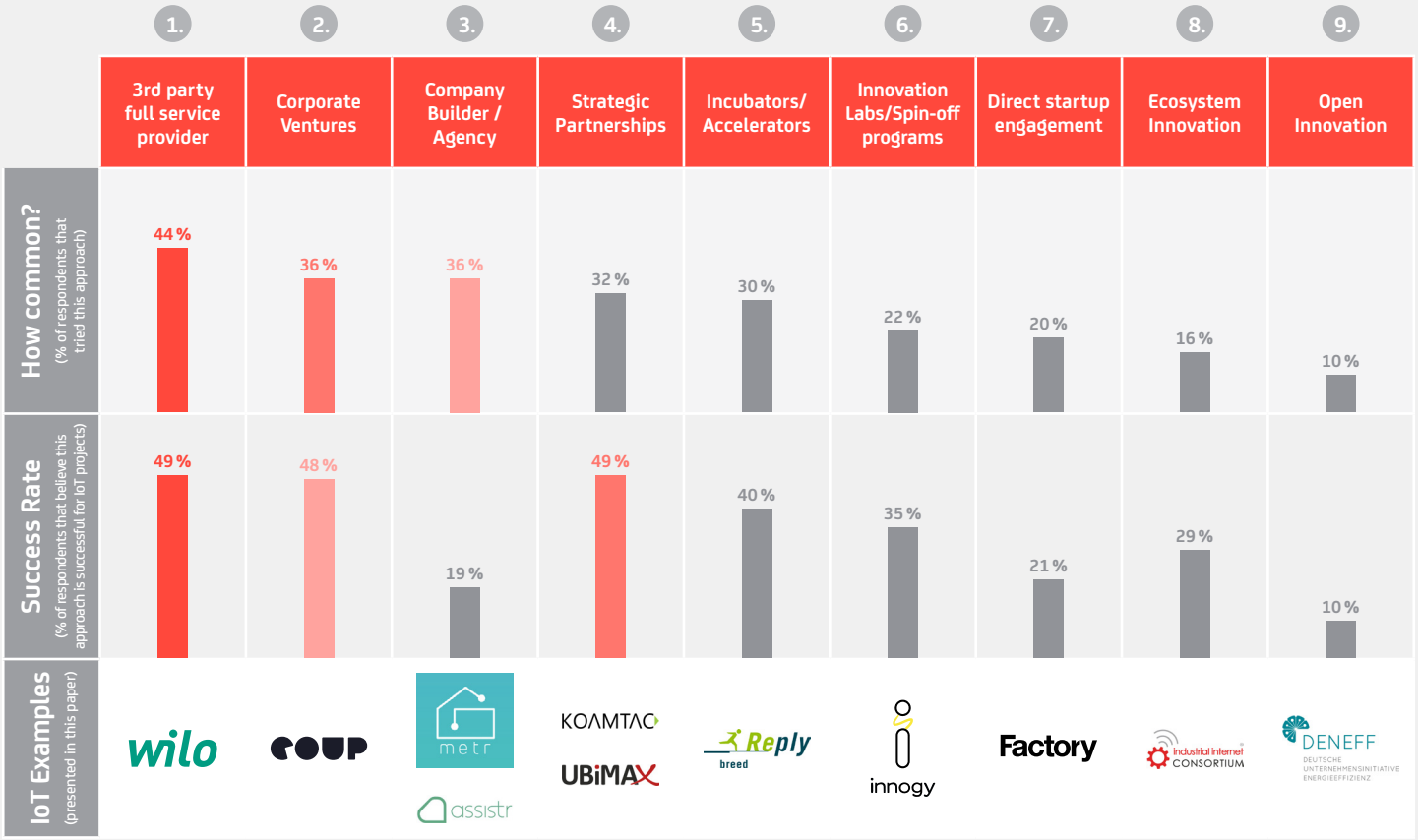
The majority of listed innovation models and 3 out of the top 5 models involve startups in some form. However, simply working with startups will not bring the expected benefits to companies if they don't understand how to work with them. (see model 7: Direct startup engagement)

Figure 5 Overview of cooperation models available to SMEs

	1. 3rd party full service provider	2. Corporate Ventures	3. Company Builder / Agency	4. Strategic Partnerships	5. Incubators/ Accelerators	6. Innovation Labs/Spin-off programs	7. Direct startup engagement	8. Ecosystem Innovation	9. Open Innovation
Description	**The SME purchases services and products from a full service provider with ready-to-use solutions**	**The SME creates an own venture arm that strategically invests in numerous startups in relevant areas**	**The SME co-creates / co-develops with experts that facilitate the end-to-end innovation process**	**The SME partners with other firms in certain strategic areas usually formalized in a business contract**	**The SME creates an own arm that strategically supports numerous startups in relevant areas**	**The SME creates an own separate legal entity that acts as an in-house startup or as an interface with the startup ecosystem**	**The SME co-creates / co-develops directly with a start-up**	**The SME joins an ecosystem to co-create solutions within a framework for strategic cooperation and information sharing**	**The SME uses various tools of innovation across organizational boundaries (e.g., Hackathons)**
Illustration									
Pros +	• Quick time to market • Access to external technology expertise	• First-hand insights into new trends and technologies • Diversified stake in potentially disruptive technologies	• Quick time to market • Access to tech expertise and network • Shared risks through joint implementation	• Increased implementation speed • Increased quality of innovation	• Direct access to startups • On-going startup scouting • Image of an innovative brand	• Innovation autonomy and defined innovation strategy • Dedicated focus outside of current R&D and legacy business	• Agile reaction to latest trends • Limited risks / investments	• Ability to influence future standards • Ensuring interoperability of IoT solutions	• Expand the breadth of ideas • Improve the internal learning capability
Cons -	• Limited differentiation and adaptability • Risk of lock-in situation • Often expensive	• Resource-heavy (especially when pursuing strategic value) • Need to establish knowledge transfer process • Need to establish investment expertise and strong network in the new industries	• Potentially expensive • Agency exits newly created business at certain point of time	• Often just a "high-level intent" • Potential imbalance in the relationship between partners	• Risk of working on topics not directly related to SME's core business • Limited knowledge transfer between startup and SME • Standardized acceleration program does not meet individual startup needs • SME-Startup fit often not ideal - limited to startups that apply to the program	• Often research-heavy with few marketable innovations • Difficulty integrating the innovation back into the core business • Employees not liable for results (no entrepreneurial risk)	• Uncertainty about startup future and/ or developed technology • Need to revise internal processes to better meet a startup's needs	• Slower decision-making • Uncertain return-on-investment	• Loss of key knowledge control • High coordination costs

SME = Small and medium-sized Enterprises; **Tech** = Technology Vendor; **Stup** = Startup; **CB** = Company Builder

Figure 6 Successful vehicles of collaboration for external IoT innovation



SME = Small and medium-sized Enterprises; **Tech** = Technology Vendor; **Stup** = Startup; **CB** = Company Builder

2.1. THIRD PARTY FULL SERVICE PROVIDER

Description	The SME purchases services and products from a full service provider with ready-to-use solutions
+ Pros	• Quick time to market • Access to external technology expertise
– Cons	• Limited differentiation and adaptability • Risk of lock-in situation • Often expensive
SMEs that have tried this model	 **44 %**

Buying services and products from a full service provider promises to overcome the two biggest obstacles identified in the previous chapter: Lack of talent and lack of technology expertise. Therefore it is no surprise that this option has been used widely in the past and is expected to remain a key model for any SME to innovate.

Using off-the-shelf and ready-to-use solutions, companies can quickly prove that IoT technology works for them.

Apart from the fact that this model is usually one of the most expensive, the following risks have to be addressed and evaluated:

- Experiencing a lock-in situation with specific vendors (e.g., once an IoT cloud platform has been integrated, it may be very costly to switch the provider)
- Losing the ability to quickly change, improve or adopt the products (e.g., a construction equipment maker realized that the data model provided in their IoT solution required massive changes for a new add-on feature they wanted to bring to market)

Companies often engage several vendors in small 1-3 month Proof of Concept projects

The current best-practice when working with third party solution providers in IoT seems to be to engage several vendors in small 1-3 month PoC (Proof of concept) projects and then evaluate how successful the solution and the collaboration is.

2.2. CORPORATE VENTURES

Description	The SME creates an own venture arm that strategically invests in numerous startups in relevant areas
+ Pros	• First-hand insights into new trends and technologies • Diversified stake in potentially disruptive technologies
– Cons	• Resource-heavy (especially when pursuing strategic value) • Need to establish knowledge transfer process (startup to corporate) • Need to establish investment expertise and strong network in the new industries
SMEs that have tried this model	**36 %**

Corporate Venture Capital arms are often subsidiaries of large corporations with the aim to make strategic investments in areas adjacent to the core business. They typically invest equity as minority shareholders in startups at Seed or Series A stage. The main goal (in addition to financial success) is of strategic nature: To be close to important technological and market developments and to get first-hand insights that allow fast reactions to new trends and technology breakthroughs. Best-in-class Corporate Venture subsidiaries provide more than just capital, they unlock strategic synergies e.g., they drive the innovation collaboration by actively setting up meetings between the startups in their portfolio and various corporate departments. Ideally, this exercise complements internal R&D efforts and ultimately increases speed, agility, and scope of innovation.[13] Especially large SMEs posess the necessary resources to use this more traditional form of investment to scout for next generation technology.

EXAMPLE 1

WILO SE, a leading manufacturer of pumps and pump systems for heating, cooling and air-conditioning technology, is investing in startups at different phases (Series A, mainly co-investment). It founded Wincubator which provides financial support for new companies in building management and water services as a long-term strategic investment; besides that, Wincubator supports startups on the operational level, with know-how and mentoring. For WILO the main purpose of externalization of the innovation activities is to better figure out the trends on the market and to see how the solutions can be implemented. The main purpose is not financial gain but to to open up opportunities for co-creation.

> ***Our objective is often not to fully acquire the start-up but rather to have a direct and frequent touchpoint around certain hot topics. I view it as a wall around our core business that ensures we won't get disrupted.***
>
> Thorsten Schaeuble, Head of Business Development Smart Factory at TRUMPF GmbH + Co. KG

13 BCG Study (2016): „Corporate Venturing Shifts Gears - How the Largest Companies Apply a Broad Set of Tools to Speed Innovation", https://www.bcgperspectives.com/content/articles/innovation-growth-corporate-venturing-shifts-gears-how-largest-companies-apply-tools-innovation/

2.3. COMPANY BUILDER/AGENCY (CO-CREATION/CO-DEVELOPMENT)

Description	The SME co-creates /co-develops with experts that facilitate the end-to-end innovation process
+ Pros	• Quick time to market • Access to tech expertise and network • Shared risks through joint implementation
– Cons	• Potentially expensive • Agency exits newly created business at certain point of time
SMEs that have tried this model	 **36 %**

TRADITIONAL APPROACH: AGENCY

Large consulting firms like Deloitte and BCG have founded digital subsidiaries to support their clients – mainly big corporations – in building products/services and entire digital turnkey businesses from scratch. They offer a range of collaborative options but typically start with consulting services and act also as an entrepreneurial partner with shared risk throughout the lifetime of the project. In order to quickly build the required solutions they bring in a diverse team consisting of skilled engineers, designers and developers – unfortunately often with a high price premium compared to typical market price salaries.

EXAMPLE 2

Bosch Coup, free-floating scooter sharing service, is the result of an innovation partnership between Bosch, Boston Consulting Group (BCG) Digital Ventures and Gogoro. Gogoro, a startup producing electric scooters with a battery swap system partnered with a new Bosch subsidiary called Coup, a smart electric scooter-sharing service that launched in Berlin in August 2016. Initially, 200 of Gogoro's scooters equipped with Coup's cloud and app ecosystem appeared on the streets. BCG Digital Ventures built the scooter-sharing software. The project has a strategic importance for Bosch, as Bosch's mobility unit is its largest business sector, providing 41.7 billion euros in sales last year, or about 59% of total group sales. Previously, this unit typically focused on developing technology for companies like Tesla, Google, and Porsche, not a direct service to an individual consumer.[14]

When choosing which innovation model is right, it is important to understand the distinctions between agency and company building approaches. A disadvantage of a traditional agency approach might be that the goal of the agency is to provide more consulting services over a longer period of time. Often, there is limited responsibility for the results and little responsibility for KPIs.

NEW APPROACH: COMPANY BUILDER

In a company building model, on the other hand, value creation is "shared" between partners. As a shareholder, company builders share both risks and successes of a

14 http://fortune.com/2016/08/04/bosch-gogoro-berlin/

newly created company, with both parties having joint goals. The company building model is in its infancy however, and will need time to prove its effectiveness.

Company builders promise to offer a complete framework for the acceleration of IoT ventures. The model is close to that of an operational venture capital arm, rather than that of an agency service.

Company builders jointly develop a product with a team of entrepreneurs

Company builders do not only invest in an idea, they also develop a product together with a team of entrepreneurs. Most often, company builders provide core expertise to the startups - technology, marketing, sales, product development and more. On top of that, company builders play a key role bringing different players in the ecosystem together e.g., research institutions, technology providers or innovation partners. They encourage everyone to participate in the company building process.

> ***At Danfoss, we are in the middle of innovating our core business in the context of (industrial) IoT. In that process, we joined forces with a company builder and established a successful accelerator program: After two years of digital transformation our top management is excited, employees are committed and new business models are being launched.***
>
> Carsten Witschonke, Senior Innovation Manager, Danfoss

Company builders typically pursue one or several of the following operating models:

1. The company builder develops an idea out of its network and builds startups on its own. In this case SMEs step in on the later stages of project development, similar to working with 3rd party full service providers (e.g., WATTx, a company builder set up and fully funded by the Viessmann Group)

2. The company builder sets up a joint venture startup with a new legal entity foundation and joint asset contribution by both parties, industry partners and a company builder (eg. Next Big Thing AG - IoT company builder - future ventures - Crypto)

3. The company builder co-develops products and services for an SME (e.g., companies developed by Next Big Thing AG - METR assistr)

EXAMPLE 3

NBT AG[15] and Smart building - metr Building Management Systems GmbH

METR, one of Next Big Thing AG's earliest ventures, has the vision to lay the foundations for future housing IoT systems across Germany. Partnering with a leading German housing association, it aims to build the foundations for future IoT use-cases in digital applications for smart building and smart home.

METR's initial product involved creating gateways for smart metering devices. The industry partner's prior solution was provided by a single organisation which held a monopoly position on a submetering gateway, maintaining complete control over price and quality

The industry partner chose to co-develop with a startup connected to a company builder in order to reap the benefits of internal innovation, whilst at the same time gaining access to an alternative perspective, knowledge and expertise that would typically be only achievable externally.

This meant that a fully user-centered approach could be adopted with the goals of both parties much more aligned, providing the industry partner with the opportunity to iterate developments and develop ventures that are purpose built.

The infrastructure provided by the company builder means that startups can focus on the business model and leave all other time-consuming tasks such as finding talent and sourcing technologies to NBT. This is proven by METR's short time to market. By partnering with NBT, the industry partner is able to co-develop the gateways in a matter of months.

From a technological perspective, the industry partner's greatest concern is for the technology to work as it is supposed to. By leveraging the in-house expertise of NBT, the partner is able to develop a solution that works and has ongoing technical support for the product today and any future iterations.

The investment, which was sourced by NBT, dramatically reduces the risk of startup failure which would leave the industry partner stuck in limbo. Therefore partnering with a company builder assures an end-to-end innovation process without the risk of the startup vanishing.

The outcome is a bespoke solution that meets all the needs of the organisation, developed from ideation right through to prototype in 9 months. The product is half the price of the previous solution with the partner retaining part ownership while increasing the functionality with greater usability and ensuring much greater data security.

15 Next Big Thing AG (NBT) is a Berlin-based company builder that specializes in the launch of IoT ventures in partnership with industry partners seeking to leverage the Internet of Things. As well as being a company builder NBT shapes the IoT HUB in Berlin, enabling the assembly of entrepreneurs, technology experts and strategic partners to drive innovations. As such, new disruptive business models can be created - facilitated by its technological competence and access to market and expertise.

EXAMPLE 4

Next Big Thing AG's and Healthcare - assistr Digital Health Systems GmbH

Assistr, Next Big Thing AG's first venture in IoT healthcare, looks to improve healthcare by identifying the most promising IoT business cases and implementing them together with an industry partner.

Research into opportunity spaces in healthcare reveals great inefficiencies in incontinence care for elderly patients that could be exploited. Diapers for elderly people, for example, have seen only incremental growth rates in the past 60 years.

Current processes hinder the adoption, as nursing staff is required to actively check and clean patients on a regular basis. As such, many patients fail to receive the quality of care that could be possible. Digitizing diapers has the potential to tackle these inefficiencies. By pushing data directly to nursing staff, the time of change can be optimized, preventing disease and cost blocks that may occur from too late / too early change. Similarly, the wealth of end user data attainable through IoT can provide a more accurate, real time assessment of patients' health.

For manufacturers of diapers, the advantages of being the first to innovate in this area could not be greater. A unique product can propel the reputation of the manufacturer as an innovation leader, differentiating themselves from the competition and reducing customer acquisition costs. In the context of little change, the first to innovate, protect IP and implement a fully realised smart diaper product will have a huge advantage over competitors and likely gain substantial market share in the first few years.

Diaper producers are aware of the necessity to innovate and have previously worked to develop smart diapers but been unable to truly realize a successful product.

There are great technological challenges in building a solution cheap enough to embed into a throwaway consumable such as diapers. It requires a firm understanding of all layers of the IoT technology stack, from sensory design right through to UX and app development. Prior attempts have cost too much and taken years to even get to prototype stage.

By partnering with a company builder, the diaper manufacturer can co-develop a solution that fits the needs of the industry within months, whilst reducing the risk of not finding a solution or taking too long to develop.

2.4. STRATEGIC PARTNERSHIPS

Description	The SME partners with other firms in certain strategic areas usually formalized in a business contract
+ Pros	• Increased implementation speed • Increased quality of innovation
– Cons	• Often just a "high-level intent" • Potential imbalance in the relationship between partners
SMEs that have tried this model	 **32 %**

Strategic partnerships may lead to increased implementation speed and higher quality outcomes by combining assets and expertise. Many vendors of IoT Solutions are currently partnering due to the complexity of IoT and the subsequent inability to offer an end-2-end solution. Some of these firms build up entire partner ecosystems of several hundreds of firms.

The SME IoT user community is adopting the trend of increasing partnerships

This trend that is happening in the IoT vendor space seems to be becoming more prevalent in the SME user community as well. Many of these co-operations are not purely company-to-company but also companies with academic organizations and research bodies (e.g., Fraunhofer).

EXAMPLE 5

Koamtac, founded in 2002, is a US-based SME that produces compact bluetooth barcode scanners. The company joined a strategic partnership with Ubimax, who offer Wearable-Computing and Augmented Reality Solutions

Koamtac's barcode scanner has been integrated into Ubimax's wearable solutions for picking and placing and assembly processes. The scanner is positioned on top of a worker's hand and serves as a way of confirming his tasks, while essentially keeping his hands free.

By cooperating with Ubimax, Koamtac has successfully placed its solution in a highly innovative field, while Ubimax has enhanced its products with an additional technology.

However, both parties have to synchronize their strategic plans and operations and be able to build a single value chain. The research partner has to be able to deliver results that are ready-for-commercialization. At the same time, the industry partner needs to own the resources and expertise that are necessary to bring the product to market.

2.5. INCUBATORS/ACCELERATORS

Description	The SME creates an own arm that strategically supports numerous startups in relevant areas
+ Pros	• Direct access to startups • On-going startup scouting • Image of an innovative brand
– Cons	• Risk of working on topics not directly related to SME's core business • Limited knowledge transfer between startup and SME • Standardized acceleration program does not meet individual startup needs • SME-Startup fit often not ideal - limited to startups that apply to the program
SMEs that have tried this model	**30 %**

Incubators and accelerators provide opportunities for companies to support a small group of start-ups throughout a certain period of time and within a structured framework. This support speeds up product development and time to market; it can range from connecting startups to relevant industry partners and investors, opening up office or prototyping facilities, running a pilot project and intensive mentoring.

Incubators aim to support a startup at the very early stage and over a relatively lengthy period (often up to 12 months or longer).

EXAMPLE 6

The incubation model of **Reply** provides hands-on-support in the development and growth of startups; from general management to technology, right through to sales and marketing. For Reply, the main goal is to search for innovative solutions, related to Reply's core business activities - a system integration and digital service company. For the startup it is beneficial that Reply has access to a large international customer base (on the enterprise level and existing internal startups) in Europe and the USA, strong expertise in technology and can provide support with design, production and logistics. A prominent IoT startup that graduated from Breed Reply is the predictive maintenance startup "Senseye".

Startups can quickly build a network in the industry, get to know the customer group and develop a prototype. Usually, incubators don't take a share of a startup. In many cases, incubators are established by universities or research labs; where the main goal is technology transfer. In practice, very few incubators are run by SMEs

In contrast to incubators, accelerators aim for fast development of concepts through a shorter term structured curriculum starting with boot camps. The objective is to get from idea to concrete products / services within 1.5 - 3 months. It helps to sharpen the business idea and to develop a sound business model. The results are often showcased at so-called "demo days". Big corporations typically have their own accelerators e.g. Grants4Apps by Bayer or You is Now by ImmobilienScout.

A large number of startups do not manage to build a complete product during the accelerator program. Nevertheless, several IoT firms with tremendous traction in the market have originated from incubator/accelerator programs e.g., Relayr (Startupbootcamp Accelerator), Senseye (Breed Reply Incubator), Konux (Deutsche Bahn Mindbox Accelerator).

Both vehicles of collaboration take many forms and might be beneficial for an SME only if they fit to the long term innovation strategy of a company. SMEs are using these vehicles to build bridges to startups and to quickly get acquainted with a broad variety of new business ideas in their business domain. However, SMEs should understand that launching an incubator or accelerator often does not speed up the innovation in the core business. Moreover, the implementation of new concepts, developed as a result of engagement with startups during acceleration program, stays fully on the agenda of SMEs.

After leaving the accelerator, startups often focus on their own business with limited benefit to the SME

During standardized acceleration programs senior management of SMEs is involved in the mentoring of startups; but knowledge transfer is often not established due to a lack of time and a failure to understand fast changing startup processes. After leaving the accelerator programs, startups are usually not further involved in building a new product for the SME as the startups continue to focus on their own business - raising funds, developing a product, scaling up. Thus, working with a startup via an incubator or accelerator is a challenging endeavour due to the different nature of doing business and the diverging needs

2.6. INNOVATION LABS/SPIN-OFF PROGRAMS

Description	The SME creates an own separate legal entity that acts as an in-house startup or as an interface with the startup ecosystem
+ Pros	• Innovation autonomy and defined innovation strategy • Dedicated focus outside of current R&D and legacy business
– Cons	• Often research-heavy with few marketable innovations • Difficulty integrating the innovation back into the core business • Employees not liable for results (no entrepreneurial risk)
SMEs that have tried this model	**22 %**

Innovation Labs are research units founded to complement traditional R&D. They perform research with wider autonomy and with a mindset similar to startups. In many ways, innovation labs attempt to operate as a sort of "in-house startup".[16] An important difference is the lack of entrepreneurial risk: Employees of the spin-off are not as personally invested in the "startup" as founders in a real startup are. In practice there are also innovation Labs with less ambitious objectives - for example, just investigating possible use cases or building a community around certain topics.

EXAMPLE 7

Innogy Innovation HUB, an innovation unit of innogy SE (subsidiary of the German energy company RWE), is looking for new business opportunities, which are about to change the current business and unlock new opportunities on the intersection of renewable energy and machine economy. New innovative business models are aiming to make innogy SE a new market leader in the environment of renewable energy generation and smart grid infrastructure. Thus, Innogy Innovation HUB is analyzing existing products and technologies and fulfilling the wishes and needs of their customers together with startups. The focus of Innogy Innovation HUB is to develop simple prototypes very quickly and test them in pilot projects with specific customer groups. Once a product is ready for the market, innogy SE starts offering it to customers as part of the regular range of products.[17]

An example worth mentioning is Skydeck, an innovation lab of DB Systel, with a focus on shaping a community of intrapreneurs and developing showcases of digital and IoT solutions for any of Deutsche Bahn's companies.

Swiss manufacturer of elevators and escalators Schindler have, similarly, established an Innovation HUB in Berlin to investigate service-based business models for their products.

16 BCG Study (2016): „Corporate Venturing Shifts Gears"

17 Innogy: https://innovationhub.innogy.com/

> ***By having a separate legal entity, we have tremendous degrees of freedom that allow us to understand the IoT startup scene holistically, experiment with solutions and get to know key venture capitalist and business angels***

Innovation Manager at Innovation Lab of Automotive Supplier

The continuum of innovation labs ranges from aiming for advancing products or services that are close or adjacent to the core business that would have been otherwise killed from internal R&D to wider diversification or disrupting existing business."[18]

Oftentimes spin-offs generate tension with other internal R&D departments when products / services come back to the core business. The following quotes are real statements from different people at the same automotive supplier. They highlight the tradeoffs between independent scouting for important trends and focusing on existing business goals:

> ***Managing the innovation lab is tricky –no real revenue opportunity has come out of it yet and I feel the projects they pursue are not targeted at helping our business goals.***

Head of R&D at the same Automotive Supplier as the previous quote

18 BCG Study (2016): „The Most Innovative Companies 2016 – Getting past „Not invented here"

2.7. DIRECT START-UP ENGAGEMENT (CO-CREATION/CO-DEVELOPMENT)

Description	The SME co-creates /co-develops directly with a start-up
+ Pros	• Agile reaction to latest trends • Limited risks / investments
– Cons	• Uncertainty about startup future and/or developed technology • Need to revise internal processes to better meet a startup's needs
SMEs that have tried this model	**20 %**

Both large companies as well as SMEs are increasingly looking to startups as an important source of innovation. A startup is usually a new company such as a small business, a partnership or an organization designed to rapidly develop a scalable business model."[19] [20]

Start-ups and established SMEs bring two distinct and equally integral skills to the table. SME's have a performance engine and resources, while startups excel at giving birth to successful proof of concepts.[21]

Cooperation models are still at an early stage, underfunded and scattershot according to a study from Imaginatik/ Masschallenge.[22] Other studies point to a certain degree of progress highlighting an increasing shift collaborating with startups.

EXAMPLE 8

There are plenty of examples of SMEs that have reached out to startups for direct engagement.

An innovative approach, which takes this model one step further, can be found in Germany's startup capital Berlin. "Factory Berlin" is a new concept that is still evolving and needs to be proven.

Factory Berlin positions itself as a community of innovators, bringing together startups and corporates in one space. Factory scouts the talents, facilitates engagements and collaboration projects between startups and companies that are willing to innovate.

Three out of four startups cooperate with established firms

For example, three out of four startups say they now cooperate with established companies and 67% of them say that they prefer early stage startup interactions.[23]

Interviews held in conjunction with this study have shown that the combination of startup engagement in a project as well as a minority equity investment have been perceived as the most successful model both for SMEs as

19 Robehmed, Natalie (16 December 2013). „What Is A Startup?". Forbes

20 Wikipedia: https://en.wikipedia.org/wiki/Startup_company

21 Yoon/Hughes (2016), HBR: „Big Companies Should Collaborate with Startups"

22 Imaginatik/Masschallenge (2016): „The state of startup/corporate collaboration 2016

23 EUROPEAN STARTUP MONITOR 2016, http://europeanstartupmonitor.com/fileadmin/esm_2016/report/ESM_2016.pdf

well as startups. They allow the SMEs to maintain some form of control over the project and its strategic direction.

SMEs should establish an internal process of how to work with startups

In order to get the most out of cooperation with startups, SMEs should establish efficient internal processes and a framework for collaboration. They need to inform all the respective colleagues about the purpose of cooperation with a startup and set clear deadlines for making decisions. It is important to understand, that the main goal of a startup is to generate revenues as soon as possible to secure their future. It might be dangerous for a startup to engage in co-operations, which take too much time or shifts their product development focus.

As a decision-maker in a large corporation or SME, it is important to be aware of how critical timing is for a startup. Furthermore, it is necessary to speed up negotiations from the SME's side, secure the budget for cooperation or plan to participate in a pilot project as a client.

> ***When our IoT startup launched, some SMEs and corporates thought they could engage us for free advice. In hindsight, we are still only creating value for firms that respected us as an equal partner from the start and acted and paid accordingly.***
>
> Pierre Maniere, CEO at Cybus

There is a growing number of mediators, which are supporting the matching process between SMEs and startups without influencing the outcome of cooperation.

2.8. ECOSYSTEM INNOVATION (CONSORTIA/ACADEMICS)

Description	The SME joins an ecosystem to co-create solutions within a framework for strategic cooperation and information sharing
+ Pros	• Ability to influence future standards • Ensuring interoperability of IoT solutions
– Cons	• Slower decision-making • Uncertain return-on-investment
SMEs that have tried this model	**16 %**

EXAMPLE 9

Industrial Internet Consortium (IIC), is an open membership organization that aims to accelerate the development and adoption of widespread interconnected machinery. The IIC testbed program provides a framework for companies to innovate in the Internet of Things by offering support in many industries such as Agriculture, Building Management, Healthcare, Factories, and Transportation. These platforms for testing of new products and applications bring together multiple technologies from various companies and demonstrate real-world implementation of Industrial Internet solutions.[24]

Innovation ecosystems are formed by various types of organizations interacting as a framework for strategic cooperation and information sharing. They enable companies and other institutions to come together, have a voice in setting the standards as well as developing and marketing new solutions – with the broader goal to shape the future of the industry.

In contrast to most other approaches, ecosystem innovation is usually not as direct and quick. As a participant of an ecosystem community, each member will have to first find their spot and create something of value for the membership community, then advocate the ideas and results.

Some ecosystems, such as the Industrial Internet Consortium, offer dedicated spaces for experimentation in real industry environments. This pushes the boundaries for IoT innovation and enables companies to bring in ideas more quickly and more reliably. Firms work jointly together on the best interoperability standards in order to ensure future IoT solutions work seamlessly.

> ***The IoT innovation best-practices we develop at IIC helped one of our industrial member companies to stop thinking in silos and get an alignment on their internal IoT innovation strategy.***
>
> K. Eric Harper, Member of the Steering Committee at Industrial Internet Consortium

24 The Industrial Internet Consortium: http://www.iiconsortium.org

EXAMPLE 10

Berlin's IoT HUB, is part of a broader government Digital Hub initiative to launch regional ecosystems across Germany. Berlin's hub focuses on IoT & Fintech, bringing together representatives from startups, research institutes, SMEs and industry. Three partners are driving the development of the IoT HUB: Factory Berlin (International Startup community), Next Big Thing AG (IoT company builder) and Berlin Center for Digital Transformation (Research partner). The Berlin IoT HUB has the main aim to facilitate collaboration and networking between key stakeholders in the IoT space.

There are both dedicated IoT innovation ecosystems such as the IoT Consortium, Industrial Internet Consortium or Plattform Industrie 4.0 and established innovation ecosystems that have laid a focus on IoT such as IEEE, ISO, or the European Alliance for Innovation (EAI).

2.9. OPEN INNOVATION/HACKATHON

Description	The SME uses various tools of innovation across organizational boundaries (e.g., Hackathons)
+ Pros	• Expand the breadth of ideas • Improve the internal learning capability
– Cons	• Loss of key knowledge control • High coordination costs
SMEs that have tried this model	**10 %**

The concept of open innovation is based on Henry Chesbrough who coined this term in his book describing how companies shifted from closed innovation processes towards a more open way of innovating.[25] The main theme is that of bringing external knowledge into the organization by tapping into the ideas of outsiders and then collaborate on technology breakthroughs.

Examples include idea competitions (e.g., Hackathons), customer immersion programs, or the cooperation for knowledge transfer with institutions and research bodies (e.g. universities).

In the last years, there has been an increase in IoT Hackathons. They are usually set-up as a 48h weekend design-sprint event bringing people from diverse backgrounds together (programmers, designers, users) with the objective of having a working prototype at the end of the event.

EXAMPLE 11

DENEFF Energy Efficiency Hackathon took place in March 2017. Aiming to find the solutions for a sustainable future, over 100 participants assembled for 12 hours to focus on the challenge of creating a sustainable energy future to fight climate change. Diverse backgrounds of the participants, from engineers, coders, designers, psychologists to business developers and entrepreneurs, aimed to unlock creativity and speed up development of the concepts. As a result of the hackathon, teams presented (somewhat) tested concepts and agreed on possible follow-up development for their ideas. [26]

Such events are often performed to find “out of the box” ideas, get new inspiration and find talent. Expectations should not be set too high, however, as the results are often still far away from a usable proof of concept.

25 Chesbrough (2013): Open Innovation: The New Imperative for Creating and Profiting from Technology

26 DENEFF Energy Efficiency Hack 2017: https://www.eehack.com

3. RECOMMENDATIONS

IoT is becoming a strategic priority for many small and medium sized organizations.

SMEs are still searching for a winning formula

Our research results indicate that SMEs are still searching for a winning formula to crack digital transformation and especially in light of innovation towards IoT. Nevertheless, in a globalizing world that pushes SMEs to external innovation, some clear patterns do emerge.

GENERAL FINDINGS:

1. **IoT drives new innovation models.** Traditionally, most SME innovation was linear and achieved by working with third parties, procuring their products and services. With digitalization and innovation in IoT, this picture is changing: Corporate Venture Capital (49%) and Strategic Partnerships (48%) rise to the same level of importance. Innovation labs (35%) and Ecosystem Innovation (29%) also gain relative importance. Most firms bet on a combination of models involving larger tech vendors, other third parties, and startups to reach a disruptive mix for innovation.

2. **Lack of talent and expertise hold innovation back.** 46% of surveyed SMEs state a lack of internal talent and 40% a lack of technology expertise. This is a vast skill gap that SMEs will have to bridge on the path to digital transformation and innovation in IoT.

3. **Incremental IoT innovation is prioritized over disruptive innovation.** Only 52% of respondents focus on developing new service-based business models while the majority (70%) are using IoT technology to improve existing products. In light of the disruptive potential of IoT, the focus on current products for linear innovation is surprising, perhaps even alarming. SMEs seem to lack a comprehensive vision of IoT.

There are 6 things SMEs should take away from this report

SIX TAKEAWAYS FOR SME'S:

1. **Make building talent and expertise a top priority.** Many SMEs lament a lack of internal talent (46%) and technical expertise (40%). Unfortunately digital talents are rare and hiring takes time. Involving new people in effective innovation processes is not feasible and in IoT increasingly difficult short-term.

2. **Go external.** Innovation done inside of an organization is perceived as rather incremental and does not lead to a disruptive change. Combined with growing competition when attracting talent, this results in a clear mandate for SMEs to look for external innovation through established partners with the necessary skills.

3. **Ask yourself if buying IoT services will help you differentiate.** While buying IoT services are still perceived as the most common source of innovation, other approaches are now similarily important. Ask yourself if e.g., working with an IoT platform will help you achieve a competitive advantage or will it rather lead to a "me-too strategy". Your competitor is likely doing the same.

4. **Adapt the innovation approach to the size of your firm.** Several of the discussed innovation models are only available to medium or large enterprises due to the high number of required resources (especially Venture Capital, Incubators, and Ecosystem innovation approaches). Working directly with startups, a company builder or performing targeted open innovation is less dependent on dedicated resources and financial investment and may be more suited to smaller enterprises.

5. **Reach out to startups but do it right.** 3 out of 5 of the most successful models for IoT innovation involve startups. Working together with startups in whatever form has been raised as a success factor. However, don't expect free work, be open to financial commitments and a long-term relationship.

6. **Organize your innovation in an independent organizational unit.** SMEs should recognize that IoT products and services development require a long-term effort. A fully independent organization (spin-off) ensures that it will not be cannibalized by the traditional core organization. But realize that there are trade-offs (e.g., not directly supporting the core product line)

4. SURVEY RESPONDENTS

The survey was completed by 50 respondents, which were distributed as follows:

Countries	Completes
Germany	25
UK & Ireland	10
France	5
Italy	9
Netherland	1
Total	**50**

Industries	Completes
Healthcare	6
Manufacturing	17
Retail	11
Energy	2
Building Management	2
Logistics	12
Total	**50**

Company Size	Completes
100 to 499 employees	11
500 to 999 employees	15
1,000 to 4,999 employees	15
5,000 to 9,999 employees	6
10,000 employees or more	3
Total	**50**

ABOUT

IOT ANALYTICS

IoT Analytics is the leading provider of market insights and industry intelligence for the Internet of Things (IoT).

More than 40,000 IoT decision makers rely on IoT Analytics' market research every month. IoT Analytics tracks important data around the IoT ecosystem and publishes a number of reports around the Internet of Things. Besides focused market reports on specific IoT segments and sponsored reports, the company offers bespoke research related to its focus areas. IoT Analytics is headquartered in Hamburg, Germany.

Find out more at https://iot-analytics.com

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Next Big Thing

Next Big Thing AG is a Berlin-based IoT company builder that offers a complete framework for the acceleration of IoT ventures. Our goal is to promote digital transformation and IoT-driven innovation for startups and companies throughout Europe.

We facilitate the merging of all necessary components of a successful venture, providing access to a thriving ecosystem of investors, startups, corporate partners, hardware and software engineers and technology providers.

Our programmatic approach to company building distills the most valuable ideas whilst offering a framework in which they can thrive, guiding our ventures from concept right through to prototyping and beyond.

Since launching in August 2016 we have successfully nurtured numerous IoT ventures across energy, property / facility management and assisted living sectors whilst developing our own tech stack of enabling technologies in blockchain and secure hardware.

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