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Innovation Network Advanced Materials (INAM) – a collective thinking platform to create, develop and produce advanced materials

Plenary session

STPs and Areas of Innovation: collective thinking

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Innovation Network Advanced Materials (INAM) – a collective thinking platform to create, develop and produce advanced materials at STPs Berlin-Adlershof

Executive Summary

For quite some time, STPs experience and increase competition for their start-ups from new and privately organized co-working spaces and accelerator programs.
STPs accept this competition by

- Focusing on their core competences and profile,
  - o Enforcing in particular co-operation between science, start-ups and industry using the potential of the STPs campus (incubation facilities and tech centres), creating open innovation approaches in the research field - e. g. IRIS, thus
  - o Strengthening and opening top level interdisciplinary research institutes for industry cooperation – which is increasingly attracting both start-ups and leading large corporations.
- Dynamic thematically focused networks (e.g. the innovation network for advances materials in Berlin INAM) can significantly contribute to new accelerator qualities providing selected start-ups with excellent access to business competence but even though with access to front edge knowledge, scientific equipment and top materials to develop new innovative solutions and products

Thus, STPs are becoming more attractive for both start-ups as well as large corporations.

1. Introduction

Today's societies face various great societal, economic and environmental challenges such as climate change, environmental protection as well as the need of resource and energy efficiency.

Many STPs have already developed related innovation infrastructure to respond to those challenging societal and global tasks either by accelerating the time line of the innovation cycle by offering modern incubator infrastructure for new innovative technology companies or by stimulating and facilitating cooperation between innovative businesses and scientific institutions. As a result, many innovative companies have been created. Most of them implement new ideas, research results and technical solutions into innovative, marketable products. In order to speed up innovation cycles, reduce time to market, and strengthen collective learning and knowledge networks between science and industry, new methods and collaborative platforms are constantly developed. Open innovation networks and related structures such as co-working opportunities, collaborative R&D and innovation spaces, multi-stakeholder-based incubators and acceleration programmes have become prominent components of local and regional innovation ecosystems. It is particularly striking for primarily public-initiated STPs and AIs, these kinds of open innovation schemes often are installed by private initiatives of large companies and venture capitalists. **However, STPs, AIs and public incubators have also responded to the changing knowledge economy's demands and have increasingly become more actively engaged in this trend recently**.

2. Change of the classical STP model

Many STPs are primarily set-up by combining the 'triple helix' of research facilities - mostly universities and/or non-university research institutes - and high-technology companies in its vicinity. The stimulation of young research-based entrepreneurship, the incubation of start-ups and science-based spin-offs, the support of technology-based, growth-oriented businesses, and the promotion of local and non-local inter-firm, science-based and/or science-industry knowledge networks are still the main tasks of the STP management company.

For many years, STP management usually focused on providing such classical incubation and SME support infrastructure and related business services, such as business management assistance, access to finance and partnership-building support. This approach worked out successful and was the domain of (mostly) publicly-owned BICs and STPs. There was little competition, if at all.

Within the past 10 - 15 years, however, new incubation and collaboration formats came up, often linked to a stark increase of newly created innovative companies. In Berlin, for example, the volume of investments and risk capital in start-up companies has more than quadrupled between 2012 and 2014 (Schmitz and Brinkhoff 2015, McKinsey 2013). New formats and organizational structures benefitted and stimulated from this dramatic shift, co-working spaces, corporate and VC-driven incubators and accelerators (betahaus, Factory, Rocket Internet, Startupbootcamp, Rainmaking Loft, YOU IS NOW, to name just a few Berlin-based examples, among many others). Also, many MNEs, among them many global ICT giants, have strongly built their own incubation and accelerator programmes, as well as open innovation labs. This trend is strongly motivated by the need to gain early access to new ideas, talent and technologies. Just recently created exemplary organizations in Berlin span from General Electric Learning Center, Telekom's hub:raum and T-Labs, Techstars Metro Accelerator, Bayer CoLaborator, Microsoft Ventures, Google for Entrepreneurs, Cisco IoE Innovation Center 'openBerlin' to Lufthansa Innovation Hub (Schmitz and Brinkhoff 2015, Schmidt et al. 2014, Berlin Senate 2013),

At the same time, **more and more start-ups have been attracted to join these private initiatives.** Convincing factors for many young tech entrepreneurs are:

- shorter times to market in conjunction with a
- very densely-designed training and service package of
- intense coaching and mentoring,
- early corporate leveraging opportunities,
- direct ties to industry, as well as
- provision and/or access to manifold seed and add-on risk capital sources (i.e. additional financing rounds)

Hence, incubation and acceleration time periods have dramatically shortened – now counted in 3-6 months or even a couple of weeks instead of several years as in the past. At an early stage, private initiatives understood the evolving technology start-ups' needs related to changes of innovation cycles very well and reduced time to market, and, thus, tremendously gained momentum.

In addition, this major shift is predominantly taking **place in the very city centre – in new emerging 'innovation districts', hip and trendy urban city neighbourhoods** with a zeitgeisty lifestyle and urban amenities – often very distant from classical STP areas in vicinity to research facilities, universities or existing incubation infrastructures.

Consequently**, STPs are facing fierce competition, as they and private initiatives are hunting for the same clients and tenants, such as** innovative start-ups, young entrepreneurs, skilled talent and risk capital. Today, private and public concepts compete for the best ideas, best service packages (incl. financing, business services, as well as corporate and R&D partners) and best people. So far, the new open innovation models and collaborative spaces seem to lead the race. Hence, the question arises: Could this be the end of STPs as we know them? The answer is: Yes. They try to adapt and to evolve like they did before.

3. Reactions of STPs - Examples from Berlin-Adlershof

At first sight, classical Berlin STPs (e.g. Adlershof, Schöneweide) and public incubators (e.g. Tegel, Wuhlheide) have not benefitted from the new start-up boom in great quantitative terms. However, it was understood that the stimulation, development, fostering and quick commercialization of new entrepreneurial ideas and building of innovative competences requires strongly idea-based, collaborative and very market-oriented support schemes and environments. This includes an excellent research environment, qualified staff, well developed infrastructure and open cooperation platforms that facilitate multi-dimensional exchange and stimulation of ideas and knowledge.

Hence, the authors argue that STP:

- Must focus on their traditional assets; such as strong scientific and research-based competences as fundaments for new innovative products, services and processes and innovation in general,
- Support open innovation approaches in the research field - e.g. integrated research institutes,
- Are strengthening and opening top level interdisciplinary research institutes for industry cooperation, in order to attract both start-ups and large corporations.
- Have to think about networks and tools for accelerated growth of their client companies in order to respond to keen competition,
- Have to create better conditions and closer ties to benefit from university research capabilities.

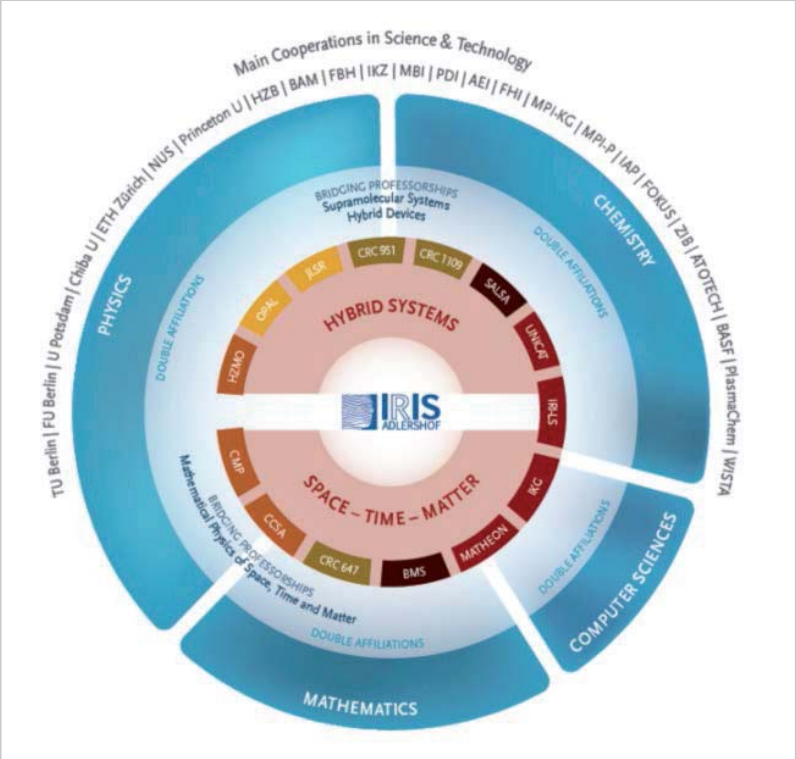
In the following section, the authors will elaborate on the new effects of a completely new approach in this sense; the Integrated Research Institute of the Sciences (IRIS) at the Science Park campus in Adlershof.
IRIS is a new 'collective thinking scheme' at the STP Berlin-Adlershof, which is established by the Humboldt-Universität zu Berlin (HU-Berlin) and strongly supported by the Adlershof Science Park management:

3.1 IRIS - Humboldt-Universität zu Berlin's Integrative Research Institute for the Sciences

IRIS is the prototype of an Integrative Research Institute (IRI). In a joint effort, miscellaneous science departments of (HU-Berlin) have developed this concept of an integrated research institute, supported by the STP Adlershof.

IRIS is aimed to combine elements of a research institute, a development lab and an Institute for Advanced Studies. It collects the core competences of modern optics, molecular systems, mathematical physics and computational sciences (see Figure 1).

Figure 1: Open innovation and technology application system of IRIS



Source: IRIS 2016

One of the most important areas of competence within IRIS are hybrid systems for optics and electronics, dedicated to the exploration of new hybrid systems of inorganic and organic material components. Based on a 'collective thinking' and networking approach, IRIS' s goal is to develop innovative and marketable technological solutions in terms of advanced materials responding to the global challenges of environmental protection and resource efficiency.

Advanced materials, material systems and material classes are identified as critical technology areas, which are to offer major sources for multi-faceted innovations tackling today's societal and environmental challenges. New materials and material applications will contribute a significant impact to new, more sustainable consumption and production patterns in society and industry. This will lead to a significant reduction of used resources, materials and energy, and enhance environmental protection and resource conservation. In manufacturing, for example, material costs allocate to almost 50% of the production costs. Consequently, the development of advanced materials and material optimization generally leads to significant cost cuts and strong competitive economic advantages.

IRIS executes excellent intra-university research cooperation among multiple science departments of the Humboldt-Universität zu Berlin. At the same time, it has established a variety of science-to-science and science-to-industry cooperation - serving as an open innovation platform to develop innovative marketable applications and solutions in optics, electronics and photonics.

The multi-faceted open innovation platform combines Know-how, ideas and talent from universities, applied R&D institutes, start-ups and spin-offs, as well as SMEs and even MNEs. The STP Adlershof complements collaborative infrastructures and spaces. Furthermore, IRIS provides modern laboratory spaces for its cooperation partners, for example, start-ups and spin-offs (OpTecBB 2015). The IRIS research facility of some 4,700 square meters for about 140 scientists, co-financed with ca. € 44m by the German Federal Government, will be completed in 2018 (see Figure 2).

Figure 2: Research facility of IRIS

Source: IRIS, 2016 b

IRIS also puts new forms of collaboration between basic sciences and applied research, technology testing and application, as well as commercialization into practice:

- So-called 'bridge professorships' (i.e. joint professorships of university departments and non-university research institutions),
- Cooperative research infrastructure,
- Science-industry cooperation in product development and commercialization,,
- Open innovation network INAM (Innovation network for advanced materials).

By its work in research and open innovation, IRIS supports core tasks of the Science Park:

- New quality of (project-based) technology value chain compositions at STPs,
- New quality of incubation and acceleration service offers - e.g. differentiated growth programmes for start-up 'gazelles' and 'regular' start-up clients,
- Active integration of research centres as technology sources and technology mentors,
- Integration of MNEs through project-based active leveraging and mentoring opportunities,
- Expansion of the STP's and AI's role as moderators and active interfaces for market-oriented cooperation of science and business,
- Enhanced research excellence to attract new technology-oriented resident firms and 'star' talent (researchers, students and company staff),
- Higher visibility to MNEs resulting in direct or indirect investments (e. g. thru cooperation, branch office, M&A),
- Showcasing the STP's/AI's and related stakeholders' impact on societal and environmental challenges.

The new approach gets an additional impact by the creation of innovative networks for advanced material, which can be used as platform, for all the different innovation players and also establishes new acceleration formats for start-ups and sci-tech SMEs.

3.2 Open innovation network INAM

Organization and objectives:
In January 2016, the innovation network INAM has been established. Core members of INAM are

- Research Institutes (HU-Berlin, IRIS).
- Start-up companies (e.g. the German-Polish company SIOD)
- Large corporations (e.g. OSRAM)

- Berlin innovation actors, e.g. Adlershof STP management company WISTA-MG, Humboldt-Innovation, maker spaces such as FabLab, the Berlin economic development and marketing agency (Berlin Partner for Business and Technology), regional cluster initiatives
- Facilitators as IP attorneys, licence offices

INAM was created to promote the development and implementation of innovative concepts for advanced materials, based on technologies of organic and molecular optics and photonics.
The founding members of this open innovation platform are research entities like HU-Berlin, large manufacturing firms like the lighting firm OSRAM,. The STP's role within the platform is to actively promote the platform and to provide infrastructure for the networking and innovation activities, to create a visible platform, implementing networking and communication measures.

The INAM network focuses on research and technological development of hybrid material systems combining organic and inorganic materials, among others. For example, printed, flexible and organic electronics are one of the fastest growing technology markets in the world. These technologies based on advanced materials are of vital interest to applications in diverse range of industries such as consumer goods, healthcare, mobility, electronics, battery technology, sensors, Photovoltaic, fibres, media and architecture. Applications of printed electronics based on hybrid materials are forecasted to grow from today's market volume of about $24 billion to ca. $70 billion in the next ten years (Source: IDTechex 2015).

Methodology:
The open innovation platform INAM sets new standards in collective advanced material research and development, as well as collectively initiated research commercialization and market introduction.

- Firth, it enables the complex combination of different key technologies, such as nanotechnology, photonics, advanced materials and smart production technologies. Combined research know-how in hybrid materials, in particular, will facilitate the development of advanced material concepts.
- Secondly, the members of INAM cover the entire value added chain beyond basic and applied research. This promotes collective product development as well as development of system components, and will result in the application and market penetration of new products in organic and molecular electronics, sensors, metrology, lighting and others.
- Thirdly, INAM acts together with regional and societal partners, such as science and technology parks, regional development organisations, cluster initiatives and others.
- Finally, within INAM network, IRIS and the STP Adlershof offer joint collaboration spaces. While the open innovation platform INAM enables access to IRIS research labs, experimental settings, analytics technology, as well as measurement and analytical engineering facilities, the Adlershof management company WISTA-MG offers INAM members, involved start ups and other firms high quality offices, lab spaces, and prototyping and production spaces in modern technology centres in vicinity to the IRIS research labs.

As a result, the 'collective thinking' process of INAM enables the development and market penetration of new material products and systems. Being primarily set up on the regional scale of Berlin, the large and internationally-operating industry partners will ensure a global reach and impact.

Advantages and challenges:
A uniquely composed variety of platform members with distinct resources and know-how contribute to the inter-organizational 'collective thinking' model of INAM: universities and inter-disciplinary research labs such as IRIS and Humboldt Access Lab - the Open Laboratory for Advanced Materials of IRIS, selected international start-up companies and university spin-offs, SMEs and large multi-international companies (e.g. OSRAM)

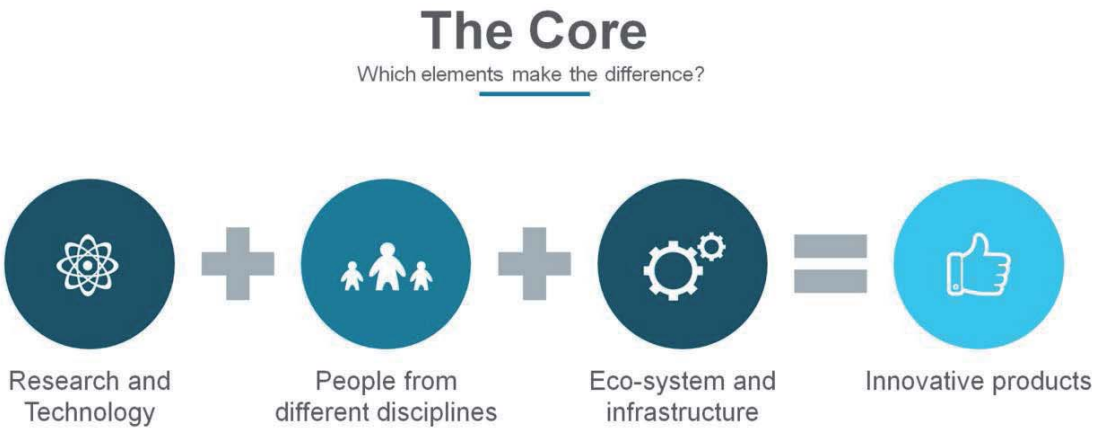
While IRIS and Humboldt Access Lab offer the research background, selected start-ups, university spin-offs and SMEs pick up the scientific resources to develop marketable solutions and technologies just 'next door'- and, in strong cooperation with distinct MNEs. Thus, INAM is creating a new understanding of dense interaction and collaboration between different STP residents.

Large corporations are essential platform members providing valuable resources such as leveraging opportunities, providing commercial test fields, and helping to approach global market reach from the very beginning ('global pipelines'). Within INAM, MNEs primarily serve as pilot technology applicants and market test-beds.

The Berlin Adlershof science and technology park is the geographical nucleus of this project. Core platform participants (as e.g. IRIS, Humboldt Access, other research institutes and several start-ups and SMEs) are either well established STP residents or incubatees, taking advantage of localized 'collective thinking', 'local buzz' and co-development in geographical proximity or even shared settings (e.g. physics labs, chemical wet labs, technology centres). In addition, STP Adlershof contributes its 'soft' incubation resources to participating start-ups and university spin-offs.

Maker spaces such as FabLab complement the infrastructure framework of this innovation platform and add some young entrepreneurial spirit to the collective thinking process.

Figure 3: INAM core elements



Source: INAM 2016, internal, unpublished paper

3.3 INAM 'software'

Advanced Materials Competition (AdMACom):
A first initiative of INAM will be the set up of an international accelerator programme 'Advanced Materials Competition AdMACom' to be held in 2016.[1] The accelerator will connect start-ups and corporates to create synergies and form horizontal or vertical collaborative partnerships. AdMACom is characterized by non-financed based framework conditions, as no equity shares are taken from the participating start-ups.

During a period of six weeks, selected international start-up companies will use new technologies (fibres, sensors, materials etc.) provided by the AdMacom partners and will integrate them to design new innovative and marketable products. During the final "demo event" - the final pitching event of the participating start-ups in front of an international audience of research, industry and finance, the winner will be selected and granted with € 20,000 seed capital.

The accelerator's curriculum is going to comprise presentations and pitches at thematic conferences and in front of large corporations. Several of them are also sponsors of the program. Selected companies will have a personal mentor, who will be team member providing input throughout the entire development process. Weekly mentoring days contribute to this component. Mentors are recruited from local, regional and international participating partners (e.g. Columbia Venture, BASF, LG, Embraer, Humboldt-Universität zu Berlin, WISTA-MG).

The INAM network will support the participating start-ups in all relevant issues, e.g. funding, materials, infrastructure, participation at events, technology transfer etc., during the competitive programme.

Furthermore, the selected companies are taking advantage of further assets and advantages:

- Free accommodation and use of offices and/or co-working spaces (provided by the STP management),
- Access to high-tech infrastructure, materials and technologies,
- Access to technology providers, technical and business expertise,
- Free access to the annual meeting of the European Optical Society (OSA) in September 2016 (bi-annual event),

[1] The competition is going to start with an international tender, published in June 2016. The selection of companies will be finished until end of July 2016. The acceleration programme will be executed – mainly at the STP Adlershof - between September and October 2016.

- Free access to the Micro Photonics Conference and Exposition (http://www.micro-photonics.de/) in October 2016,
- No equity taken in return for the participation in the AdMaCom accelerator.

Talent education and training initiative ProMANO:
The access to high-quality R&D staff, engineers and a skilled workforce is a key issue in the knowledge economy. Tech-based companies increasingly have an eye on Berlin as a business location with its exceptional high density of renowned universities and research institutions, and consequently researchers and technical staff. The availability of skilled talent and qualified scientists is better in Berlin than in many other places in Germany.

Though, the recruitment of skilled workers is another topic. In particular, qualified apprenticeships and training are lacking behind, due to limited high-quality training and apprenticeship capacities in SMEs. In order to tackle this challenge, technology companies and co-located academia join forces in a collaborative effort to define and to qualify necessary skills in a joint educational initiative.

This is what is happening at the Adlershof-based network for apprenticeship in material research and nano-technologies, called - ProMANO. It was founded with a strong impetus of collective thinking platform. The initiative ensures training and placement of qualified personnel, based on a collaborative education programme of INAM partners, i.e. different SMEs, large companies and research institutions, in microsystems, microelectronics and materials (proMANO 2015, WISTA-MANAGEMENT 2009).

4. Conclusion and lessons learned
In Berlin, like in many other international metropolitan regions, privately initiated incubation and acceleration programmes are competing with classical STPs, AIs and incubators. From today's perspective, these new models appear as a competitive advantage due to their comprehensive, intense and compact service package and fast processes to market. Furthermore, their location in the very city centre often is associated with a variety of urban amenities tend to appeal more to the new firms in ICT, IoT, creative industries and urban technologies.

STPs, AIs and public incubators have to adapt and to respond to this competition. It turns out that STPs indeed have the capabilities and assets to provide different approaches and pathways to support fast-growing technology start-ups. The most promising of them, responding to the emerging competition of privately initiated incubation and acceleration schemes, are based on collective and knowledge-based partnerships and networks based on the STPs' local and non-local ecosystem of knowledge institutions, industry partners and direct ties to finance and other business services.

Success factors for open innovation and collaborative innovation and product development processes in the sciences particularly also are heavily depending on access to modern lab and measurement equipment and infrastructures, trusted knowledge of the scientific community and - not to forget - opportunities for direct and personal communication. In this respect, STPs can be competitive contenders in the competition for innovative start-ups, new entrepreneurial ideas and skilled talent.

In this paper, the authors did underline that STPs have to evolve towards more active and sophisticated coordinators initiating, promoting and steering direct and indirect links between knowledge-creating and knowledge-related entities, i.e. science, private sector in terms of start-ups, SMEs and MNEs, finance, business services and public administration on various geographical scales (Hansson 2007). Collaborative spaces and collective thinking platforms such as the INAM network at Berlin-Adlershof are important components to initiate and to put into value (e.g. through knowledge transfer and new marketable products and processes) open innovation networks and technology value chains.

Multiple lessons learned for the STP and AI community can be derived from the Adlershof example of the multi-disciplinary university-based INAM open innovation network:

- In particular, STP and AIs can take advantage from their strong R&D and/or university anchor institutions, which are known for their research excellence. In this case, STPs and

AIs have to encourage and facilitate the opening of their research capabilities to start-ups, SMEs and MNEs for active interaction and collaboration.

- STP and AIs can initiate, organize and implement distinct 'collective thinking' platforms and networks for diverse stakeholders from science, industry, public institutions and even society (citizens, end-users). As a result, complete technology value added chains can be built and represented in such networks / platforms - spanning from idea generation to product commercialization. Also, particular 'collaborative spaces' should complement the different elements for open innovation and interactive technology development and innovation processes.
- Jointly designed acceleration programs can help to attract a higher number of science-based and high-technology start-ups and spin-offs. A multi-stakeholder consortium of universities, R&D, industry, business services, risk capital, and the STP itself can offer attractive growth-oriented business development environments. High-end research infrastructures, competent partners in R&D, even access to new science-based technologies and research results and subsequent support in their testing and transformation to marketable products, as well as first pilot projects and fast access to international markets. Through such accelerator programs, STPs and AIs can become neutral 'brokers' between start-ups and MNEs without taking any shares of equity or fees from either both of them.
- However, such successful 'collective thinking' networks and even physical 'collaborative spaces' can enhance the STPs' and AIs' visibility and reputation through their success and internationally known innovations and products. Furthermore, STPs and AIs increase the awareness of potential investors, new resident firms and R&D centres as well as 'star talents' in science and entrepreneurship.
- The active support of talent training, education and apprenticeships can provide a great value to such open innovation networks and the STPs' and AIs' attractiveness for new companies in general.
- STPs and AIs can set new standards within the competition for new ideas and talents. Moreover, they can showcase new examples and technology-oriented focal areas in the region's knowledge economy.

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