

The Story of CERIT Science Park in 10 Years and 7 Cases

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Abstract. This paper provides a glimpse into the realm of CERIT's (CEnter for Research and education in IT) service-oriented startups across diverse sectors, highlighting their impact on media, sports, energy, manufacturing, maintenance, chips design, and cybersecurity and defense while showing the evolution as part of the global movements. Each case can serve as lessons learnt and inspiration for evolution of future Science Park(s) services, or even to shape the future of Service Science discipline on its own.

1 Introduction

1.1 Motivation

In the dynamic landscape of technological innovation, service-oriented startups have emerged as transformative catalysts, reshaping traditional business sectors. These startups leverage cutting-edge technologies to empower industries, fostering efficiency, innovation, and sustainability. Traditional view of science parks as means of technology transfer between R&D and industrial production recently transforms into service-oriented, value co-creation environments. Being with the CERIT Science Park (CSP) at Masaryk University from its inception in 2014 onwards [1], we can witness important decision-making points contributing to its today's manifold ecosystem helping to create and develop service-oriented businesses in many business branches.

This paper provides a glimpse into the realm of CERIT's (CEnter for Research and education in IT) service-oriented startups across diverse sectors, highlighting their impact on media, sports, energy, manufacturing, maintenance, chips design, and cybersecurity and defense. Each case can serve as lessons learnt and inspiration for evolution of future Science Park services, or even to shape the future of Service Science discipline on its own.

The structure methodology of the paper is as follows. First, we let outline developments in CERIT Science Park since engaging the first clients in 2014 until its recent state in 2024. In parallel, we try to identify overwhelming trends in IT and its business and societal and impact in the same years. We will see how far we were able to foresee and strategically plan its goals and client recruitment policy. For the identification of the decisive trends during the years, we used ChatGPT 4o (commercial) [2] giving the chat this prompt: “For

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each year from 2014 to 2024, can you provide a paragraph describing the leading development (or even technological breakthrough) that determined the further evolution of IT and its impact onto society?” We then took the substance of the answer for each year and use it for mapping with the achievements of the Science Park and namely its client companies located there – either the same year or later.

1.2 CERIT Science Park and IT Historical Milestones

1.2.1 Year 2014: Rise of the Cloud & Opening of the CERIT SP

After several year of technical and business development in the area, the cloud computing in 2014 revolutionized IT infrastructure. Major players like Amazon Web Services (AWS), Microsoft Azure, IBM Cloud, and Google Cloud Platform expanded their services, allowing businesses to scale rapidly without heavy investment in physical servers. It was also a great success of IT service orientation per se. Most of the firms in CERIT can therefore provide their R&D and service provisioning without extensive on-premises infrastructure.

1.2.2 Year 2015: Mobile Payment Boom

In 2015, mobile payments surged, with technologies like Apple Pay and Android Pay gaining traction. This development transformed the financial sector, making transactions more secure and convenient. In the same year, one company whose primary business was secure banking applications, started its operations in CERIT Science Park. Its mission was to provide highly secure customer solutions for mobile market. After successful 10 years, the company focused its business at tools (e.g. libraries) for development of secure mobile apps.

1.2.3 Year 2016: Artificial Intelligence Renaissance

2016 saw significant advancements in artificial intelligence (AI), particularly in machine learning and deep learning. Companies like Google, Facebook, and Amazon made strides with AI technologies, leading to innovations like voice assistants (e.g., Amazon Alexa) and improved recommendation algorithms. It was also roughly the year where one company providing a sophisticated software solution designed for automated visual inspection in manufacturing; powered by proprietary AI-based anomaly detection algorithm and advanced image processing technology, it offers an intuitive platform for accurately identifying defects and imperfections in physical products. The company later relocated to CERIT Science Park.

1.2.4 Year 2017: Blockchain and Cryptocurrencies

Blockchain technology and cryptocurrencies gained mainstream attention in 2017, primarily driven by the meteoric rise of Bitcoin. Blockchain's decentralized ledger system promised to revolutionize various industries, offering enhanced security, transparency, and efficiency. While there have been numerous Fintech startups that time, we have not got any into CERIT Science Park.

1.2.5 Year 2018: 5G Rollout

The rollout of 5G technology in 2018 marked a significant leap in mobile network capabilities. It also reshaped perspectives in smart power grids – expanded bandwidth allowed new applications towards more flexible, intelligent, and sustainable energy supply and consumption.

1.2.6 Year 2019: Edge Computing

Edge computing emerged as a pivotal technology in 2019, addressing the limitations of traditional cloud computing by processing data closer to its source. This development was crucial for applications requiring real-time processing and low latency, such as autonomous vehicles and industrial IoT. Again, smart power grids are an ideal application domain for edge computing as for many problems, that data emerge at the edge – and thus also its processing can reside there – without the necessity to transmit the data back and forth to large data center.

1.2.7 Year 2020: Remote Work Revolution

The COVID-19 pandemic in 2020 accelerated the adoption of remote work technologies. Video conferencing tools, collaboration platforms, and virtual private networks became essential. This shift fundamentally changed the workplace, promoting flexible work arrangements, reducing commute times, and highlighting the importance of digital infrastructure. Not surprisingly, it also affected entertainment industry by growing interest in video- compression, processing, and transmission services that are provided by another start-up company located in CERIT Science Park.

1.2.8 Year 2021: Quantum Computing Breakthroughs

In 2021, significant advancements in quantum computing were made, with companies like IBM and Google achieving milestones in quantum supremacy. These breakthroughs promised to solve complex problems beyond the capabilities of classical computers, potentially revolutionizing fields like cryptography, materials science, and drug discovery. Czech Quantum Communication Infrastructure [3], part of the European QCI, is in a neighboring successor: CERIT Science Park II [4].

1.2.9 Year 2022: Metaverse Expansion & Better Entertainment Experience

The concept of the metaverse gained substantial traction in 2022, driven by investments from tech giants like Facebook (rebranded as Meta) and developments in virtual and augmented reality technologies. The metaverse envisioned interconnected virtual worlds for social interaction, entertainment, and commerce. Though incomparable by size, one start-up company from CERIT Science Park expanded its services in entertainment technology aiming at a better sport viewing experience.

1.2.10 Year 2023: AI and Ethics

In 2023, the focus on AI ethics intensified as advancements in AI technologies raised concerns about bias, privacy, and job displacement. Governments and organizations began implementing regulations and frameworks to ensure ethical AI deployment. The societal impact involved increased awareness and dialogue around responsible AI use, promoting transparency, fairness, and accountability in AI applications across various sectors. The National Coordination Centre (NCC) for Cybersecurity established recently with The National Cyber and Information Security Agency is in CERIT Science Park II. NCCs mission is to *possess or have access to research and technological expertise in cybersecurity and have the capacity to engage effectively and coordinate with industry, the public sector, the academic and research community and citizens.* [5]

1.2.11 Year 2024: Sustainable IT Initiatives

In 2024, the IT industry saw a major shift towards sustainability, with companies adopting green technologies and practices to reduce their carbon footprint. Innovations in energy-efficient data centers, renewable energy sources for IT infrastructure, and sustainable hardware design became prevalent. However, IT also helps to make energy supply and

consumption more sustainable by making the grids more efficient. See the *Energy Case* later.

2 Cases in CERIT Science Park

Now we can go into more detail for selected cases of companies, who connected their destiny with the CERIT Science Park as a platform and community for their growth and success.

2.1 Case: Media

High-speed video processing was an RD topic at Masaryk University's Faculty of Informatics [6] since its foundation in the middle of 1990s. Actively contributing to that time rapid development of high-speed networks enabling new forms of remote collaboration using videoconferencing, the Faculty of Informatics together with the CESNET – Czech academic network operator became a front-runner in original methods of highly effective and efficient JPEG2000 processing implemented in codecs. It works together with media content providers and distributors, not only in media & entertainment business but also for medical and geospatial imaging. Thanks to its top speed and high performance it brings Ultra High-Definition video broadcasting to reality, offering life-like images to viewers in real time. The codec provides the best solution to store and process gigapixel aerial or medical images.

This company is a typical showcase of innovative approach originally based on academic research but being able to spin-off quickly and find local investment which, however, helped the firm to grow globally. It also illustrates how the client- and service-orientation is vital also for technology-oriented startups. The novel methods do not bring profit and do not attract investment unless carefully targeted to very specific business needs. The inventions are not primarily capable of turning into products being sold in millions – rather they are ready to be customized on a value co-creation basis for specific purpose.

2.2 Case: Sport and Entertainment

Technology is revolutionizing the sports industry, with startups driving advancements in performance analysis, sports management, and improved fans experience. CSP hosts a company – a specialized supplier of AV components and software into fully integrated systems for sports industry, such as equipment for operators of sport halls. Providing the necessary hardware integration of devices such as LED screens, digital scoreboards, game clocks, TVs, outdoor displays, camera sets and the like. However, a pillar of this company's business is not just technology delivery but end-to-end services, from planning to the opening ceremony, including installation, training, and maintenance, including 24/7 helpdesk and on-premises by arrangement. Innovative service includes automatic pitch area recognition powered by AI enhanced by manual choice for correcting AI limitations and addressing complex camera views.

2.3 Case: Energy Sector

The energy sector is undergoing a profound transformation with startups focused on renewable energy solutions, grid optimization, and energy management.

One of the companies in CSP has evolved from a group of graduate students of the Service Science program supported by local investors which eventually created a unique know-how and methods for advanced data acquisition and processing in power distribution industry. The services provided by this company help to improve functionality of smart meters and data center in power distribution. It does not just allow to process consumption values for billing purposes but also collects and analyses data from the grid such as voltage, current, active/reactive power, meter events, and even weather data. The algorithms for advanced data processing are based on machine learning which can ensure accurate estimation of missing values, complex validations, the detection, and classification of behaviour patterns, pointing up anomalies and forecasting.

Recently, after more than two years of preparation, an Important Project of Common European Interest (IPCEI) in microelectronics [7] was launched, involving 68 key companies from all over Europe. The company from CSP will develop its AI/ML algorithms for sensor data processing and make them operational on a range of hardware platforms from key chip manufacturers.

2.4 Case: Manufacturing

Service-oriented startups in manufacturing are deploying IoT, robotics, and data analytics to streamline operations and enhance productivity. It is the business goal of another company at CSP which underwent similar way – from a group of graduate students with entrepreneur spirit and recently foreign investment, the company founded its services on heavily customizable still- and motion- image processing used for inspection on production lines and detecting anomalies and errors.

One example can be packaging industry being traditionally dependent on manual works in assembly and checking of packages for completeness. The software can be applied to inspect the packaging of virtually any product. May it be furniture, electronics, food & beverages, or pharmaceuticals.

2.5 Case: Predictive Maintenance

Startups in maintenance are leveraging IoT sensors and predictive analytics to shift from reactive to proactive maintenance strategies. This not only minimizes downtime but also reduces operational costs, ensuring equipment reliability across various industries.

One of recent spin-offs in CSP established its services on planning predictive maintenance using artificial intelligence and machine learning algorithms for one of the customer's production lines (paint shop). As the input data serve both historically measured data and expert knowledge (service protocols). Anomaly detector (location, time, type) identifies unusual changes and unknown behavioural patterns, based on automatic learning from typical behaviour using positional and correlation characteristics. At the output, a prediction of a timeframe for the next breakdown and time of appropriate service intervention is produced.

2.6 Case: Chip Design

We know that so-called Moore's Law on doubling the number of transistors (or memory capacity) each two years does not work anymore at least in the last ten years. The future is parallel and distributed computing on one hand, and custom computing based on differentiated processors on the other hand.

One company recently settled in CSP is again a former start-up emerging from academic research aimed at chip design tools. It provides a spectrum of advanced design instruments for chip design as well as libraries of ready-made design building blocks for specific purposes, such as basis for custom processors. It represents a typical borderline between products and services: ready-made components and tools for the customers – it allows value co-creation for specific purposes and domains, such as cybersecurity or automotive sectors.

2.7 Case: Cybersecurity

As cyber threats become more sophisticated, startups in cybersecurity and defense are developing advanced solutions to safeguard critical infrastructure, data, and national security.

CyberRange.CZ (KYPO) [8] belonging to key infrastructure offered by CSP is a space for cybersecurity professionals, providing specialized training in daily operations and crisis readiness. In contrast to other mentioned startups, KYPO belongs to the University and its software part is released as open-source KYPO CRP. Apart of the services closely related to KYPO installation and maintenance, we provide trainings that equip security professionals with hands-on experience enhancing client organization's security and resilience.

3 Why CERIT Science Park Model Works?

We saw a numerous non-exclusive list of cases where a co-existence of academic institution and service-oriented IT industry is vital for achieving success measured in both academic and business indicators. Are we able to identify key factors leading to the success of this combined service-oriented model around CSP? Let us try to dive into the field and see the main points.

3.1 Streamlined Effort

CSP, though owned by the University, is a typical product of public and private collaboration – the public sector provided structural (CAPEX) funding for the CSP, the University offered its scientific know-how, graduate students in Service Science and technical disciplines, and operational capacity for the CSP premises. Private sector contributed investment and business operational capacity for the startups and covered the operational costs (OPEX) at the CSP.

3.2 Common Ecosystem

The absolute proximity, i.e. co-location of CSP and Computer Science departments of the University in the same building allows to efficiently combine education (graduate studies of Service Science [9] and other IT disciplines) with research and production. Systematic education in Service Science gives a solid foundation educating T-shaped professionals strong in IT but also equipped with basic notion of business administration and entrepreneurship. It makes a strong initial combination of skills necessary to establish a startup business.

3.3 Multidisciplinary and Transdisciplinary Approach

The study system allows free selection of courses across the University. This is, however, not enough. The study program on Service Science was, in contrast to other IT programs, constructed multidisciplinary from the very beginning, following the T-shaped professional profile. It allowed to dynamically introduce specializations on Management of Software Systems, SW Services but also *Management of Cybersecurity* which specifically gained on importance in the last decade with the advent of new requirements on cybersecurity in organizations, mainly due to new legislation. The internal construction of the program ensures further extensibility if new application areas are foreseen. In case of Europe, building its competitive semiconductor industry may be one of such challenges – and opportunity for a new specialization in Service Science program.

3.4 Service-orientation

Service Systems Management and Engineering became an increasingly popular study program at the Faculty of Informatics since its inception in the middle of 2000s. It opened new horizons beyond the traditional Business Informatics which was a fundament for business computing and administration rather than for supporting innovative businesses and startups. Service science tried from the beginning to become a bridge not just among multiple faculties and disciplines at Masaryk University but also to serve as a direct connection to service economy and vehicle for startup creation. With the subsequent help of CERIT Science Park providing the infrastructure, a foundation of the innovation ecosystem around services has been established.

3.5 Scalability

CERIT Science Park and its client firms would not have been successful if it could not offer the firms certain perspectives to grow. For several start-up success stories, the original premises suitable for a micro-company would not have sufficed. Neighbouring follow-up project CERIT Science Park II [4] was initiated and completed in 2023, offering up to 20000 m² space to let, allowing companies of various sizes to expand there.

CERIT Science Parks I and II are parts of CyberCampus^{cz} which is a symbol of the Czech Republic's self-confident approach to building a resilient digital society [10] inspired by the French "Campus Cyber" [11]. It is a geographical area in Brno that gathers key subjects, expertise, activities, and infrastructure all in one place.

4 Conclusion

The CERIT Science Park has demonstrated remarkable success over the past decade by fostering a unique ecosystem that bridges academic research and service-oriented startup innovation. Through strategic public and private collaboration, CERIT has supported the growth of diverse companies across sectors such as media, sports, energy, manufacturing, chip design, and cybersecurity. This paper highlights key cases that illustrate how CERIT's model of co-location with the Faculty of Informatics at Masaryk University, coupled with multidisciplinary education and a strong focus on service science, has facilitated significant technological advancements and business growth. The success stories underscore the importance of an integrated approach combining academic excellence, practical business support, and scalability, making CERIT a pivotal player in the evolution of service-oriented science parks. As CERIT Science Park II expands this model, it continues to offer a promising future for innovative startups and the broader IT landscape.

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