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Accelerating Synergies in Technological Research Parks: The Case of TECNOPUC

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Executive Summary

One of the holy grails of Science and Technology Parks (STP) is the creation of synergy across tenants. Synergy can manifest itself in several ways: when two (or more) companies use each other's capabilities to further their own work; when companies join forces to deliver innovative products or services that could not exist if the respective companies were working alone; or when companies locate suitable partners or financial backers either inside or outside of the park.

Specific examples of different types of synergy exist in most parks; typically, companies become aware of each other's capabilities and needs through personal connections, networking events, or even through the work of individuals who make connections their mission. The connection of one's capabilities with another's needs, or just a connection between capabilities of two or more companies, is arguably one of the avenues for innovation leading to commercial success. Although in some cases such synergies are extremely successful, it is hard not to think that serendipity plays a large role in this process, and that only a fraction of the potential is being explored. Ultimately, still missing is an approach that consistently delivers purposeful synergistic business connections, adding value to the tenants and to the park.

Enter Strategic Resource Mapping (SRM) (Evaristo and Zaheer, 2014) as an enabler of synergy acceleration. SRM is a novel methodology which can be used to assess and identify needs and capabilities in organizations across different boundaries (or silos): different geographies, functional areas, or business units. The same concept can be adapted to look at multiple federated organizations, such as the companies in a STP. In this manuscript, we will describe the generic problem underlying the challenges discussed, give examples of real problems and solutions in corporations, extrapolate the solution to Regional Economic Development, and then expand key details to the reality of a STP. The case study of SRM application at TECNOPUC in Porto Alegre, Brazil will then be described. Conclusions will be drawn.

Introduction

One of the most vexing challenges businesses face today is to achieve best utilization of key capabilities and resources across its many silos. Although many methodologies have sprang up to support efficiency improvements over the last few decades, they were not designed to cross key boundaries nor to contemplate individual level expertise or business unit capabilities in a holistic level.

We believe that at the root of the problem is the organizational inability to truly understand and identify key capabilities or resources available across different boundaries: geographic, business, functional and many more. In practice, such resources or capabilities are hidden in plain sight; for instance, located under a different control unit. And since control units – or silos – tend to optimize their operation intra-silo, the system-wide optimization that would enable cross-utilization and therefore best application of scarce resources to improve the overall system performance is very hard to achieve.

As a result, key resource allocation decisions are made based on a subset of the total picture. It is not a surprise that organizations may end up over-investing in areas that have redundant resources or underinvesting in other areas which are indeed starved. The resulting waste saps much of the organizational energy that could be redirected to innovation, growth, and so much more. Worse, realization that certain capabilities are inadequate only comes to the fore when strategies start to fail.

We believe that a solution to this problem is the concept of metacapabilities. Metacapability is the "ability to identify and leverage distributed capabilities across the firm" (Evaristo and Zaheer, 2014, p. 329). This concept is operationalized by Strategic Resource Mapping, a methodology designed to create visibility of resources / capabilities either at the individual or at the business unit level. There are different operationalizations of SRM at the business unit level: (a) same ownership in a large corporation or industrial conglomerate, or (b) different ownership, as in clusters which would include Science and Technology Parks (STP).

In the remaining of this manuscript, we will first describe the benefits accruing from a generic solution to this issue, then expand on how the SRM methodology delivers that solution. Examples at the individual and business unit level will be provided. Then we will extrapolate how that solution is generalizable to multiple enterprises, and how it can support the concept of regional economic development. Finally, we will focus on one subset of the overall system: Science and Technology Parks, and describe the experience at TECNOPUC.

Problem Description and Value of a Solution

The lack of visibility of key resources manifests itself in different ways. In this section, we will give examples of problems in sales, technical proposal development, and R&D. For each example, we will first share the problem, then expand on the solution and its benefits.

In large and complex multinational sales, it is particularly difficult to quantitatively identify impediments to increases in sales profitability. The complexity in B2B sales can easily be underestimated, but it should not: the requirement is that the sales force need to know in depth both a complex portfolio of products and services as well as each of the key customers who are present in multiple locations around the globe. To increase the challenge, each of these customers may have different tiers of supply chain in each of these locations. At any given point, the sales team needs to be able to touch one of these hundreds of potential contact points to deliver the correct value proposition to have a chance of earning and maintaining the business. This means deploying hundreds of people across the globe, servicing hundreds of customers, at the lowest cost, and selling a portfolio that can be in the hundreds. The challenge is to identify which specific knowledge limitations from the sales team are critical to complete the most profitable deals across each customer's supply chain.

Successful sales depend on both behavioral as well as content expertise. Behavioral acumen relates to being good negotiator, for instance. We focused the solution on the latter, using SRM to increase the visibility of the expertise for each salesperson worldwide. Expertise, as related to sales, comprehends (a) knowledge of the value proposition for each product or service, (b) detailed knowledge of the customer needs, segmented by type of facility (coordination, design or manufacturing), location (city and country), supply chain tier and specific supplier or buyer. The application of SRM identified the vulnerabilities in the system – i.e, all the points where expertise was lower than required to complete potential sales. Those vulnerabilities were then matched with the most important and profitable opportunities. The result was a prioritized list of which expertise needed bolstering (and where). Investment on capability enhancement was then laser-focused with a very high ROI. At 3M, the benefit was growth of over 30% in sales in three years, with a cumulative value of over $500M USD (Evaristo, 2014).

A similar problem is the development of R&D proposals in Universities, Science Parks, corporations, or large agencies. Proposals are typically prepared in response to a RFP issued by a funding body or customer. The challenge is to (a) identify team members with all the appropriate skills from (b) a large number of possible candidates, across many boundaries or silos, to (c) deliver the best proposal in the shortest time. At NASA-JPL (Jet Propulsion Lab, Pasadena, California), SRM was deployed to first assess the individual capabilities and second to connect scientists to requirements of particular RFPs, accelerating the preparation process and improving its quality.

A third problem worth discussing is innovation in R&D. The main challenge, similarly to proposal development, is the identification of people with the right skills to contribute. Several key differences exist, though. One, the matchmaking process between task and skill is now fuzzier: it must include certain adjacencies not fully defined upfront to deliver breakthrough innovation. Two, certain skills must coexist within the same person to both enable as well as accelerate the process. At 3M, SRM was used many times to create teams with the smallest number of scientists who at the same time had the largest number of deep skills judged central or adjacent to the product or service intended. The value in this case is more efficient use of time to deliver innovation: for instance, instead of exploring empirically multiple avenues, the cross-skill membership ensured that less likely to succeed alternatives were identified early on and as a result not pursued. Similar approaches were used in several areas of the company, focusing investments of over $50M USD, ultimately supporting over $10B USD in revenues.

These three problems have several aspects in common: their respective solutions were based on (a) identifying and measuring key skills, (b) across very different areas of the organization (geographically, functionally, type of business), (c) to create a matchmaking solution addressing the slightly different requirements of each example.

It is worth considering how the same problem and solution set would affect challenges at the business unit level, be those under same or separate ownership. Let's address next the case of separate ownerships, given that same ownership is a subset of the latter issue.

The complexity of the problem of identifying key capabilities and needs across multiple business units with separate ownership is much larger. First, there are no established mechanism for sharing such information. Second, there is no formal incentive to improve the overall system performance when many players may see the environment as a zero sum game. Third, any attempts at matchmaking have to overcome the challenge of both community and trust development and creation. Fourth, intellectual property issues may be quite thorny. Fifth, there is no established formal structure that may take upon itself the task of addressing all these problems. Sixth, there is no mechanism to create connections between a particular system (as a set) and external stakeholders such as funding agencies / VCs, government units, Universities and other enterprises geographically distant.

In the next section, we will link these challenges to much larger problem: Regional Economic Development, and discuss how they can be addressed. Later in the manuscript we will focus on a subset of this problem: the STP environment.

Connecting the Challenge/Solution to Regional Economic Development

What has just been described as the problem of identifying capabilities and needs across multiple business units with separate ownerships is the same problem and set of challenges around Regional Economic Development. Strategic Resource Mapping is a way to address all these issues concurrently, delivering on the promise of Regional Economic Development.

Strategic Resource Mapping is able to identify, on a regional basis, what the most prevalent capabilities are, reinforcing the perception of critical mass and offering powerful avenues for policy making and increasing efficiency of scarce investment funding. SRM also identifies what is missing across the system, enabling laser focused interventions that the full system can benefit from. Further, connections of the cluster members with other key stakeholders is made easier due to identification of common interests.

Ultimately, judicious deployment of SRM can increase "virtuous coupling" across a loosely coupled network or cluster. The visibility of capabilities and needs among stakeholders addresses the creation of purposeful connections among members and ultimately the creation of synergies leading to regional economic development. The most important set of outcomes originating from SRM deployment are:

- Creation of virtual sub-networks segmented by common interests, needs and capabilities.
- Implementation of purposeful interactions inside the sub-network as well as across the entire network. These "purposeful connections" are a key element of SRM based on capabilities and needs of the stakeholders. In practice, the deployment of SRM enables stakeholders to go beyond traditional serendipity based networking solutions to create what we call planned serendipity.
- Identification of the joint set of needs – i.e., what are the challenges most faced by companies in the cluster?

Having described in general terms the challenge in delivering Regional Economic Development, let's focus on a subset of the issues discussed: a Science Technological Park (STP). A STP typically involves a smaller set of stakeholder types, simplifying the solution.

STP – focused solution

More recently, the capabilities of SRM have been focused on STPs. The use of Strategic Resource Mapping in STPs is designed to enable consistent, reliable acceleration of synergies (a) across tenants of a research park and (b) between selected tenants and external stakeholders such as funding agencies, research groups (including University Departments, Research Foundations and others) and businesses (VCs, local industry, etc.). This strategy increase the value offered by the STP management to its tenants – it actually gives them skin in the game by investing in the efficiency and effectiveness of the tenants.

This methodology creates overall value by enabling purposeful connections across park tenants that (1) identify and increase the market of products and services within the park, (2) create more efficient paths to identify joint development opportunities and (3) increase the visibility of intra-park investment opportunities. A second phase enables similar connections with external stakeholders.

These "purposeful connections" are part of an innovative solution based on capabilities and needs of the park tenants. The database generated by collecting data across the park creates the basis for a

matchmaking system. In practice, the deployment of this methodology alleviates the need to interact with every single other company (an impossibility in large parks) to identify ideal partners. Further, it enables the tenants to go beyond traditional serendipity based networking solutions (brown bag lunches, various meetings, etc) to create what we call planned serendipity via identification of a limited subset of highly compatible potential partners.

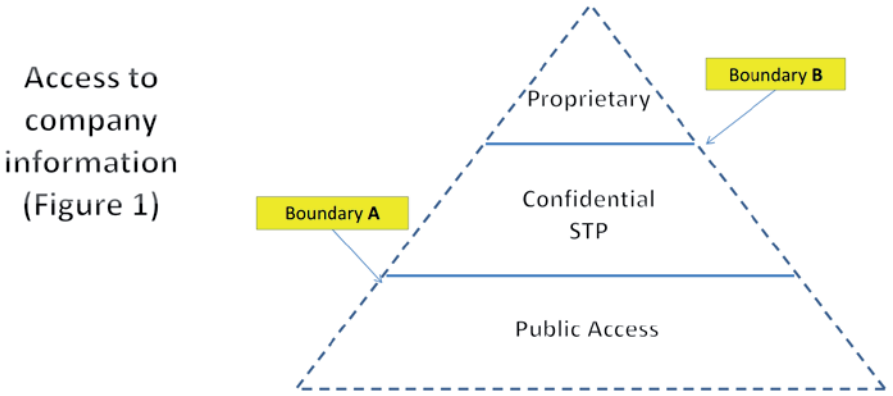
This system can be accessed in multiple ways:

- First, all companies receive a buy map and a sell map. An example follows:
    - Company "A" is given a list of all the companies in the park which have capabilities which are most important to satisfy the needs of company "A". This output is called the "Buy" map for company "A".
    - Company "A" is also given a list of the companies which have needs matching company "A" capabilities. This output is called the "Sell" map.
- Matches of companies are also based on complementary capabilities or satisfaction of needs. Any company can have curated access the database via request to the "Synergy Architect," a role tasked with connecting companies. Such requests can be ad hoc or via expert panels designed to explore key innovation ideas.

Crucially, analysis of the capabilities and needs across the STP creates many other benefits:

- Highly segmented understanding of what the park looks like both in terms of capabilities and needs. For instance:
    - The identification that "digital pricing" as a need across most companies under 15 employees would enable the creation of an offering addressing this gap.
    - The "map" of key capabilities and needs across the tenants enables the creation of a blueprint for additional tenants' capabilities. When another company joins, does the park want someone with more of the same capabilities or select someone else with diverse capabilities that could both plug a critical need for the other companies in the park AND increase the chances of related diversity leading to more innovation?
- Identification of key segments (say, IT companies interested in the renewable energy market AND database optimization challenges) leads to more efficient and focused relevant event creation to introduce / connect companies. That will lead to identification of opportunities for cooperation (or coopetition).

The delivery of highly efficient and effective matchmaking also requires trust within the system. This is achieved in two ways: First, the appointment of a synergy architect, a role that is respected by all parties. Second, the data summarizing all capabilities and needs is divided into three segments, as seen in Figure 1 below. The "public access" data at the bottom of the pyramid includes issues deemed not sensitive by the firms. The "confidential STP" data is data that is either not codified in the system but still available to the synergy architect, or codified data that has been deemed by the participants to be confidential. Finally, proprietary data is not shared by the companies with one another. It could be a decision to acquire a different company to address a key technological need, for instance.



The boundaries (A and B) are permeable. For instance, if a company decides to act on a strategic decision to purchase another one in the park, it might share that information with the synergy architect, who then can play the role of matchmaker and seek agreement from a not yet identified company as to their interest in starting merger negotiations.

Ultimately, the combination of these solution / benefits increases multi-fold opportunities and likelihood to connect with partners who have deep interests in common, leading to faster growth, more innovation, and macro economic development. And all that happens faster and at much lower cost than the alternative of trusting that chance will bring the ideal partner to one's door.

In the next section, a case study designed to test and explore the solution presented will be discussed.

Application of Strategic Resource Mapping at TECNOPUC

In this section, we detail the process leading to acceleration of synergies at TECNOPUC, a leading STP in Brazil. TECNOPUC houses over 6.000 employees distributed in nearly 120 companies in the areas of ICT, Energy and Environment, Life Sciences, and Creative Industry.

As discussed, the key challenge impeding the large scale generation of synergies across different business units in a research park is the sheer lack of visibility to each others' capabilities and needs. The transaction cost of learning about what all the others could offer or need is overwhelmingly expensive and time consuming. As a result, only a small sample of the potential connections actually happen.

The application of SRM to TECNOPUC was designed to create unprecedented visibility to tenants' capabilities and needs, matching companies with potential partners with needs for their capabilities and vice-versa. In the case of TECNOPUC, this matchmaking was implemented through a system enabled by proprietary algorithms augmented by the experience and human touch of a key group of managers (including the synergy architect mentioned earlier). The existence of a structured way to identify the capabilities available (or missing) in the park created novel ways to manage the park's technological blueprint (delivering the appropriate capability diversity across tenants to increase innovation likelihood), to offer value-added services (since it becomes straightforward to identify what are most common needs across tenants), and ultimately to increase the likelihood that more companies get to find partners to create even further ways to leverage their capabilities.

The project had four main phases: First, identification of the key success factors for the ICT companies, a process conducted over nearly two months with both individual face to face meetings with key

stakeholders as well as facilitated meetings across small teams of tenants. Second, that list was tested and validated extensively. Third, an instrument was developed and data was collected across the tenants. Fourth, prototypes of the matchmaking solutions were deployed, and use cases developed. This led to an institutionalization and long-term sustainability plan. Finally, the initiative was launched. More details were presented in Lamb, Giugliani, Prickladnicki and Evaristo (2015).

Some of the examples of synergy created that are unlikely to have been created otherwise include:

- A company whose product focused on network health was hoping to engage customers further, getting past the immediate reaction of who wants to hear bad news. This company was introduced to another one who create interactive games on line – and the outcome were the consideration of gaming aspects to the network health product.
- Another company came to the synergy architect with a query of which other companies in the park had at the same time (a) expertise in mobile development, (b) experience in interface design and at the same time the STP-confidential information on (c) availability of man-hours within a key timeframe.
- A company focusing on e-learning connected with a company working on project management – the result was perfecting learning management systems.

In conclusion, the preliminary results of the project were very promising. The process continues, and is now in the institutionalization phase.

Conclusion and Future Directions

Strategic Resource Mapping has been used in large multinational manufacturing companies to improve sales (as much as $300M), to increase supply chain efficiency (with multiple manufacturing and engineering projects leading to savings in the tens of millions), and to better manage R&D investments (focusing investments of over $50M supporting more than $10B in revenue). In governmental agencies like NASA-JPL it was used to accelerate and improve team formation to respond to RFPs. In Australia, it helped identify vulnerabilities in Sustainability teams in Victoria (Melbourne). In counties and cities in the USA it has increased service levels without increasing cost -- and much more.

The application of Strategic Resource Mapping to business units with different ownerships is a straightforward expansion of the methodology. A key deployment is to enforce Regional Economic Development. Within that context, a subset are projects within STPs.

In this manuscript, we elaborated upon the general problem characteristics, as well as the benefits of solving them. In particular, we offered examples across the value chain of problem-solutions. And we offered also an example of a successful introduction of SRM within a STP. The brief case study shows types of synergies created with this approach that would have been unlikely to be created in any other way.

The approach described is ready for another expansion and testing – for instance, focusing on ways to leverage cross-sectorial SME innovation across a very large physical area (say a continent). We encourage researchers and practitioners to consider the type of possibilities this approach offers, and to go ahead to investigate also other related sub-areas.

Note: This project was chosen as one of third most "Inspiring Solution" by the International Association of Science Parks and Areas of Innovation (IASP). The associated award was presented to TECNOPUC at IASP World Conference in Beijing (September 2015).

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