Selecting a Collaboration Program with New Ventures through Enterprise Architecture

Summary of dissertation for the degree of Master in Information Systems and Computer Engineering

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ABSTRACT

This extended abstract presents the key finds of a research following the Design Science Research Methodology, the objective is to support companies select the most suitable collaboration program with new ventures for their needs. We define a Value-Adding Model based on Resource-Based View and Dynamic Capabilities to define how startups can bring value to mature companies. Then, we build a Program Typology, presenting the characteristics of available programs and develop a method to select the program based on Enterprise Architecture. To demonstrate and evaluate the artefacts, the method is applied in a real-world company.

Keywords

Innovation Management, Collaboration Programs, Enterprise Architecture, Resource-Based View, Dynamic Capabilities.

1. INTRODUCTION

Dynamic markets characterized by an open international commerce, fast technological developments, well-developed international markets for components and services and inefficient trade of expertise, are in deep transformation [1]. In these environments, mature companies are challenged by startups, associated with more flexible and agile practices, developing new technologic capabilities, exploring new markets and testing new businesses models.

Stablished companies, with large resource pools and extensive experience underperform in innovation due to organizational conflicts studied on the organization ambidexterity theory [2]. To overcome the misalignment of exploitation and exploration, companies can use ambidexterity mechanisms such as structural separation or open innovation initiatives [3]. On the other hand, new ventures are, in general, highly dependent on external resources, such as financing and business expertise [4].

The mutual interest in partnerships between stablished companies and new ventures generated the creation of several collaboration program models [5], each aiming to achieve specific strategic objectives for both firms. This motivates this research. We have the objective of support companies decide which collaboration program model is the most suitable for their specific strategic goals.

2. RESEARCH METHODOLOGY

This research follows the Design Science Research Methodology (DSRM) [6, 7]. DSRM is an outcome-based methodology, focusing on the development, functional performance and improvement of artefacts.

The methodology comprehends six steps: motivation and problem identification, solution objectives definition, design and development, demonstration, evaluation and communication.

As this research contributes to the scientific literature developing a functional artefact, the DSRM is adequate. As it aligns proactivity and scientific rigor on the solution design with nuances of organization context.

3. RELATED WORK

Open innovation, entrepreneurship and innovation management are active areas of research. Although, collaboration programs are a relatively new area and most works analyze programs through case studies on a single program. There are few works comparing programs. This section presents important concepts of collaboration programs and a brief overview of the research on single programs.

3.1. Open Innovation

Open innovation is the paradigm that companies can combine inflows of knowledge to accelerate internal innovation and outflows of knowledge to expand the markets for external use of innovation [8]. New ventures and startups are a valuable source of innovation, due to its different resources and capabilities [9].

3.2. Business Phases

A business lifecycle can be divided into phases with different needs and characteristics. There are several frameworks proposed for startups. In this work, we define four phases, based on [10].
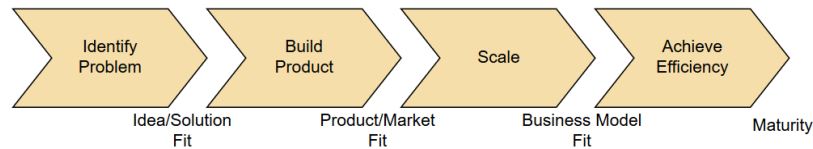

<p align="center">Figure 1. Startup lifecycle [10].</p>

1) Idea Phase. On this phase, entrepreneurs identify a problem with market potential and have initial ideas of solution and value proposition. Information gathering activities are conducted to learn about the problem and market. An operational prototype is developed to test the solution and prove demand.

2) Startup Phase. The main objective of this phase is improving the product and finding customers willing to pay for it. With a validated prototype, the team iterates and tests assumptions about the solution and market. Initial key performance indicators are identified and tracked. A startup can attract investment. In the end of this phase, sales channels and customer base are established.

3) Growth Phase. The objective of this phase is to validate the business model, achieving positive cash flow. To generate profit, the firm starts to look at company building beside product development. Management specialists are hired, formal processes are defined, an organization structure is built. Scalability issues appear.

4) Maturity Phase. In this phase, business grows at lower or even negative rates. The company looks for new markets, develop new products and face strong competition. Efficiency becomes central to management strategic objectives. Processes are improved and matured. Bureaucracy and organizational rigidity emerge.

3.3. Programs.

Based on the analysis of the literature, there are five types of collaboration programs, which can be independent or corporate.

1) Innovation Contests. Is characterized by a competition in which a company (seeker) facing an innovation problem publish the problem for a population of independent agents (solvers) and provides an award to the agent that generates the best solution [11].

2) Accelerators. Execute limited duration (usually 2-6 months) programs to cohorts of startups, helping them with the new venture process. Besides cooperation between teams [12], acceleration programs can offer capital, workspace, intense mentorship, networking and other supporting activities to foster startup survival.

3) Incubators. Incubation programs are like acceleration programs, the main difference is the duration and intensity of support. While incubation programs last between 1 and 5 years, acceleration programs have a shorter duration, between 2 and 6 months. Incubators also deliver less intense mentorship, focusing on networking and resources. Generally, incubation programs target growth stage ventures, with developed product and sales, while acceleration programs also support businesses in the startup phase [13].

4) Venture Builders. In this program, an independent institution is set to develop in parallel several startups. These startups share a common pool of resources. The Venture Builder provides all the necessary resources, such as capital, workspace, professional services. Creating startups in a repeatable process, the Venture Builder keeps at least 50% of the equity, guaranteeing control [14].

5) Venture Capitals. Funds that raise capital from individuals or institutions to invest in early-stage businesses that offer high return potential with high risks. In the corporate form, Venture Capital can mix financial and strategic objectives [15].

4. RESEARCH PROBLEM

Based on the literature review, programs are studied individually with different foci. Such as innovation, economic and management perspective. However, few comparisons were done [5].

With several program possibilities and limited resource, companies must decide which is the best program or set of programs for their specific needs. Based on that, our research problem is: there are several new venture support

program models and open innovation initiatives available, companies lack a method to select the most suitable program for their organizations.

5. THEORETICAL BACKGROUND

To develop the necessary artefacts to solve the research problem, we use theories of strategic management and enterprise architecture. The strategic management theories involving resource-based view and dynamic capabilities are used to understand how collaboration programs add value to companies. Enterprise architecture is used to connect the company strategic goals with the resources accessed through collaboration programs.

5.1. Value-Adding Model

We use the model of [16] to understand how collaboration programs add value to companies and startups. This model is based on the resource-based view. RBV aims to identify competitive advantage sources inside the firm. Resources are defined as any input through which the corporation can perform operations and create economic rents [17]. Resources generate competitive advantage if they meet, at least partially, four conditions: it should be valuable, rare, inimitable and non-substitutable (VRIN).

A common type of VRIN resource is knowledge that support distinctive capabilities [18]. Knowledge is studied in the knowledge-based view theory and is characterized in Maula's value-adding model. Startups can have knowledge regarding specific market segments, new technologies or product development methodologies that expand the resource pool of stablished companies.

The third block of the value-adding model is Endorsement. Partnering with other firms change the perception of other regarding a firm [19]. Startups bring the image of innovation and youth to mature companies. Innovation is trending and the recognition of an innovative firm is desired by most companies.

Research merges and acquisitions, *Harrison* argued that mergers were more successful when the merged companies had complementary resources [20]. Collaboration of companies and startups add value to companies when they access complementary resources and capabilities. However, in the traditional RBV theory, resources are static and startups have few, such as knowledge or image, resources and cannot justify the value addition. But, startups have different organizational and motivation settings that change how they acquire and transform resources. The capability of changing the resource pool is studied in the dynamic capabilities theory.

5.2. Dynamic Capabilities

Dynamic capabilities are the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision maker [21]. Startups have different organizational settings and procedures to react against changes in the environment. Startups change develop new capabilities and acquire new resources in a complementary way compared to mature companies. Therefore, companies can gain competitive advantage partnering with startups and acquiring these capabilities. Teece [1] disaggregates capabilities into three components:

1) Sensing. Capability of identifying and shaping opportunities.
2) Seizing. Capability of addressing new opportunities through new products or processes.
3) Managing Threats and Reconfiguration. Capability to reconfigure the company reacting to external stimuli.

Startups have diverse dynamic capabilities, mainly in the sensing and seizing forms.

5.3. Enterprise Architecture

We use enterprise architecture and the The Open Group Architecture Framework Architecture Development Method (TOGAF ADM) to relate the company's goals with the resources accessed through collaboration programs. Enterprise architecture is a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organizational structure, business processes, information systems and infrastructure [22]. To model the enterprise architecture, we use the Archimate 3.0 notation [23], mainly the motivation and strategy extension and the business layer. To develop the architecture, we use the steps Preliminary, Architecture Vision and Business Architecture of the TOGAF ADM [24].

6. SOLUTION PROPOSAL

Based on the research problem, our proposal has three objectives (Table 1), addressed through three artefacts.

Table 1. Solution objectives.

Solution objective	Objective's rationale	Question related
Build a value-adding model of programs	Theoretically supported model to assess the benefits of programs	How programs improve the performance of my company?
Define a comparison model between programs	Identify differences between programs, from new ventures' and companies' perspectives	What is the difference between programs?
Develop a method to select programs and align with strategic objectives	Following an enterprise architecture approach, relate programs with strategic objectives	Which is the optimal program for my specific need?

6.1. Value-Adding Model

We expand the value-adding model of Maula with dynamic capabilities. This model is essential to characterize programs.
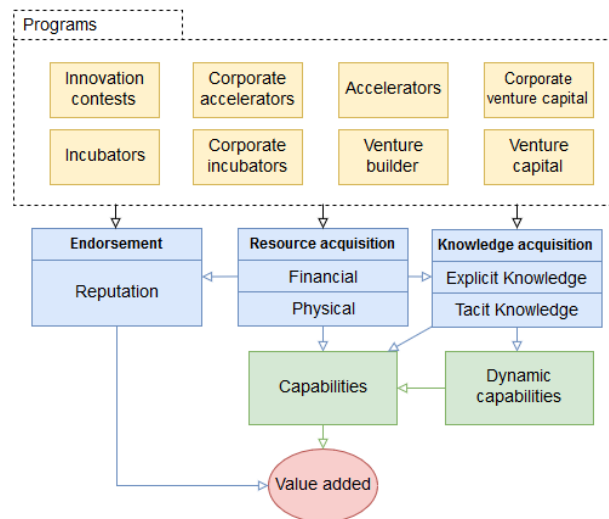

Figure 2. Extended value-adding model based on [16].

For each strategic objective achievable through collaboration programs, we define the necessary resources and (dynamic) capabilities. This model also supports the Program Typology stablishing which resources and capabilities are transferred from each program or venture stage.

6.2. Program Typology

The program typology characterizes collaboration programs in dimensions divided in three groups: objectives, design elements and resources and capabilities. It is based on the corporate accelerator typology of [25].

6.2.1. Objectives

Each program has a primary objective and additional objectives. The primary objectives are strategic, financial or a mix of both. Programs with pure financial objectives pursue financial gains, usually getting equity from the partner and adding value to the business. However, most corporate programs target, besides financial objectives, strategic objectives. Based on the literature, we identified the following objectives that are achievable through collaboration programs.

- Develop new technologic capability
- Identify and understand the needs of new markets
- Generate business ideas
- Test new business models
- Create demand for firm product
- Develop products on current platforms
- Exploit firm's technologies in non-core businesses

- Solve existing business problem

Each strategic objective requires a partnership with a startup in a defined quadrant of the familiarity matrix. We use the familiarity matrix [26] to characterize the program's objectives.

Besides these main objectives, firms can also achieve additional benefits through collaborations: foster innovation culture, attract talent, and improve innovative brand.

6.2.2. Design Elements

To reach desired objectives, the company should design the program. Several design dimensions are identified.

1) Locus of opportunity. Defines whether the innovation source is inside or outside the company.
2) Exploration x Exploitation. Defines if the company is exploiting existing capabilities or exploring new markets or solutions.
3) Industry relation. Defines the minimum relation of the partner firm with the company.
4) Degree of elaboration or Venture stage. This dimension defines the maturity of the partner firm.
5) Revenue model. Programs can generate revenue through diverse ways, such as equity, fees or % of earnings.
6) Duration. Defines the total time length of the program.
7) External partner. Some programs allow the participation of an external partner in the program operation.
8) Connection to parent. Due to legal or organizational constraints, some problems require an independent entity to run the program.
9) Leadership experience. The responsibility of the program managed can be dedicated to external or internal resources.
10) Involvement degree. Each program requires the transfer of specific resources to the partner firm. This dimension defines which are the key resources.

6.2.3. Table

Based on the literature regarding collaboration programs, we identified five models of collaboration programs, each materialized in different types, totalizing 22 types. The complete program typology is annexed in the Appendix A.

6.3. Selection Method

The selection method is based on enterprise architecture and follow the TOGAF ADM. It is divided in three phases, the motivation phase, the strategy phase and business phase.

1) Motivation phase. In this phase, the user should define the **strategic goals** of the collaboration, derive the **innovation outcomes**, define respective **requirements** and **constraints**. With these inputs, it is possible to model the **Goal Realization View**.
2) Strategy phase. Based on the innovation outcomes, the user should define necessary **course of actions** and identify the necessary **resources** and **capabilities** to perform those actions. These inputs form the **Strategy View.** Based on this view, the user should model the **Resource Map** of the firm, identifying the resources the company already possess to perform the actions. The missing resources should be transferred from partners.
3) Business phase. Using the model of the motivation, the user should identify **collaboration programs** that respect the requirements. After that, he should eliminate programs that do not respect the defined constraints. If more than one program respect all requirements and constraints, the user should consider executing all programs or select the most suitable one based on the resource transfer, costs or duration.
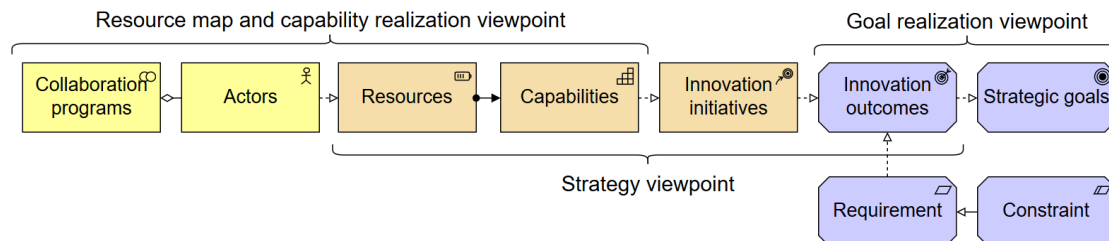

Figure 3. Selection method.

7. DEMONSTRATION

The artefacts were applied in a real-world company: LoriComm. This company provides Internet of Things (IoT) telecommunication infrastructure. It main goal with collaboration programs is to **Create Demand for Their**

Product. Based on their goal, we defined the **Foundation of New IoT Firms** as the desired innovation outcome. This objective is characterized as **Strategic,** positioned on the **New Business** quadrant in the familiarity matrix, and focusing **Startup or Growth Phase** ventures. The constraints are: the opportunity should be **External**, the minimum industry relation is that the partner company should be a potential **LoriComm Customer,** there should be **No Equity Involvement**, the maximum budget is **100kEUR**, and the partner should **Operate in Portugal.**
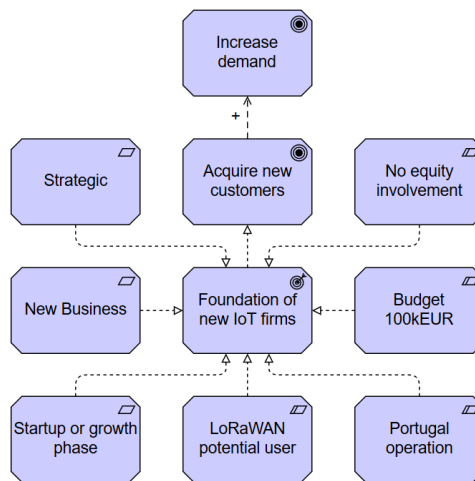

Figure 4. Goal Realization View of LoriComm.

In the strategy phase, we identified the following course of actions: **Spread LoRaWAN Technology, Generate New IoT Business Ideas, Test New Business Models**. Based on these actions, we modelled the strategy view. LoriComm possesses the resources in purple and misses the orange ones.
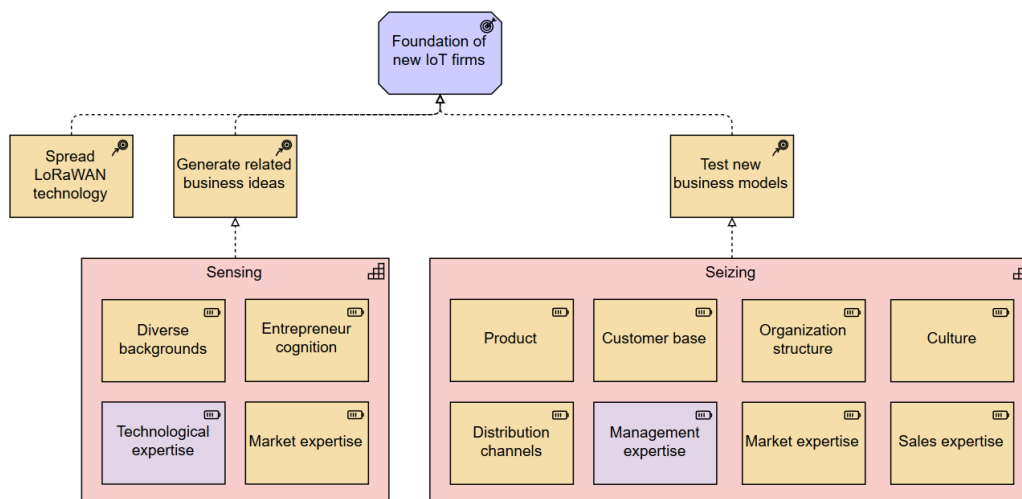

Figure 5. LoriComm Strategy View.

In the business phase, we identified the collaboration programs that respect all requirements. However, all programs missed at least one constraint. As the requirements were more flexible than the constraints, we changed the requirements and focused on the Generate Related Business Ideas action and identified the **Innovation Contests** as the most suitable program.

The demonstration showed that the method was easy and fast to apply. However, to select the most suitable program, we had to iterate the process and change the requirements in order to find at least one possible program, as all programs that met all requirements did not respect all contraints.
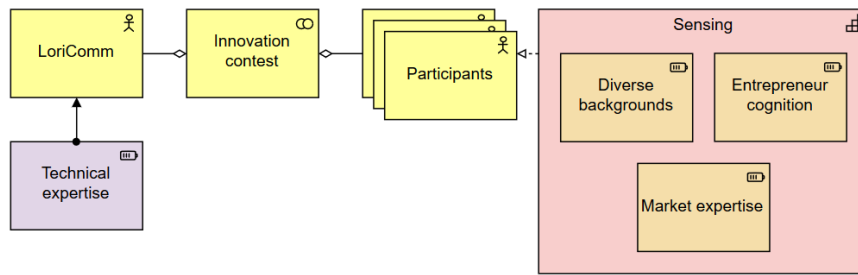
Figure 6. LoriComm Capability Realization View.

8. EVALUATION

The artefacts develop on this thesis bring the scientific knowledge to a problem that is commonly solved ad-hoc. Combining concepts of strategic management and enterprise architecture it provided a fast method to identify potential programs in a preliminary phase of analysis. The main advantages of this method is the speed, as the dense work of compiling the research on collaboration programs is previously done in the form of the typology. The extensive research also guarantees that the company evaluate all available programs before deciding which one is the best for their needs. The main downsides of the artefacts are regarding data gathering (we used only secondary data, what constraints the information about programs, such as costs, financial performance, number of partners per program) and the possibility of reaching a set of candidate programs (mainly due to missing quantitative metrics).

9. CONCLUSION

This research fills an important gap in the literature, comparing existing collaboration programs between stablished companies and new ventures. Based on strategic management concepts, we characterize collaboration programs and build a method supported by enterprise architecture to select the most appropriate one.

The artefacts were applied in a real company, showed all potential programs and selected the most suitable one based on the constraints. The method achieved great efficiency in a preliminary analysis.

Further research in this area comprehends studies on design of collaboration programs, aimed to support decision making in the implementation phase. Maintenance and expansion of the program typology with new data and dimensions. Addition of quantitative metrics in the selection method.

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Appendix A. Program Typology

	Program	Innovation Contests				Independent Accelerator
	Type	Hackathon	Market Explorer	Solution Seeker	Idea Generator	Venture Developer
Objective	Primary	Strategic	Strategic	Strategic	Strategic	Financial
	Familiarity Matrix	All	New Market	New Solution	New Business	-
	Description	Explore digital solutions to existing business problems or a specific technology potential	Identify and explore new markets for existing technologies and capabilities	Prospect solutions for identified business problems	Generate business ideas that complement or support current business strategy.	Invest in promising startups, make them more valuable, and earn a financial premium
	Degree of Elaboration / Venture stage after program	Idea or prototype	Idea or prototype	Prototype or full solution	Idea or prototype	Startup phase
Approach	Locus of opportunity	External and internal	Internal	External	External and internal	-
	Strategic logic	Exploration	Exploration	Exploration	Exploration	-
	Industry relation	Minimum relation	Minimum relation	Strong relation	No minimum relation	-
	Revenue model	No revenue	No revenue	No revenue	No revenue	Equity (5-12%), possible fee
	Degree of Elaboration / Venture stage before program	-	-	-	-	Idea or startup phase
Organization	Duration	12 hours ~ 3 days	1 ~ 12 months	1 ~ 12 months	1~12 months	2 ~ 12 Months
	External partner	Partly	No	No	Partly	-
	Connection to parent	Part of parent	Part of parent	Part of parent	Part of parent	-
	Leadership experience	Internal	Internal	Internal	Internal	Internal and external
	Involvement degree	Support to understand the problem, strategic guidance	High mentorship on existing technologies and capabilities	Support and tools to understand the problem	Business support, strategic guidance	Intense mentorship on entrepreneurship methods and business expertise, network development, strategic guidance
	Example	Startup Weekend	IBM Innovation Jam	Netflix Prize	Cisco I-Prize	Y Combinator

Corporate Accelerator				Independent Incubator		
Listening Post	**Value Chain Investor**	**Test Laboratory**	**Unicorn Hunter**	**Coworking**	**Science Park**	**University Incubator**
Strategic	Strategic	Strategic	Financial	Financial	Public	Financial or Public
All	New Solution	New Business	-	-	-	-
Understand recent trends and developments in a respective market and initiate relationships	Identify, develop, and integrate new products and services into parent company's value chain	Create a protected environment to test promising internal and external business ideas	Invest in promising startups, make them more valuable, and earn a financial premium	Provide infrastructure to new ventures and profit from fees	Foster local economy and/or scientific community through innovation	Commercialize university technology
Startup phase	Startup phase	Startup phase	Startup phase	Startup phase	Startup phase	Startup phase
External	External	Internal and external	External	-	-	-
Exploration	Exploration	Exploration	Exploitation	-	-	Exploitation
Medium relation	Strong relation	Minimum relation	No minimum relation	-	-	-
No revenue	Equity (5-12%)	Equity (5-12%)	Equity (5-12%), possible fee	Fee	Equity and/or fee. May have no revenues if public funded	Equity and/or fee. May have no revenues if public funded
Startup phase	Startup phase	Idea or startup phase	Startup phase	Startup phase	Startup phase	Startup phase
2 ~ 12 Months	2 ~ 12 Months	2 ~ 12 Months	2 ~ 12 Months	1 ~ 5 years	1 ~ 5 years	1 ~ 5 years
No	Partly	No	Partly	-	-	-
Part of parent	Part of parent	Separate legal entity	Separate legal entity	-	-	-
Internal and external	Internal and external	Internal	External	Internal and external	Internal and external	Internal and external
Intense mentorship on business and industry expertise, network development, strategic guidance	Intense mentorship on business and industry expertise, network development, strategic guidance	Intense mentorship on business expertise, minimum strategic guidance	Intense mentorship on entrepreneurship methods and business expertise, network development, strategic guidance	No involvement, shared infrastructure and resources between incubated ventures. Advisory paid on demand	Strategic and ad-hoc mentorship, network development, shared infrastructure and resources between incubated ventures	Strategic and ad-hoc mentorship, network development, shared infrastructure and resources between incubated ventures
Microsoft Ventures Accelerator	TechStarts METRO Accelerator	Allianz Digital Accelerator	Axel Springer Plug & Play	Betahaus	Taguspark	CIENTEC

Corporate Incubator			Venture Builder	
Fast-Profit	**Future Builder**	**Value Chain Improver**	**Independent Builder**	**Corporate Builder**
Financial	Strategic	Strategic	Financial	Strategic
New Market	New Business	New Solution	-	All
Spin-off non core technologies for profit	Evaluate the potential of related new markets, technologies and businesses	Incubate new businesses for potential incorporation	Build ventures in a repeatable process. Leveraging economies of scale and accumulating expertise	Build industry related ventures in a repeatable processes. Leveraging corporate resources and accumulating expertise
Startup phase	Startup phase	Startup phase	Growth phase	Growth phase
Internal	Internal and external	External	Internal and external	Internal and external
Exploitation and Exploration	Exploration	Exploration	Exploration and Exploitation	Exploration and Exploitation
No minimum relation	Minimum relation	Strong relation	No minimum relation	Strong relation
Equity	Equity	Equity	Equity (50%+)	Equity (50%+)
Idea or startup phase	Startup phase	Startup phase	Idea phase	Idea phase
1 ~ 5 years	1 ~ 5 years	1 ~ 5 years	Long-term	Long-term
No	No	No	-	No
Part of parent	Separate legal entity	Part of parent	-	Separate legal entity
Internal and external	Internal and external	Internal and external	Internal	Internal and external
Strategic and ad-hoc mentorship, network development, shared infrastructure and resources between incubated ventures	Minimum strategic influence, business expertise mentorship, network development, infrastructure and resources	Maximum strategic involvement, business expertise mentorship, network development, infrastructure and resources	Full control and support	Full control and support
Siemens Novel Businesses	Next47 (Siemens)	Siemens Technology to Business	Betaworks	Kamet (AXA)

Independent V. Capital	Corporate Venture Capital			
Venture Capitalist	Driving	Enabling	Emergent	Passive
Financial	Strategic	Strategic	Financial, may turn strategic	Financial
-	New Solution or Business	New Solution	New Market or Business	-
Invest in promising firms, make them more valuable, and earn a financial premium	Invest in related ventures to leverage industry specific assets, sustaining current strategy	Invest in complementary firms to develop an ecosystem	Leverage company technologies in non-core markets, making "real-options" investments	Invest in promising firms, make them more valuable, and earn a financial premium
Growth phase	Growth phase	Growth phase	Growth phase	Growth phase
-	External	External	External	External
-	Exploitation	Exploration	Exploration	-
-	Strong relation	Medium relation	Minimum relation	No minimum relation
Equity (10-20%)	Equity (10-20%)	Equity (10-20%)	Equity (10-20%)	Equity (10-20%)
Startup or growth phase	Startup or growth phase	Startup or growth phase	Startup or growth phase	Startup or growth phase
Long-term	Long-term	Long-term	Long-term	Long-term
-	No	No	No	No
-	Separate legal entity	Separate legal entity	Separate legal entity	Separate legal entity
	Internal	Internal	Internal and external	Internal and external
Board level advisory, network development	Industry and technology expertise, board level advisory, network development	Industry expertise, board level advisory, network development	Technology expertise, board level advisory, network development	Board level advisory, network development
Sequoia Capital	Microsoft Ventures	Intel Capital	Mitsui Global Investment	Google Ventures