IASP International Association of Science Parks and Areas of Innovation

33rd IASP World Conference on
Science Parks and Areas os Innovation 2016

Russia, Moscow

Modern STP and AI in a global society, economy and environment – Measuring their multi-faceted impact

Parallel session

The impact of STPs and AOIs

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1. Introduction

Typically, STP and AI are political key projects linked to high expectations for an enhanced regional economic development. They require large-scale, primarily public, investments. They are long-term projects, but it usually was after tenacious years of rather moderate development when they obtain the expected regional effects and returns: more jobs and value added, increasing company investments and FDI, vibrant start-up scene and culture of entrepreneurship, enhanced innovativeness and competitiveness, new patents and products, successful inter-organizational b2b and business-to-science projects, commercialization of research, excellency of applied R&D, higher attraction of skilled talent, professional re-development of urban (industrial/brownfield) areas – to name just a few (of predominantly economic and innovation-related effects).

The paper argues that showcasing the success and, in particular, the various dimensions of STP's and AI's impact in regions to diverse regional stakeholders has been becoming more important today and will even intensify more in the future, as competition for (public and private) funds, donors and general support is increasing strongly.

On the global scale, the impact reporting of STP and AI is characterized by the use of distinct KPI, evaluation processes and frequency of documentation. The scope and quality of impact reporting, however, differs by the STP's and AI's stages of maturity, size, ownership model, technology focus and, of course, resources. Nevertheless, specific performance indicators are applied commonly and also of universal value among STP and AI, for example, created jobs and companies, their respective growth figures and value added, as well as contributed innovativeness and tax impact.

In this paper, the authors argue that, firstly, modern STP and AI must showcase their value to regions and the society in more facets – responding to the extended diverse set of stakeholders and ever-changing societal standards. Consequently, STP and AI also must demonstrate their responses to today's critical societal and environmental challenges such as sustainable urban development, environmental protection and resource efficiency, open innovation and community reach. Secondly, standardized key performance indicators (KPI) must be identified and developed, respectively, which enable a feasible, sustainable and comparative performance benchmarking between distinct STP and AI types. Exactly for these reasons countries like Turkey (as discussed in the Technokent case study) have established nationwide KPI-based evaluation and ranking systems.

Furthermore a well-selected set of KPI may tell a convincing story about a strategy. A strategy which – measured by the right KPI – can be proven to be demonstrably consistent,

sustainable and successful. For instance the story of selecting the right teams, then incubation the right start-ups, subsequently winning finance for them, tracking the survival rate and tracking exits or trade sales clearly shows a success chain, which is hard to attack from whatever opponents. The same holds true for the green field development logic: Nurturing the start-ups in incubation centres, moving them to technology centres for special production and research and – once they are mature enough – move them into private real estate developments or have them build their own custom-built premises. If this process is well tracked by the right chain of KPI, real estate investors will feel attracted to the STP/AI because a fact-based strategy reliably creates demand. The same thought applies to developing a local risk financing environment: Breeding exits or successful trade sales, thus creating future serial entrepreneurs and active knowledgeable investors may be looked at as a process which can be tracked and in a limited way actively designed. Other systematic lines of strategy, for example, developing industrial co-operations from one-off projects to strategic cooperations with large international customers may prove to have the same logic. Certainly industrial cluster development can be tracked as well with sensible sets of KPI.

Understanding KPI not only as tool forged upon STP/AI management by control addicted shareholders but using them as a strategic weapon useable for leading one's own organisation, as a winning logic to attract investors, as convincing critical talent but also guiding political and public decision makers towards a common goal. The communication strategy of KPI based performance should be well designed. This paper aims to analyse the set of KPI in a sample of cases, present a set of standardized KPI, which reflect the multi-faceted impact and societal responsibilities of STP and AI on the global scale nowadays and connect it with a potential strategic narrative.

In this paper, we will provide a comprehensive good practice analysis of methods being applied to measure, evaluate and, potentially even, simulate the diverse effects of STP and AI worldwide. Furthermore, the authors will conduct a case study among selected IASP members to explore new and innovative performance measurement tools, in particular those responding to their novel challenges. In addition, the authors will discuss impact assessment methodologies of similar stakeholder and public welfare-oriented organizations in order to take advantage of good practices utilized outside the STP and AI community so far.

The paper is highly motivated by our own experiences of designing and adapting the KPI sets for Adlershof. In addition we have felt the power of tracking the economic impact on the regional economy in cooperation with the renowned German Institute for Economic Research (DIW). This profound analysis puts a spotlight on the direct, indirect and induced effects of the STP Adlershof on regional employment, company growth, value-added and taxes. Moreover, other contracted impact studies, for example, demonstrate the STP Adlershof's contribution to the general place quality and urban development, as well as community reach to STP residents' employees and co-located university students, while an additional evaluation utilized a macro-economic simulation tool BEST to simulate expected prospective economic effects.

In addition, STP such as Seville-Cartuja strongly emphasize the STP-based tangible effects in terms of product and process innovation, patents, knowledge transfer and collaborative R&D projects, as well as successful commercialization of R&D results.

Furthermore, the 'Stadtrendite' (i.e. rates of return of social and urban investments) may be an interesting evaluation methodology to measure the social and urban value of STP. So far, being widely discussed to illustrate the regional value of public/municipal housing organizations in Germany, which share similar stakeholders and common welfare-oriented visions, this paper examines the feasibility of the concept's adaption to STP and AI.

Equally important, modern STP and AI should display their prime responsibility as role models for new technologies responding to societal challenges such as sustainable development, resource efficiency and environmentally responsible forms of working and living. For example, Hong Kong Science Parks Corporation already pursues such path and measures its environmental impact and direct activities linked to its defined sustainability vision at full length. Using very standardized and universally applicable indicators such as energy consumption, renewable energy generation, waste production, emissions, water use, use of products following green procurement requirements and public transport commuting, this good practice already may contribute to a blueprint for an overall evaluation methodology of STP's ecological footprint – demonstrating their leadership role in this respect.

In our paper, we aim to provide a widespread overview and comparative analysis of key evaluation methods and KPI examining the multi-faceted impact of science and technology parks and areas innovation. The paper also seeks to test the feasibility and universal applicability of such methods in order to enable a continuous internal benchmarking, as well as comparative/global evaluations of STP and AI performances. Ultimately, the identified indicators and good practices will result in a hands-on and tested methodology set, which allows the demonstration of the multi-dimensional value of STP and AI for regions, in particular, and the global world in general.

2. Theoretical background

2.1 STP and areas of innovation

Typically, **science and technology parks** are, initially mostly public investment-driven, property-based initiatives that are characterized by a spatial concentration of university and non-university research institutions, technology-oriented firms – primarily SMEs. Additionally, entrepreneurship-support institutions such as (mostly public) business incubators supplement these innovation hubs. Science and technology parks act as interfaces between businesses, universities and other research institutions. Consequently, they take an important role as territorial seedbeds of high-technology and science-based entrepreneurship and innovation (Kühn 2003).

Regardless of the mode of governance, STP pursue several objectives related to the regional development and the regional economy's growth, competitiveness and innovativeness (Siegel et al. 2003):

- Promotion of newly created knowledge and innovation,
- Support of technology-based entrepreneurship,
- Enhancing the growth of high-technology SMEs,
- Attracting new investors (e.g. R&D labs, SMEs and MNEs) involved in cutting-edge technologies,

- Fostering local and non-local strategic corporate and industry-science alliances,
- Enhancing the regional identity and image.

In today's globalized knowledge economy, advanced STP are evolving to active knowledge-coordinating institutions by fostering and managing direct and indirect links between the diverse set of knowledge organizations and knowledge-related organizations within the multi-faceted regional innovation ecosystem and beyond the local scale (Hansson 2007). In addition to sophisticated business services and management assistance, open collaboration spaces not only to STP residents, but also to non-local businesses, people and organizations have become critical criteria for modern STP, i.e. the so-called 3rd-generation STP, today (European Commission 2013). Furthermore, 'soft' place-making processes and investments (e.g. services, recreation and housing) are additional portfolio elements due to the constant process of adapting to the various needs and demands of a diverse set of STP stakeholders, users and target groups.

'Areas of Innovation' are associated with an additional important evolutionary step in the development of STP in the recent past. By contrast, areas of innovation define extended urban geographical areas, such as entire city districts, cities and even regions. They comprise highly diverse, inter-disciplinary and cross-industry networks of knowledge organizations and related entities of the regional innovation system (e.g. universities, R&D institutions, technology firms, public authorities, incubators, innovation centres, venture capitalists and entrepreneurship training programmes). Hence, the individual offers are combined into a joint model and made available in the entire extended urban area. The creation of synergy effects and smart governance of a wide range of interactive structures and levels are vital to AIs. Moreover, a great emphasis is put on the attraction and education of talent, access to innovation financing and the attraction of MNEs as anchors and potential partner organizations for local start-ups, SMEs and science (European Commission 2013).

In addition to the broad set of objectives allocated to STP earlier, areas of innovation also serve as test beds and demonstration areas for new (urban) technologies, for example, in ICT (Internet of Things applications), mobility and transportation, urban design and planning, energy and resource consumption, commerce, health as well as recreation and tourism – often strongly linked to new technological solutions meeting global challenges and cities' changing needs.

By concept, it is aimed to agglomerate and link all different steps of new technology product, service and process creation – from idea generation through R&D to prototyping and demonstration and finally early commercialization - through open platforms, vertical and horizontal collaborative networks and effective interfaces. In these open innovation and user-driven innovation processes, talent, users and citizens generally play a major active role and have become a critical stakeholder group – stressed by the concept of the 'quadruple helix', among others (Carayannis and Campbell 2009, Dubina et al. 2011). Consequently, terms such as 'smart city', 'living lab' and 'urban lab' are utilized synonymously in the literature and in policy discussions.

In addition to the talent's organizational role in the innovation and technology value-added chain of areas of innovation, talent is literally becoming a central resident and user at areas of innovations. Examples such as 22@Barcelona, Montreal's innovation district and the

Boston Innovation District strongly aim to showcase sustainable, participatory and inclusive visions of cities' and city districts' manifold and combined functions as a place for living and working, production and entrepreneurship, education, research and innovation, as well as recreation, retail and services (AIA 2014, Brookings 2014, Piqué et al. 2015).

2.2 Impact reporting of STP and AIs

Three overall reasons are identified, why STP and AI must measure and report their performance and their regional value.

- First, STP and AI are primarily public investment-driven projects, which aim to achieve certain defined local and regional objectives. Moreover, STP and AI must build a favourable understanding and continuous active support of local and regional policy-makers and donors as well as neighbouring citizens and communities.
- Secondly, STP and AI must showcase their success to the outside in order to build and maintain their image and reputation as prime business and technology locations. A sound image and branding is very critical to attract investors, new companies and R&D centres, as well as skilled talent.
- Finally, effective performance measurement is essential to the STP / AI management and related stakeholders to enable the continuous improvement and adaption of the STP / AI model and management – like in any other private business or public institution (Dabrowska 2011).

In today's globalized knowledge economy, modern STP and AI must display their prime responsibility as high quality regional growth engines. As the same time, they also serve as role models for new technologies responding to societal challenges such as sustainable development, resource efficiency and environmentally responsible forms of working and living.

Due to the evolutionary dynamics of STP's and AI's functions and goals and the associated extension of related target groups, users and stakeholders, the most important topics, in which STP and AI have to communicate their regional impact and societal function are:

- Regional economic effects,
- Regional innovativeness and competitiveness,
- Ecological 'footprint' and role model for sustainable working and living,
- Societal and social development (i.e. rates of return of urban and social investments),
- Tolerance and diversity,
- Internationalization and global integration.

The evaluation of STP's and AI's performance and success requires the understanding of the specific objectives and goals of the individual STP/AI. Only this way, it allows the correct assessment of their achievements in relation to their defined and agreed goals by using a set of clear and meaningful key performance indicators (KPI) (Dabrowska 2011). Consequently, the question has be to tackled: What does a successful STP /AI mean to the different stakeholders?

As a result of the dynamic evolution and extension of the traditional STP concept, a large variety and growing number of **stakeholders and target groups** are involved and are tangent to STP's and AI's development and their related effects (see Table 1).

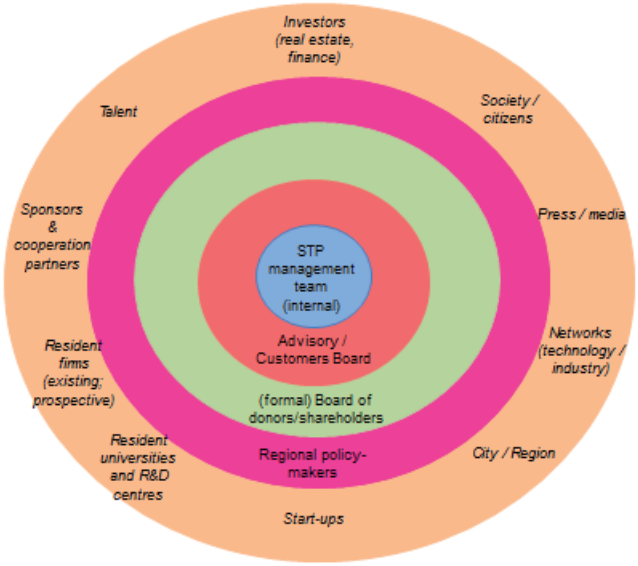
Table 1: Stakeholders and target groups of STP and AI impact reporting

'Triple Helix'	'Quadruple Helix'	'Extended Helix'
Science (regional universities, HEI, R&D institutions)	Science (regional universities, HEI, R&D institutions)	Science (universities, HEI, R&D institutions)
Regional Private Sector	Regional Private Sector	Prospective international public and private R&D investors
Government / public administration	Government / public administration	Regional and international Private Sector
	Society	Prospective resident technology firms (start-ups, SMEs, MNEs)
		Government / public administration
		Society
		"Residential" residents (Appartments, etc), neighbours
		Talent
		Prospective investors (real estate, corporate and venture finance, services etc.)
		Press / media

The different stakeholders of the regional triple and quadruple helix often are represented and actively integrated in planning, development and management issues of STP and AI within their advisory boards and supervisory boards. Further participatory and inclusive forums comprise regular planning meetings and customers' feedback tools (e.g. annual clients survey, annual reception).
In addition, STP and AI take advantage of various channels of communication and dissemination to report in full about fulfilled goals, achieved results and key activities.

Regular press conferences, periodical reports, result-related story-telling, as well as ad hoc social media and website postings are the most popular channels.

Figure 1: Stakeholders and target groups of STP and AI impact reporting



Source: Authors

Similarly important to the communication channels, a large variety of methods are currently applied to execute the measuring and evaluation of STP's and AI's multi-faceted effects and wide range of activities. So far, very few commonly applied performance measurement approaches to STP and AI particularly have been identified. Moreover, further impact assessment methodologies can be derived from similar stakeholder and public welfare-oriented organizations, as well as corporate reporting approaches.

However, impact studies and performance measurement within the STP and AI community differ by scope, depth and detail. In most cases of STP and AI, effects and activities in only individual topics are measured, evaluated and reported internally and externally (e.g. socio-economic effects, innovation and R&D outputs, knowledge and technology transfer). So far, only very few examples of a comprehensive impact reporting related to the multi-faceted functions of STP and AI are observed. Furthermore, it is very useful to define and agree on a minimum degree of homogeneity in these kinds of effect evaluations. So far, this kind of consensus has not yet been reached.

In the following, the authors present specific impact measurement and assessment approaches, which relate to individual, but also to mixed sets of impact areas.

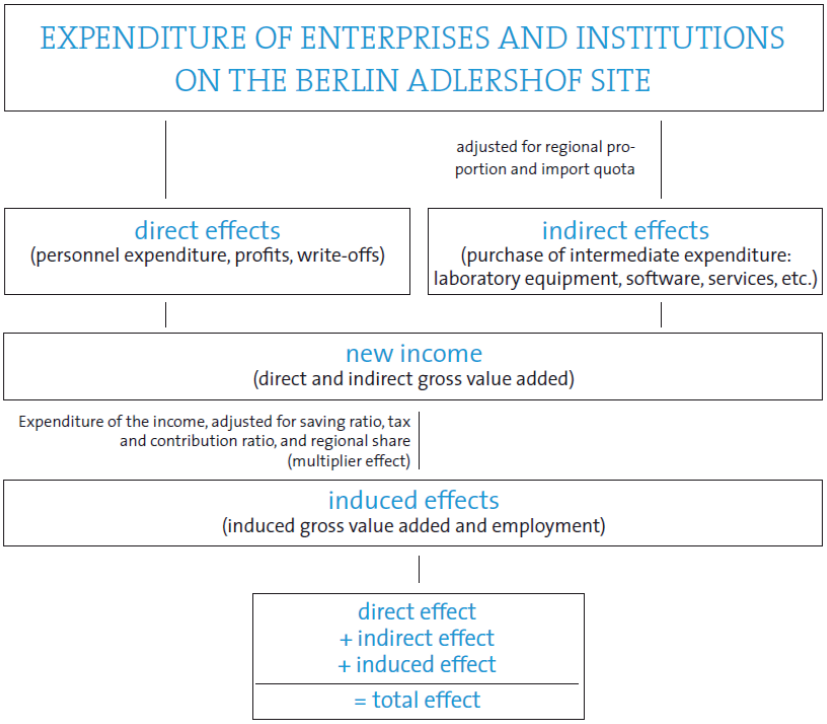
2.2.1 Regional socio-economic impact and multiplier analysis

The **regional impact and multiplier analysis** is the most commonly used method for quantifying regional socio-economic effects of STP and AI. The analysis determines the total of direct, indirect and income-induced stimuli resulting from the respective STP or AI on the regional economy. This method is applied to STP and AI of all different types and stages of

maturity (WISTA-Management 2011, The Innovation Hub in Tschwane 2012, APTE 2006, University of Arizona 2009, among others).

The analysis is based on the following methodology to measure the impact in terms of employment, value-added and tax revenues: All revenues and expenses of resident firms and scientific institutions have a direct effect on the regional economy. Additionally, resident companies and academia in order to develop, produce and distribute their products generate further expenditures, for example, for supplies and intermediate goods. These expenses have an indirect effect on other industries – to some extent on the regional scale, which increases the value added in the region. The remaining share is allocated to intermediate imports from outside the region (national and international). Ultimately, further income is generated through directly and indirectly created value added. This income-induced demand results in additional employment, added value and tax revenues (WISTA-Management 2011, Handrich et al. 2008).

Figure 2: Analysis of the regional economic impact of Adlershof



Source: the Economic Significance of Adlershof, DIWecon GmbH 2008

Typically, this complex analysis is contracted out to specific service providers and/or scientific institutions. Due to the related relatively high costs and usually only marginal differences from year to year, STP managements only authorize it every once in a while and not on an annual basis.

2.2.2 Knowledge transfer and innovation outputs

The **measurement of localized knowledge spillovers and related innovation as well as R&D outputs** is another important focus of STP and AI impact reporting. As an illustration, the STP Seville-Cartuja regularly records and communicates, for example, the number of inter-organizational R&D and innovation projects developed and initiated on site, the share of

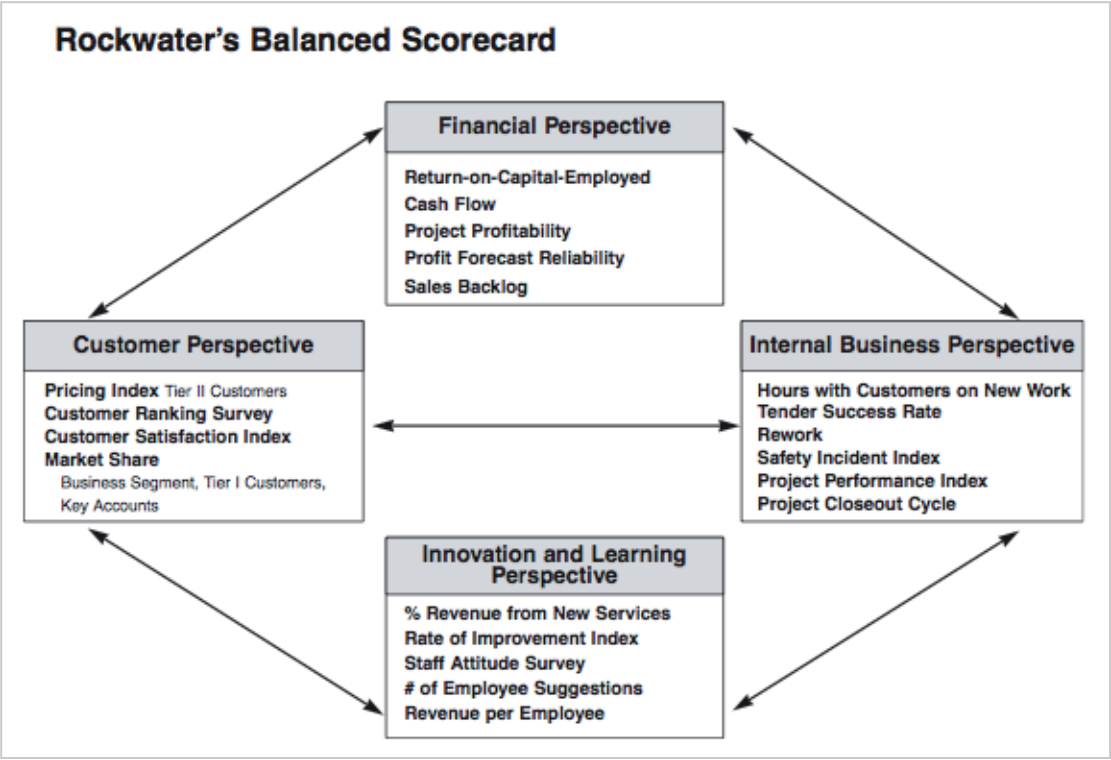
resident organizations carrying out local and non-local collaborative R&D activities, the number of created patents, as well as the number of new created and marketed products explicitly in its annual report (Cartuja 93 S.A. 2011).

Localized knowledge transfer and related innovation effects also are a major focus of the academic discussion in particular. Such analysis is usually applied using a comparative analysis of a similar set of on-park and off-park firms. Though, scientific studies do not find clear evidence for localized knowledge spillovers and higher innovativeness and R&D outputs in STP and AI. While the studies certainly identify localized knowledge spillovers, technological innovation and R&D outputs of on-park firms, in most cases no significant differences are found to off-park high-technology firms (Lindelöf and Löfsten 2004, Westhead and Storey 1994, Siegel et al. 2003, Fugukawa 2006, Kulke 2008, Vedovello 1997, among many others).

2.2.3 Balanced scorecard

The **balanced scorecard** (BLC) is a strategy performance management tool, which was created by Kaplan and Norton (1992, 1993). It focuses on the organization's strategic agenda and monitors a mix of financial and non-financial data items. While financial data report about the results of activities already undertaken, non-financial items are operational measures on customer satisfaction, internal business processes, the organization's innovation and learning activities - in turn, operational measures, which will affect the organization's future financial performance. The aim of this tool is the identification of a number of financial and non-financial measures and attaching targets to them. As a result, effect and activity reviews enable to determine whether the current performance meets expectations as planned.

Figure 2: Balanced scorecard methodology applied to Rockwater company



Source: Kaplan and Norton 1993

In 2010, numerous leading 3rd-generation STP adopted the balanced scorecard method to the measuring of success of STP and jointly developed an exemplary matrix of key performance metrics and evidences. The aim was to design a matrix of KPI, which can enable the consistent and comparative measurement of STP's and AI's performances. Following the BLC approach, this adapted matrix is divided into four main categories: commercial (7 KPI), stakeholder perspective (7 KPI), brand and reputation (5 KPI) and, finally, internal business perspective (5 KPI) (Dabrowska 2011). Using 24 KPI elaborated by various measurement metrics, this matrix enables a first comprehensive overview in regard to several of the manifold STP and AI objectives (including regional economic development, sustainability and environment) (see Table. However, the authors stress that further in-depth measurements in the additional previously defined individual key challenges and objectives of STP / AI are vital.

Table 2: BLC-based matrix of KPI for 3rd-generation STP

Categories	KPI
Commercial	• Profitability • % occupancy rate • Sales • Debt management • Financial performance of budget • External funding raised • Investment returns
Stakeholder perspective	• Tenants' satisfaction • Innovation support • Companies' growth • Companies' innovation profile • Quality of tenants • Environment – carbon footprint • Health and safety standards
Brand and reputation	• Media coverage • Accurate communication • International profile • Size of science park's 'community' • Referrals from other organisations
Internal business perspective	• Employee satisfaction • Timely communication of accurate information • Fault log service levels • Effective security service • Reliable IT systems

Source: Dabrowska 2011

2.2.4 'Stadtrendite'

An additional approach, which is employed to public welfare-oriented organizations particularly, is the so-called **'Stadtrendite'**. This evaluation method measures the positive returns of social and urban investments, in turn the social and urban value of organizations and projects. So far, it is implemented to the value of public municipal housing organizations in Germany (Schwalbach et al. 2006).

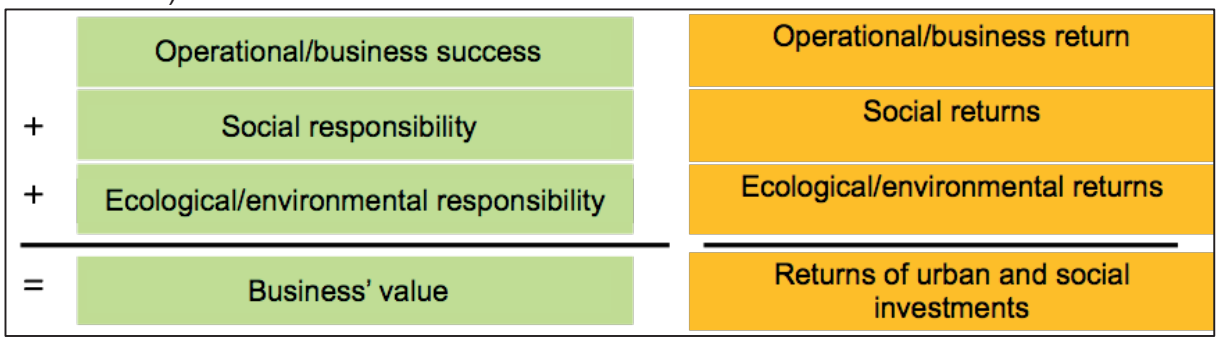
Applied to the concept of STP and AI, positive externalities contributing to the city and its population to be measured would include:

- Measures and activities contributing to urban city, district and neighbourhood development,
- Measures and activities enhancing social inclusion and in turn reducing social segregation.

As measures and activities linked to the goals mentioned above are related to certain investments and monetary costs, they reduce the income (i.e. business performance) of STP and AI. The 'Stadtrendite' tool enables the compensatory summation of generated urban and social externalities (e.g. additional value added, municipal income, reduced societal and city government costs). Thus, STP's and AI's value and performance in this respect becomes apparent after the so-called 'triple bottom line' (see Figure 3) (Schwalbach et al. 2006). However, this approach is characterized by a very sophisticated and complex analytical process, which covers three components:

1. Annual profit of STP / AI management organization,
2. Direct costs for STP / AI activities and projects in favour of city development and social inclusion, taken over by the city government otherwise. Examples are neighbourhood management, direct tenant-related benefits such as reduced rents, non-profit activities for social projects, financial support of childcare, primary school and high school projects, social housing.
3. Monetary assessment of positive after-effects for the city and the STP/AI associated with such projects and measures. Societal and urban externalities may include long-term effects such as attraction and retaining of skilled talent, increased place quality and improved social environment. In addition, local demand and employment effects may also be detected.

Figure 3: Triple-bottom line calculation model of 'Stadtrendite' (returns of urban and social investments)



Source: Based on Lenk et al. 2010

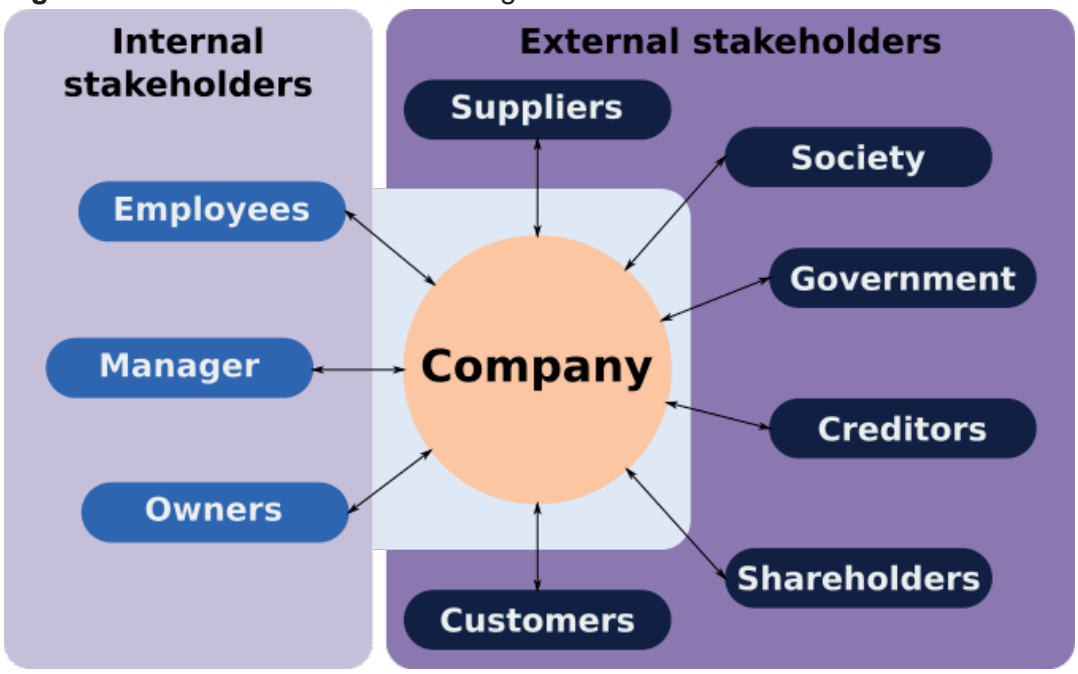
The authors argue that the tool 'Stadtrendite' is an interesting and value-added approach for STP and AI-related impact reporting, as similar stakeholders (i.e. the region, the regional society) and welfare-oriented visions are targeted. More importantly, it assesses and showcases the STP's and AI's value for urban and social development, which is gaining increasing momentum.

2.2.5 Global Reporting Initiative (GRI)

The sustainability reporting process, set up by the **Global Reporting Initiative (GRI)**, represents a standardized framework to prepare sustainability reports by organizations, regardless of their size, sector or location. In particular, it aims to standardize, to quantify and to underline the reporting organizations' environmental, social and governance impact derived from the activities.

The GRI framework also responds to a directive of the European Commission in 2014, which obliges large firms (with more than 500 employees) to report on environmental, social and employee-related, human rights, anti-corruption and bribery matters, as well as diversity policies applied to the management and additional supervisory bodies, among others.

Figure 4: Stakeholder model according to GRI



Source: Wikipedia

The GRI framework defines 1) different general disclosures and 2) specific standard disclosures, which each comprise multiple key categories and associated measurement indicators. Especially, the specific standard disclosures aim to measure and report the organization's performance in a very comprehensive scope. They include the categories economic, environmental and social (see Table 3).

Table 3: Overview of GRI categories

General standard disclosures	• Strategy and Analysis • Organizational Profile • Identified Material Aspects and Boundaries • Stakeholder Engagement • Report Profile • Governance • Ethics and Integrity

Specific standard disclosures	• Disclosures on Management Approach
	• Indicators and Aspect-specific Disclosures on Management Approach
	  • Economic
	  • Environmental
	  • Social
	  • Labor practices and decent work
	  • Human rights

	• Society • Product responsibility

Source: GRI 2013

Consequently, the GRI framework has been used by a large number of companies in last few years. In the meantime, several advanced STP and STP operating firms have compiled and released respective GRI reports. Hong Kong Science and Technology Corp., Hsinchu Science Park in Taiwan and Ascendas Singapore are some of the cases, which have presented basic, but also quite comprehensive examples of GRI-based reports.

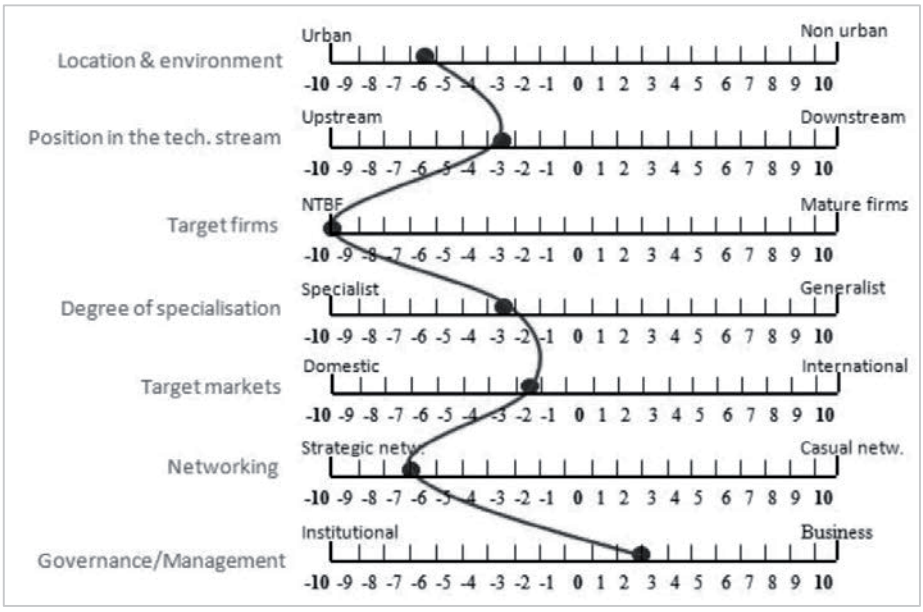
In its sustainability report, Hong Kong Science Parks Corporation (HKSTP) measures and relates its environmental impact and direct activities linked to its defined sustainability vision in detail. Using standardized indicators such as energy consumption, renewable energy generation, waste production, emissions, water use, use of products following green procurement requirements and public transport commuting, HKSTP's reporting on its ecological and sustainability impact illustrates an growingly important component of STP and AI-related impact reporting.

2.2.6 'Strategigram'

The **IASP-'Strategigram'** is an analytical tool that aims to enable a better comprehension of the diverse STP models. It enables the identification of STP's strategic profiles, benchmarking with similar STP cases, as well as the identification of success factors and good practices. The tool is based on the allocation of the STP's position on seven strategic axes: location and environment (i.e. degree of urbanization), position in the technology stream, target firms, degree of technology or industry specialization, target markets, strategic value of networking, as well as governance and management model.

The ends of each axis represent different strategic options, which are clearly at either end of the spectrum. The 'Strategigram' also enables the observation of the respective STP/AI model's progress over time, as, for instance, the technology profile and target markets may change over time (Bellavista and Sanz 2009).

Figure 5: Strategic profile of Tuspark (Beijing, China) using the IASP-'Strategigram'



Source: Bellavista and Sanz 2009

3. Empirical approach and case studies

For our empirical research we selected seven international STP and AI case studies, which are characterized by different sizes, regional economic environments, levels of maturity, as well as degrees of urbanity. For each case study, we conducted structured expert interviews via phone with the respective management and/or CEO, who have shared and contributed valuable insights and comments.

In order to enhance the understanding of the current reporting practices, we take a close look on the following STP and AI:.

- ODTU Teknokent in Ankara, Turkey
- The Innovation Hub in Gauteng, South Africa
- AnnArbour, USA
- Netpark/NetparkNet, UK
- Hong Kong Science and Technology Parks Corp., Hong Kong, China
- Adlershof Science and Technology Park (WISTA-MG), Germany
- Mjaerdevi, Sweden

3.1 ODTU Teknokent, Turkey

History and profile:

ODTU Teknokent opened in 2000, after a long-term planning and development process, which started at the end of 1980s. ODTU Teknokent aims to provide contemporary infrastructure (e.g. the incubation centres Tekmer, Technopreneurship Incubation Center and Halici Software House) and superstructure to researchers and young high-tech companies that develop and produce leading technologies in order to propel the international

competitiveness of the Turkish economy. Furthermore, ODTU Teknokent facilitates university-industry collaboration and the creation of interactive synergy effects.

Today, ca. 300 tenant firms with ca. 5,000 employees are located at the site. ODTU Teknokent runs various business assistance and entrepreneurship programmes. Examples are pre-incubation programmes to promote technology-based entrepreneurship ('New Businesses New Ideas Contest' and 'Animation Technologies and Game Development Center'), and the 'TeknoJump' accelerator programme, which also assists to the firms' internationalization. Further support organization of the Teknokent ecosystem include a business angels network and a technology fund, a STP-based technology transfer office for the commercialization of academic know-how, defence and ICT clusters, and, finally, several international liaison offices to promote international business links" (Teknokent 2016)

Ownership and management:

The operating company ODTU Teknokent Yönetim A.Ş was founded in 1991. It operates like a private company. Among the shareholders are STP Development Foundation, Middle East Technical University, Ankara Chamber of Commerce, Bleda Inc. and EBI Inc..

ODTU Teknokent Yönetim A.Ş is responsible for the development and implementation of the management and development strategies that are determined by ODTU Teknokent Higher Advisory Council. The company's executive board defines the run application programmes, which must align with ODTU Teknokent's vision and objectives.

Reporting:

The goal setting is strongly dominated be the highly detailed reporting scheme requested by the Ministry of Science, Industry and Technology. The so-called Technology Development Zones (TDZ) performance index is based on three categories, six dimensions and 36 parameters:

- The 1st dimension records the support provided to the STP management company, exemptions provided to the companies and the management company's expenditures.
- The 2nd dimension measures the R&D competence, e.g. R&D projects, expenses and revenues.
- The 3rd dimension evaluates import data and company compositions.
- The 4th dimension covers domestic and foreign patent applications and registrations, utility model and brand registrations.
- The 5th dimension evaluates incubation programmes and technology transfer office services including intellectual property rights.
- The 6th dimension observes university-industry collaboration, inter-firm cooperation and international collaborations.

The very detailed and complex KPI based performance index results in an annual national ranking of all technology development zones in Turkey. ODTU Teknokent's leading ranking position is widely communicated via its website, marketing material and general communication.

As ODTU Teknokent is providing tax exemptions and other advantages to its resident companies, the companies and other institutions have to report all necessary figures regularly. This legal framework allows such detailed KPI recording and analysis. Very few

STP are able to use this kind of mechanism. It is quite evident that this reporting complexity requires substantial resources and puts some stress on the reporting companies.

3.2 The Innovation Hub

History and profile:

The Innovation Hub is sub-Saharan Africa's first internationally accredited and leading science and technology park, located in Tshwane, South Africa. Established by the Gauteng Provincial Government in 2001, the Innovation Hub's aim is to actively support innovation and businesses' development in order to contribute to the regional economy's growth and competitiveness, the creation of jobs and the reduction of poverty in Gauteng. The targeted sectors are ICT and advanced manufacturing, green economy and biosciences (THIHMC 2016)

Ownership and management:

The Innovation Hub Management Company SOC Ltd. (TIHMC) is a wholly owned subsidiary of the Gauteng Growth and Development Agency (GGDA). It was established by the Gauteng Provincial Government through its Department of Economic Development (DED). It is responsible to develop and manage The Innovation Hub as a science and technology park.

Reporting:

The goal-setting process starts with the general political mission formulated by the Premier Minister of the Gauteng Province as underlined in his the State of the Province Address (http://www.gov.za/speeches/premier-david-makhura-gauteng-state-prov-state-province-address-2016-22-feb-2016-0000). According to the annual report of Gauteng Growth and Development Agency, the following primarily infrastructure-related KPI are applied to analyse and report The Innovation Hub's progress and impact (see Figure 6).

Figure 6: Overview of KPI of The Innovation Hub

Strategic Objective	KPI	Planned Target	Actual Achievement	%	Deviation from Planned target
Well-maintained and managed existing infrastructure	Percentage occupancy of facilities	95%	99%	104%	+4%
Strategic economic infrastructure projects implemented	Number of strategic economic infrastructure projects implemented through strategic partnerships	3	3	100%	0%
	% Completion of Climate Innovation Centre (CIC)	100%	100%	100%	0%
	Establishment of EB2	Soil turning	Contractor/ developer appointed	30%	70%
	Facilitate the establishment of a Bio-Park facility	Second construction	Building design finalised and contractor appointed - implementation milestone 2	100%	0%

Source: Gaudeng Growth and Development Agency Annual Report 2013/14

The Board of TIHMC, however, asks for a very detailed reporting applying a wide set of additional KPI (see Figure 7). In summary, the 22 KPI in total display The Innovation Hub's performance and impact in the following key areas:

- Economic development
- Skill and talent development
- Infrastructure development
- Innovation support
- Entrepreneurship programs

The internal implementation plan adds another 11 KPI, focussing on

- Funding issues for programmes
- Clean reporting, auditors and governance related issues
- Budgeting issues

Figure 7: TIHMC scoreboard (excerpt)

1. 2016/17 – 2018/19 CORPORATE SCORECARD (WITH SHAREHOLDER)

The following performance indicators and measures will be monitored for achievement in support of strategy over the MTEF period:

Performance Indicator	Baseline	MTEF Targets					Annual Target
	Estimate 2013/14	Year 1 2014/15	Year 2 2015/16	Year 3 2016/17	Year 4 2017-18	Year 5 2018-19	2016/17
NEW, SMART, GREEN, KNOWLEDGE-BASED ECONOMY AND INDUSTRIES AS PART OF A RADICALLY TRANSFPRMED GAUTENG ECONOMY							
Number of companies graduated from Maxum Core	-	-	4	6	8	10	4
Number of companies in Maxum pre-incubation	26	26	26	26	26	30	26
Number of new companies incubated at Maxum Core	16	16	16	33	40	45	33
Number of entrepreneurs incubated in eKasiLabs				150	150	150	150
Jobs created Permanent jobs: Maxum – 20, CIC –20, CoachLab – 100 Contract jobs: Maxum – 60	439	205 jobs created 125 permanent jobs 80 contract jobs	200 jobs created 140 permanent jobs 60 contract jobs	511	440	515	511 jobs created 195 permanent jobs 316 contract jobs
Number of companies incubated at BioPark	-	-	5	11	15	-20	11
Number of innovations commercialised from Maxum	9	10	15	27	30	20	27
Number of Indigenous Knowledge	New indicator			5	5	5	5

Source: Internal management documents from THIMC

To manage this complex set of KPI, the management team has developed a performance management system (PMS) (which was an internal KPI itself). The main KPI are collected through a company survey. Customer satisfaction and environmental KPI are not covered yet. The reason for this is a general survey fatigue among the resident companies.

In addition to the direct performance measurement, TIHMC commissioned a regional economic impact study 'Social economic impact assessment' to an external consulting company for the fiscal year 2012/13.

3.3 Business Durham, NETpark

History and profile:

Business Durham is the economic development agency for Durham County, working on behalf of Durham County Council to promote the businesses' development and economic growth in the region. NETpark is one of the key instruments of Business Durham. Since its opening in 2000, NETPark has activated a number of facilities including the NETPark incubator (4,000 m²) and two new discovery centres (each 1,800 m²) to provide support environment for growth-oriented high-tech companies. An important element of the park's strategy is to focus on and be a leader in the growing field of (heterogeneous) materials integration.

Management and ownership:

The management team lead by Catherine Jones is an integrated part of Business Durham.

Reporting:

The reporting format has constantly been utilized for about eight years. Primarily, the KPI listed below, focus on the reporting of NETpark's direct economic impact and contribution to the local and regional economic development. Further topics are the commercialization of technology and research results, as well as regional industry-science and inter-firm cooperation.

Table 4: NETpark KPI as provided by the interviewee

Gross value added	• Increased GVA from occupants in NETPark • Increased GVA per head
Employment	• Number of jobs created/safeguarded • Total jobs at NETPark • Quality of jobs, salary of £29,500, i.e. 20% above mean salary (£24,588) • Gender balance • Skill level
Increased number of technology based companies in County/region	• Businesses created • Businesses attracted • Total number of businesses at NETPark • Tenants which leave • Businesses surviving 12 months (non-Incubator) • Businesses surviving 12 months in the Incubator • Businesses surviving and graduating from the Incubator • Businesses graduating Incubator and moving into larger premises in the County
Attraction of firms from other parts of the UK and abroad	• Attracted businesses
Increased exports	
Exploitation of technologies	• Number of patents held • Number of new products to market • Number of IP licensed out • Number of patents licensed in
Attraction of investment funds (including bank and venture funding)	• Amount of additional CAPEX supported (leveraged) • Order book increase resulting from BD engagement with businesses
Technology exchange work with universities in the North East and between companies	
Employment of local people	
Raising employment aspirations amongst local pupils *measured*	

by number of participants.	

Source: NETpark document

In addition to the KPI outlined above, NETpark follows some additional operational KPI internally like, for example, compliance checks, risk register, occupancy figures, profit and loss, marketing activities of the park, enquiries, etc..
Recently, a new strategic vision for 2025 is developed by NETpark, which will go along with a few changes concerning the reporting. The new strategy will be monitored by using a new set of KPI (starting this year) along a five-point plan, which will be reported publicly every year. The basis for the new reporting scheme will be an annual review of tenants, which will also include customer satisfaction. To date the detailed reporting scheme is not disclosed.

Overall, the management pursues the strategy to generally simplify the reporting process in the future.

3.4 Ann Arbour

History and profile:

SPARK was founded in 2005 as an economic development board for the larger Ann Arbour area. Its establishment was a reaction towards the loss of a large automotive manufacturer - a critical employer in the region.

Ann Arbour is strongly driven by the University of Michigan and can be characterized as an area of innovation. It provides with a wide range of services, covering inward investment, start-up support, business development assistance and talent services, among others. It has proven to be a highly successful organisation to provide high quality economic growth to the region.

Management and ownership:

The company is a private company managed by a board of directors and an executive committee. It holds investments in an investment fund and a microloan scheme.

Reporting:

The 14-page annual report clearly shows the emphasis of SPARK's strategy on economic development-related effects and related business / customer services.

Figure 9: SPARK Successes – summary page

Source: Annual Report SPARK 2014

In more detail, SPARK's reporting of effects and achievements highlights the AI's contribution to the local and regional economic development. Further performance indicators are related to specific services for businesses and the AI's marketing measures:

Table 4: SPARK's KPI as provided by the interviewee

Entrepreneurial Services	• Number of numbers of companies served • Number of public grants received and private equity raised • Number of incubator graduates
Business development	• The areas of site selection, talent-related services, project management of support and incentive programmes to incumbent companies and business attraction services are displayed in a more narrative fashion – such as story-telling about the perceived successes.
Marketing services	• Number of PR hits & views • Number of social media impressions • Number of YouTube plays • Number of online impressions • Number of website visits • Number of financial statements (financial highlights are

	displayed in a very condensed and graphic form)
Summarized achievement reports	• Number of growth projects with resulting investments and announced jobs • Number of pre-seed investments • Number start-ups assisted • Number of microloans awarded • Number of incubator tenants nurtured • Number of companies assisted with resulting job postings

Source: SPARK

Regular reporting to the board is realized in an abbreviated form during the board session six times a year. Moreover, these metrics' results are shared with the business community during a large annual meeting. This forum is more directed towards the region overall as public support is key to a community-based organisation's motivation. The management of SPARK indicates that further efforts to communicate positive effects and outcomes will have to be increased in the future.

3.5 Berlin-Adlershof

Profile and history
Adlershof is a 420 hectares (4.2 km²) development area in the south eastern part of Berlin. Early after the reunification process the decision was made to develop a science park plus a surrounding area in to what was then coined 'Adlershof – the City of Science, Business and Media'.
In the aftermath of reunification the former Academy of Science of German Democratic Republic was closed down, the remnant severely downsized, restructured and integrated into the German science system loosing about 4,500 researchers of the formerly ca. 6,000. Due to the relocation of the Humboldt-Universität zu Berlin the scientific core of Adlershof today has around 2,500 scientists and 6,000 students. Around this a set of incubators and technology centres were planned and built representing approximately 150.000 m² of research and high-tech production surface occupied by around 450 high-tech companies with appr. 6,000 employees. In total, ca. 1,000 companies with ca. 16.000 employees are situated at the site today. The continuous growth was achieved by incubation, acceleration and inward investment, but also by attracting real estate investors offering professional office, lab and production space for 'graduates' as well as large companies. The management team expects to grow the area to about 25,000 employees in the coming years.

Management and governance:
WISTA-MANAGEMENT GMBH is the key agency developing and operating the science and technology park. It is a limited company in 100% ownership of the city administration of Berlin. The supervisory board has eight members: four representatives of the city government, three businesswomen and one renowned scientist. An affiliated company - Adlershof Projekt GmbH, a fiduciary development agent to the City of Berlin, is responsible for the development of the STP's wider area. Furthermore there is an affiliated company taking care of the facility management and a company developing the area, which is now Tegel airport.

An advisory board represents the key stakeholder groups in Adlershof, which are the Humboldt-Universität zu Berlin, the association of non-university research institutes, the association of SME in Adlershof, the mayor of the city district as well as one representative of the on-campus 'media city'. Both boards have three regular meetings per year.

Reporting:
WISTA-MANAGEMENT GmbH reports to the Supervisory Board in a quarterly report covering the following key issues:

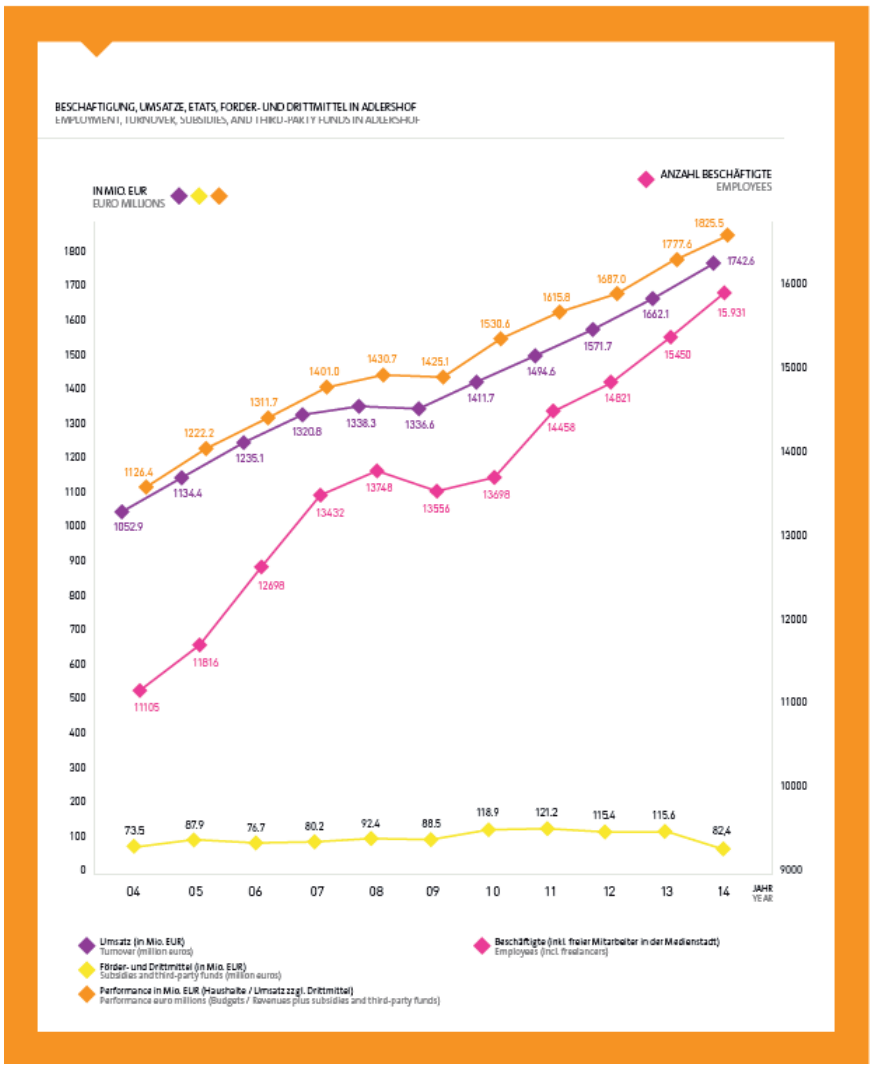
- Profit & loss, investment related issues: actual against plan and forecast, investments and liquidity for WISTA MANAGEMENT GmbH and affiliates
- Occupancy rate, sales projects
- Department and affiliate company specific reports: marketing, construction, business development, event business, acquisition of inward investments, incubation, network management, facility management issues, project initiatives like energy project, acceleration project, new locations

The report to the Advisory Board is a subset of the report to the Supervisory Board. The Advisory Board is a sounding board for new projects, concepts and initiatives.

Twice a year 'Adlershof Update' is held, a communication event to the Adlershof community, where relevant information about the STP's development is presented.

The key report is the Adlershof Annual Report summing up both: reports of the management company and its affiliates, publishing of development figures as well as the results of the customer satisfaction and appreciation report. It is made public in the download section of www.adlershof.de and presented at the annual press conference as well as widely mailed to stakeholders. The following graphs illustrate some of the key results:

Figure 10: Employment, turnover and value added of Adlershof resident organizations



Source: Adlershof Annual Report 2014

Figure 11: Detailed business figures of Adlershof key stakeholders

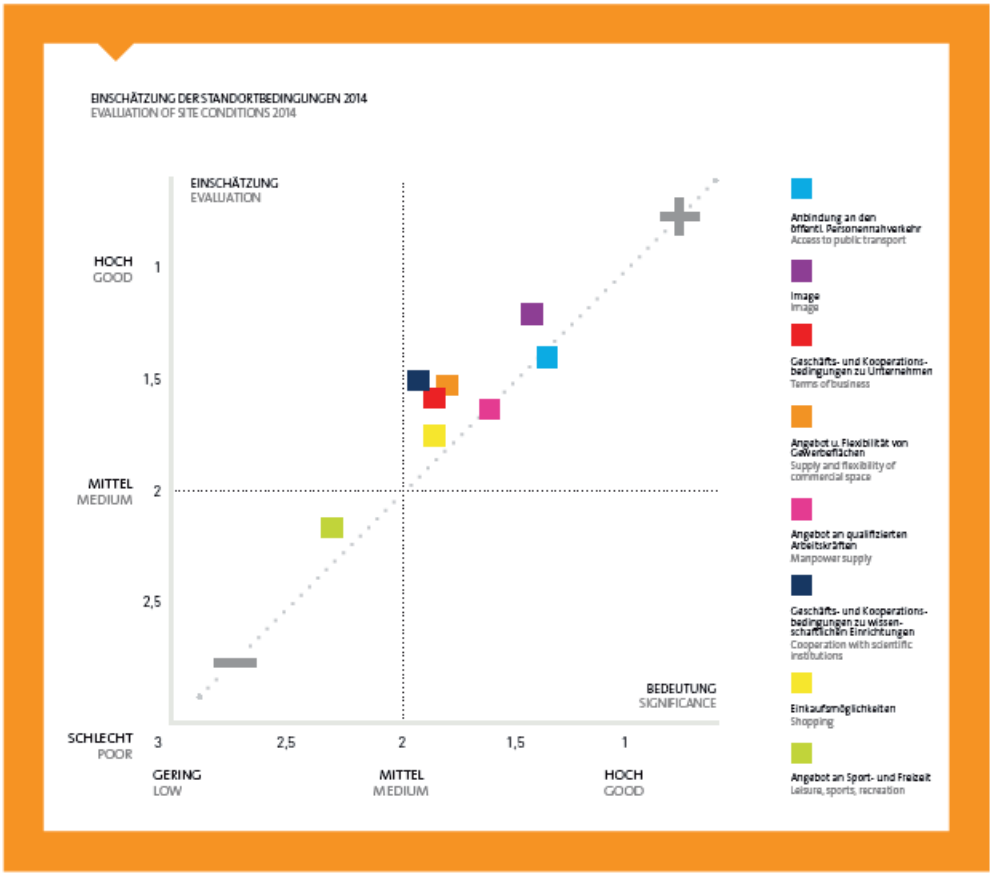
ENTWICKLUNG DER UNTERNEHMEN UND WISSENSCHAFTLICHEN EINRICHTUNGEN IN ADLERSHOF 2014
DEVELOPMENT OF COMPANIES AND SCIENTIFIC INSTITUTES IN ADLERSHOF 2014

	Unternehmen, Einrichtungen, Institute Companies, institutes			Beschäftigte Employees			Umsatz, Haushalt (in Mio EUR) Revenues, budgets (in m EUR)			Fördermittel bzw. Drittmittel (in Mio EUR) Subsidies and third-party funds (in m EUR)			Performance* (in Tsd. EUR) Performance* (in thou. EUR)		
	2014	2013	Veränderung Variation	2014	2013	Veränderung Variation	2014	2013	Veränderung Variation	2014	2013	Veränderung Variation	2014	2013	Veränderung Variation
Unternehmen im Wissenschafts- und Technologiepark Companies in the Science and Technology Park	478 478	459 459	+ 4,1 % + 4,1%	5.865 5,865	5.576 5,576	+ 5,2 % + 5,2%	717,7 717.7	693,5 693.5	+ 3,5 % + 3.5%	10 10	23,5 23.5	- 57,5 % - 57.5%	727,7 727.7	717,0 717.0	+ 1,6 % + 1.6%
Außeruniversitäre Forschungseinrichtungen Non-university research institutes	10 10	10 10	---	1.686 1,686	1.683 1,683	---	132,3 132.3	133,1 133.1	---	40 40	42,6 42.6	- 6 % - 6%	172,3 172.3	175,7 175.7	- 1,8 % - 1.8%
Humboldt-Universität zu Berlin	6 6	6 6	---	1.076 1,076	1.064 1,064	+1,1 % +1.1%	48 48	48 48	---	31 31	28 28	+ 10,7 % + 10.7%	79 79	76 76	+ 3,9 % + 3.9%
Medienstadt Media City	135 135	140 140	-3,6 % -3.6%	2.004 2,004	1.939 1,939	+3,3 % +3.3%	214,1 214.1	209,9 209.9	+ 2 % + 2%	0,1 0.1	4,0 4.0	- 97,5 % - 97.5%	214,2 214.2	213,8 213.8	+ 0,2 % + 0.2%
Unternehmen und Einrichtungen im übrigen Entwicklungsgebiet. Companies and facilities in the industrial estate.	372 372	381 381	-2,4 % -2.4%	5.300** 5,300**	5.018** 5,018**	+ 5,6 % + 5.6%	630,5 630.5	577,6 577.6	+ 9,1 % + 9.1%	1,3 1.3	17,5 17.5	- 92,6 % - 92.6%	631,8 631.8	595,1 595.1	+ 6,1 % + 6.1%
Insgesamt Total	1.001 1,001	996 996	+0,5 % +0.5%	15.931** 15,931**	15.281** 15,281**	+ 4,2 % + 4.2%	1.742,6 1,742.6	1.662,1** 1,662.1**	+ 4,8 % + 4.8%	82,4 82.4	115,6 115.6	- 31,3 % - 31.3%	1.825,5 1,825.5	1.777,5 1,777.5	+ 2,7 % + 2.7%

** ohne SOLON Energy GmbH / excl. SOLON Energy GmbH
* Umsätze zzgl. Drittmittel / Revenues plus third-party funds

Source: Adlershof Annual Report 2014

Figure 12: Appreciation and significance of site conditions in Adlershof



Source: Adlershof Annual Report 2014

An annual summary report is compiled and handed over to the city's holding administration once a year. Among others, strictly financial data and the distinct goals are documented (Table 5).

Table 5: Key KPI reported to the public administration as shareholder of Adlershof

Goals	Actual 2013	Plan 2014	Plan 2015	Plan 2016
Turnover (net) of ancillary leasing costs	13,427	13,306	14,027	14,076
Profit (in € 1,000)	515	-799	1,528	1,666
Customer satisfaction level (compared to previous year in customer survey	104.5%	100%	100%	100%
# of new start-ups	22	15	15	15
Job growth in %	3.8	5	5	5
New large accounts	2	2	2	2
Number of apprentices at WISTA-MG	2	2	2	2

Source: Zielbild WISTA-MANAGEMENT GMBH, Beteiligungsbericht des Landes Berlin 2014

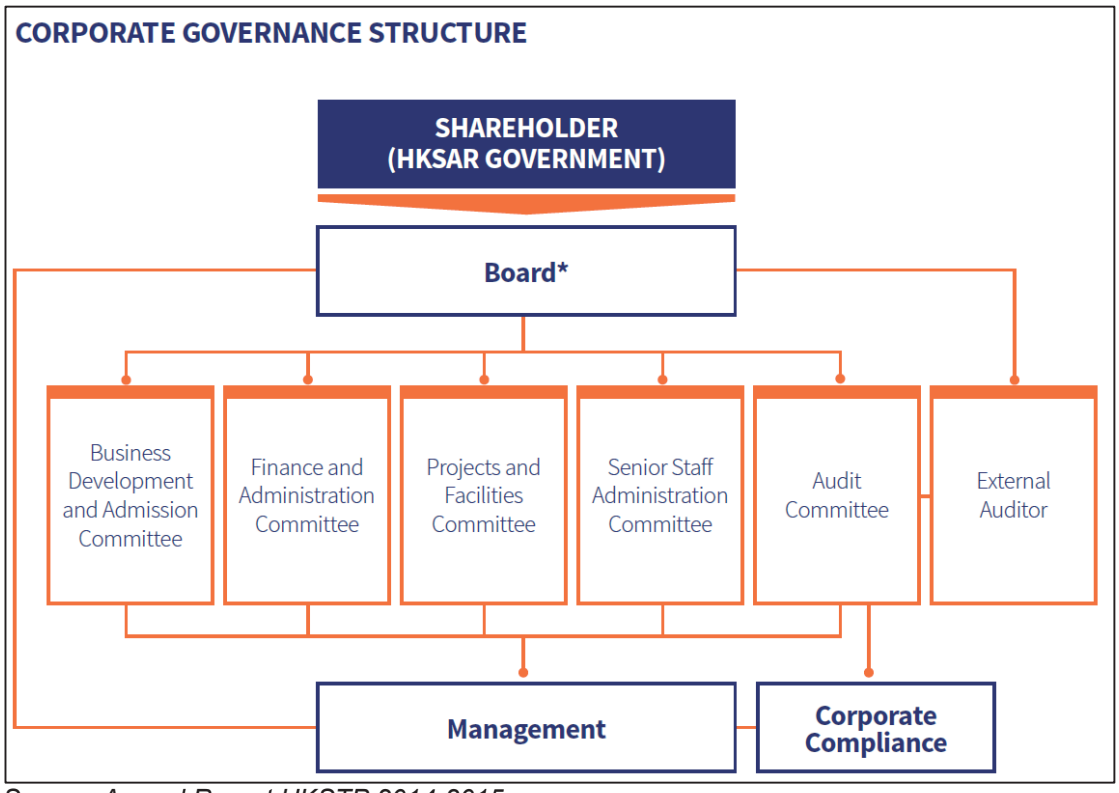
On a regular basis, studies of the regional economic effects are commissioned to the research institute DIW, assessing the impact of Adlershof to Berlin's economy. The most recent one was focussing on the effects of the incubation and technology centres in Adlershof.

3.6 Hong Kong Science Park

Profile and history:
Hong Kong Science & Technology Parks Corporation (HKSTP) is a statutory body dedicated to build a vibrant innovation and technology ecosystem to connect stakeholders, assist technology talents, facilitate collaboration, and facilitate innovations in order to generate social and economic benefits to Hong Kong and the region. HKSTP, established in May 2001, comprises a science park, an InnoCentre and three industrial estates Tai Po, Tseung Kwan O and Yuen Long. As of March 2015, HKSTP park has grown to ca. 510 companies with ca. 11,300 employees.
HKSTP focuses on the support of science-based and technology firms in several clusters including electronics, ICT, Green Technology, biomedical technology, and material and precision engineering. The nurturing of ideas, innovation and companies' growth is supported by R&D facilities, infrastructure for applied research and product development, and market-led laboratories and technical centres with professional support services (e.g. creative design support at InnoCentre). Further value added services and comprehensive incubation programmes aim to accelerate the growth of technology start-ups (HKSTP 2016).

Management and governance:
HKSTP's Board has 17 members, three of whom are from political or public administrative stakeholders (including the Chairwoman appointed by the Chief Executive of Hong Kong SAR), three are university scientists and eleven are experienced businesspersons. The Board has several subcommittees supporting the executive management team.

Figure 13: Hongkong STP ownership and supervisory structure



Source: Annual Report HKSTP 2014-2015

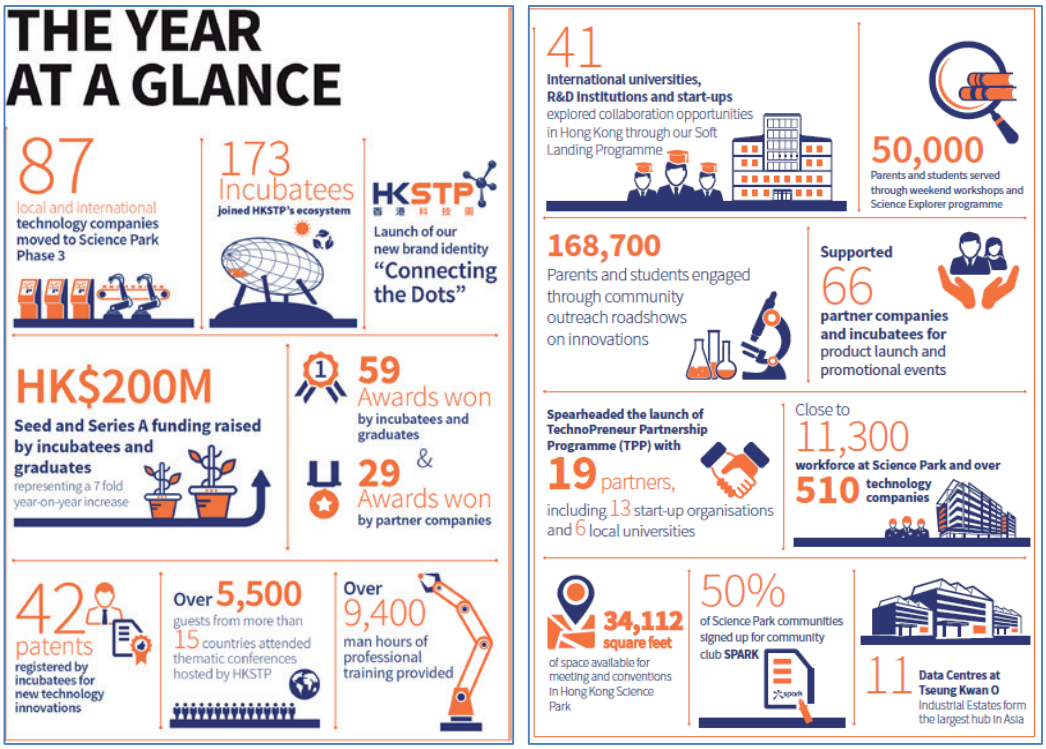
The executive management team consists of seven officers: CEO, Commercial, Corporate Development, Project Development, Operating, Marketing and Compliance Officer.

Reporting:
The key element of HKSTP's reporting is the highly professional and comprehensive Annual Report. The 120+ page paper covers in the most detailed way a large range of performance areas. The operational performance of HKSTP is split up into the following ten key areas:

- Cluster Management
- Start-ups
- Industry Collaboration
- Knowledge Transfer
- Support for R&D and Innovations
- Talent
- Community Development
- Infrastructure and Services
- Vibrant Atmosphere
- Operational Highlights

The following graphical overview illustrates the key KPI the park management publicly monitors (Figure 14).

Figure 14: The year at glance – the most important KPI of HKSTP

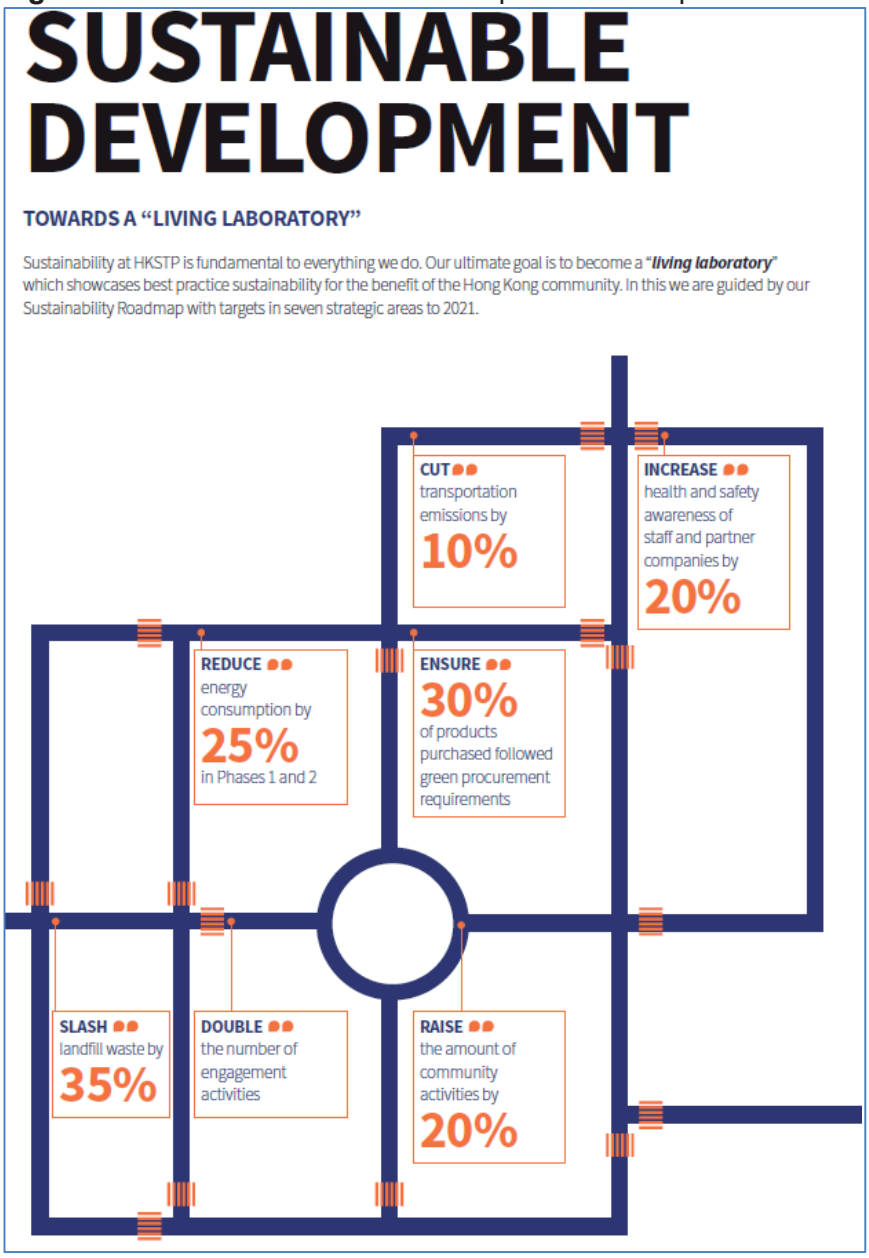


Source: Annual Report 2014/15

Beyond these three additional performance areas are covered in the HKSTP reporting (see Figure 15):

- Corporate Governance Reports with relevant KPI (incl. workplace health, security as well staff training and community engagement)
- Risk Management
- Sustainable Development

Figure 15: HKSTP sustainable development efforts plus related KPI



Source: Annual Report 2014/15

Overall, the reporting of HKSTP is the most comprehensive performance measurement analysis and communication covered in the case studies of this paper. To the authors, HKSTP really sets new standards in this respect – measuring and showcasing the very manifold function of HKSTP in the region.

3.7. Mjärdevi

History and profile:

In 1983, the municipality of Linköping decided to develop a business area adjacent to the University of Linköping. Since then, more than 300 companies employing over 6,000 people have located in the area. In a joint effort, the STP management company in cooperation with real estate developers aim to attract start-ups, SMEs and MNEs. Interestingly, the STP

management firm itself does not own any real state at the site. Among others, Mjärdevi Science Park supports the interaction of students, firms, projects and research in a new collaboration space ‘creActive Mjärdevi’ and through numerous networking events such as ‘LunchBeat’.

Management and ownership:

A 100% affiliate company of the municipality of Linköping, Mjärdevi Science Park AB is a limited company responsible for the development and marketing of Mjärdevi Science Park. The regional triple helix, namely five politicians, four entrepreneurs and two university members, is represented in its board of directors.

Reporting:

For quite some time, the implemented KPI metrics, following a long-term ten-year plan and a three-year plan according to the owners’ directives, have been pretty simple.

The reporting primarily focuses on the STP’s economic impact in terms of the number of companies and the number of employees. However, comprehensive regional impact studies have not been compiled yet. According to the management, this has been due to the lacking demand and associated high costs. In addition, a number of selected issues are addressed depending on running projects, e.g. internationalization efforts, usage figures of the meeting centre creActive etc.. These figures are not publicly available.

Along with the new ten-year, plan the management expects the KPI to shift from clearly result-based to less numeric targets to depict the engagement of stakeholder of the regional ecosystem, for example, measuring the number and structure of attendees of specific meetings, conferences, programmes and projects.

This shift to more project-oriented reporting is caused by a stronger focus on new programme formats, which have been recently designed to enhance the engagement of specific target groups, e.g. the recruiting assistance programme ‘TechPilot’.

Customer satisfaction has been measured by an annual survey so far. Here, the management teams plans to implement to more activity-based ad hoc surveys and continuous dialogues via blogs etc..

There is a very short written monthly report to the City of Linköping, the board and the student organisation. Larger communication events addressing other stakeholders or the general public have not taken place so far.

4. Overview of critical KPI

The key areas of reporting we found in the case study analysis are:

- Management company profile
- Real estate and infrastructure
- Industrial and entrepreneurial community
- Cooperation for open innovation
- Cluster relevance
- Talent attractiveness
- Community
- Sustainability
- Branding
- Wider economic effects

Grouping the KPI found in the case studies to the specific key performance areas and sub-topics leads to an overview of the used KPI (see Table 6).

The authors found a general tendency to professionalise reporting methods and develop them along the increasing responsibilities of STP and AI. Public authorities tend to increase the reporting duties given the large investments and commitments that STP and AI require. Countries like China, Turkey, and the U.S. have introduced comprehensive ranking schemes. So, STP managers can expect to see an increasing demand of reporting. The authors propose to address this issue in a proactive manner, as most of the numbers and issues reported on can be used for marketing, arguing for budgets, evaluate departments or determine bonuses, and create credibility for further expansion.

STP/AI differ substantially in their focus of development. The differences arise from their maturity, from their position as in inner city or non-urban park, from their shareholdership, from their technology focus etc.. The right set of KPI therefore will never be identical between two parks. However, it may be likely to find a higher level of common KPI in parks that have a similar position in the “Strategigram” as displayed in Figure 5. STP/AI wishing to enter peer review exercises or benchmarking should certainly look for strategic commonalities.

The target groups for reporting efforts have different expectations as well. The “onion model” displayed in Figure 1 indicates that there are different levels of hierarchy in reporting. The core reporting will be dictated by the legal framework the STP/AI is operating in. Shareholders and Supervisory Boards as well as governing political bodies worldwide have a standard set of unabidable performance measures. The choice of reporting focus in the outer ring can be chosen by the park management according to the operational and delevopment focus. The general public and real estate for instance investors will have different informational needs. A comprehensive set of KPI, however, is a precious tool to create trust in all stakeholder groups and confidence in the management team.

Table 6: Sectors and KPI identified in the seven case studies

Sector	Sub-Sector	Possible KPI (most used in STP sample)
management company profile	Financial performance	turnover, profit, investments, liquidity etc
	corporate governance	set of control issues
		equality measures
		transparency measures
	staff training	special programs and # of participants
		# of apprectices in company
	Customer Satisfaction	Satisfaction numbers from surveys
		Appreciation number/ importance rating from surveys
Real estate and infrastructure	Real estate	occupancy rate
		new buildings
		enhancements
		new buildings by private investors
	Infrastructure Projects	energy, telecom, waste etc supply
		traffic lines, connections etc
		urban development
industrial and entrepreurial community	companies	number of new companies
		number of employees
		investments made by new and existing companies
		key performance of existing companies
		efforts made to gain new companies
	Start-Ups	# companies founded on site
		finance gained for start-ups and growth companies
		programs run for start-ups (accelerators, bootcamps etc)
		# of companies in incubation
		# of companies graduated
co-operations for open innovation	industry cooperation, knowledge transfer	number of industry cooperations
		third party money gained for universities from industry
		programs run for industry cooperation
		specialised events/ # of particpants
		programs and methods and # of particpants
	Support R&D and Innovation	number of patents
		number of utility models
		design initiatives
cluster relevance	cluster development	# companies in cluster
		# of people employed in cluster
		#/size of specialised open access labs
		# of cluster meeting and initiatives
		#/name of tractor companies
		#/name of leading projects/institutions in cluster
		#/name of leading researchers in cluster
Talent attraciveness	Talent development	# Entrepreneurial courses
		# Summerschools, Boot camps, etc
		# relation to universities, vocational training institutions
		# specialized educational programs for companies
Community	STP/AI Community Engagement	bonding events like sport, etc
		joint CSR programs
		faculty clubs, etc
		# of events and description
		# programs and description
	Community support	social programs and # of participants
		STEM and PUSH events
Sustainability	Sustainability	energy/CO2 programs
		waste/noise/water programs
		mobility programs (emobility, biking, etc)
	health and safety programs	special programs and # of participants
branding	internet, social media	reach figures
	awards won	# and description of awards
		ranking positions in national /international rankings
wider economic effects	regional ecomomic impact	regional jobs created
		regional wealth /value add created
		regional tax and social security contributions

Source: Authors

5. Communicating and activating KPI for management issues

A well-designed set of KPI is the navigation instrument of a development strategy. Putting the KPI into this perspective publishing the relevant KPI illustrates the strategic course. It is a plausible demonstration of the management's determination to make a public commitment. Hong Kong STP and Ann Arbor systematically use this method to impressively illustrate their reliable course. One of Teknokent's main marketing messages is the leading national ranking of their STP within their peer group.

KPI, on the other hand, provide an excellent basis for evaluation and motivation of the management of STP/AI and their staff. John E. Jones, the well-known management trainer, is much quoted to have said: "What gets measured gets done. What gets measured and feedback gets done well. What gets rewarded gets repeated." An integrated goal-setting process for the whole STP/AI management regarding the annual and long-term goals is a transparent and motivating way to steer a reliable course for the whole organization.

In Table 7, the authors compiled the key comments taken out of the seven case studies plus own professional experience to illustrate the potential of powerful storylines developed from a well-selected set of KPI.

Table 7: KPI and potential storylines for communication

Sector	Sub-Sector	Possible KPI (most used in STP sample)	Potential Story Line
management company profile	Financial performance	turnover, profit, investments, liquidity etc	stable, well run and strong reliable company
	corporate governance	set of control issues	leading in open books management, role model organisation
		equality measures	
		transparency measures	
	staff training	special programs and # of participants	professional sustainable management
		# of apprectices in company	
	Customer Satisfaction	Satisfaction numbers from surveys	permananent improvement process, well prioritized
		Appreciation number/ importance rating from surveys	
Real estate and infrastructure	Real estate	occupancy rate	high acceptance by RE investors, well connected, attractive for hightech companies, favourable conditions, well planned, built to last
		new buildings	
		enhancements	
		new buildings by private investors	
	Infrastructure Projects	energy, telecom, waste etc supply	
		traffic lines, connections etc	
		urban development	
industrial and entrepreurial community	companies	number of new companies	place for growth, attraction for companies, well marketed, the place to be
		number of employees	
		investments made by new and existing companies	
		key performance of existing companies	
		efforts made to gain new companies	
	Start-Ups	# companies founded on site	systematic creation of entrepreneurial environment
		finance gained for start-ups and growth companies	
		programs run for start-ups (accelerators, bootcamps etc)	
		# of companies in incubation	
		# of companies graduated	
co-operations for open innovation	industry cooperation, knowledge transfer	number of industry cooperations	access to university research well organized, cooperative spirit, easy to do business with
		third party money gained for universities from industry	
		programs run for industry cooperation	
		specialised events/ # of particpants	
		programs and methods and # of particpants	
	Support R&D and Innovation	number of patents	transfer orientated researchers and organisation
		number of utility models	
		design initiatives	
cluster relevance	cluster development	# companies in cluster	powerful, systematically developed cluster offering tangible advantages for cluster members
		# of people employed in cluster	
		#/size of specialised open access labs	
		# of cluster meeting and initiatives	
		#/name of tractor companies	
		#/name of leading projects/institutions in cluster	
		#/name of leading researchers in cluster	
Talent attraciveness	Talent development	# Entrepreneurial courses	good programs draw excellent people, creation of entrepreneurial and cooperative spirit
		# Summerschools, Boot camps, etc	
		# relation to universities, vocational training institutions	
		# specialized educational programs for companies	
Community	STP/AI Community Engagement	bonding events like sport, etc	well curated spirit of coperation and belonging, attractiveness to general citizens
		joint CSR programs	
		faculty clubs, etc	
		# of events and description	
		# programs and description	
	Community support	social programs and # of participants	model role, adressing high end target groups
		STEM and PUSH events	
Sustainability	Sustainability	energy/CO2 programs	model role, potentially living lab character
		waste/noise/water programs	
		mobility programs (emobility, biking, etc)	
	health and safety programs	special programs and # of participants	
branding	internet, social media	reach figures	fact based marketing, establishing pride of belonging
	awards won	# and description of awards	
		ranking positions in national /international rankings	
wider economic effects	regional ecomomic impact	regional jobs created	well spent anchor investments, public as well as private
		regional wealth /value add created	
		regional tax and social security contributions	

Source: Authors

Acknowledgements:

The authors would like to thank the following interviewees for sharing their very valuable experiences: Hanzade Saricicek (ODTU Teknokent), McLean Sibanda (The Innovation Hub), Catherine Jones (NETpark), Paul Krutko (AnnArbour), Marian Gaultney (Hong Kong STP Corp.), Miranda Lena (Mjärdevi), Dr. Andre Domin (Technologiepark Heidelberg).

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