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The Co-innovation Bingo: An Object-Oriented Networking Mechanism to Foster Coupled Open Business Innovation

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Abstract

Background: A firm's cooperative strategies are a fundamental issue in the search for business growth avenues, but a system that eases the emergence of coupled open innovation appears to be missing. **Objectives:** This paper describes a business networking tool to foster coupled open innovation emergence. **Methods/Approach:** We adopted a methodology based on design science comparable to grounded theory because solutions emerged by testing a design artefact with companies. **Results:** We designed and tested an artefact designed as a game to encourage participants to meet as many partners as possible. It is based on collaborative innovation mechanisms and gets inspiration from fields such as organization design, service design, and prospective design. The proposed artefact comes as prescriptive rules that support managers' open innovation opportunity elicitation. **Conclusions:** From a practical point of view, we contribute by helping companies find emergent open innovation opportunities. From a theoretical point of view, this artefact is part of an emergent theory of object-oriented coupled open innovation mechanisms.

Keywords: collaborative innovation; coupled open innovation; innovation mechanisms; design science; gamification
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Introduction

Due to the complexity of products, services, and ultimately of customers' needs, thinking about a firm's cooperative strategies is a fundamental issue in the search for business growth avenues. Indeed, the World Economic Forum stated that collaborative innovation between companies "can [...] foster new growth through new products and non-market considerations that enable the evolution of entire systems" (World Economic Forum, 2015). Therefore, we define inter-firms' collaborative innovation as 'ad hoc innovation,' involving changes in competencies, technologies, and interactive construction of new outcomes (Castaldi et al., 2010; Gallouj, F. and Weinstein, O., 1997).

Nature of the problem: Innovation's capacity in SMEs

Entrepreneurs seek partners to carry out innovations and develop markets. The relationships sought are of different types: entrepreneurs sometimes seek short-term relationships (swinger) and sometimes long-term relationships (keeper). Entrepreneurs can find themselves in these identical processes with different objectives. In addition, their needs and capacities evolve. Hence, the diversity of professional and thematic networks, representative of a profession or aimed at commercial objectives, creates uncertainty for the entrepreneur who wishes to find an alliance partner to elicit or produce innovation.

According to M&BD Consulting (2016), 94% of SMEs surveyed see innovation as an essential factor in ensuring the sustainability of their business, and 56% use creativity methods. However, 78% have neither a formal idea generation process nor a formal idea evaluation process, and 50% of the respondents practice occasional innovation. It is also interesting to note that more than 50% of companies practice open or collaborative innovation through customers, suppliers, or clusters. The authors conclude that "efforts to improve the innovation process must be oriented towards creativity through the involvement of employees and the provision of tools" aimed at 1) raising awareness among leaders and managers on the need to involve all employees in the innovation process and 2) provide leaders and managers with tools that allow them to generate ideas from which future innovations will flow.

New types of innovation artefacts are needed by the organizations

According to Rothwell (1994), the current generation of innovation responds to a significant change in the market, such as economic growth, industrial expansion, intensification of the competition, resource constraints, etc. This fifth generation of innovation is based on the networking model, allowing flexibility, customized activities, and constant and rapid innovation. Indeed, accession to resources to innovate is strongly limited regarding the high cost or the high specialty that specific resources require. This situation improves the need and the use of networking and partnering. For example, access to a large and safe online storage space or computing power can be expensive to develop in-house. Companies that are not specialized in those activities will be well advised to externalize those activities.

This new generation of innovation is completed by practices of companies capturing ideas in several processes of open innovation (Chesbrough, 2003), such as outside-in, inside-out, or coupled innovation (Gassmann & Enkel, 2004). Moreover, forms of open innovation could be defined as open ecosystems, open innovation through acquisitions, open patent systems, or open-sourcing (Bogers et al., 2019). Among those best examples,

most innovations are based on dynamic capacities such as sensing, seizing, and transforming innovation opportunities (*ibid*). Companies must develop internal conditions to identify and capture value from open innovation (Vanhaverbeke and Roijakkers, 2015).

The innovation support in Switzerland does not focus on inter-firms cooperation

According to our previous survey of 500 entrepreneurs in French-speaking Switzerland, entrepreneurs are looking for solutions to support creativity and the development of non-technological innovation, particularly in the service sector. The business services of the Regional Innovation Systems (RIS) in Switzerland mainly offer help to create a business plan, training, legal and accounting services, market studies, help with exporting or finding foreign partners, help in e-business and information and communication technologies, advice on the development of new products and services, help in finding financing from banks, help in raising funds from business angels and venture capitalists, recruitment and human resources consulting, networking of entrepreneurs or mentors [unpublished data]. Some initiatives encouraging creativity are emerging, such as hackathons (Flores et al., 2019) and other intergenerational creative events [unpublished data]. But a lack of understanding of the factors of choice and the decision conditions of the actors remains.

Our analysis of the 3 biggest innovation support organizations in the French-speaking part of Switzerland shows that very few services toward cooperative strategies are proposed so far.

On the one hand, the partners' research services are based on the work of the coaches able to advise entrepreneurs in choosing a cooperative organization. On the other hand, previous research [unpublished data] showed that participation in hackathons or "ideathons" does not guarantee to find a cooperation partner.

The business network services need a framework to support their inter-firms 'cooperation strategies

Nevertheless, Zeng et al. (2010) find significant positive relationships between inter-firm cooperation, cooperation with intermediary institutions, cooperation with research organizations, and innovation performance of SMEs, of which inter-firm cooperation has the most significant positive impact on the innovation performance of SMEs.

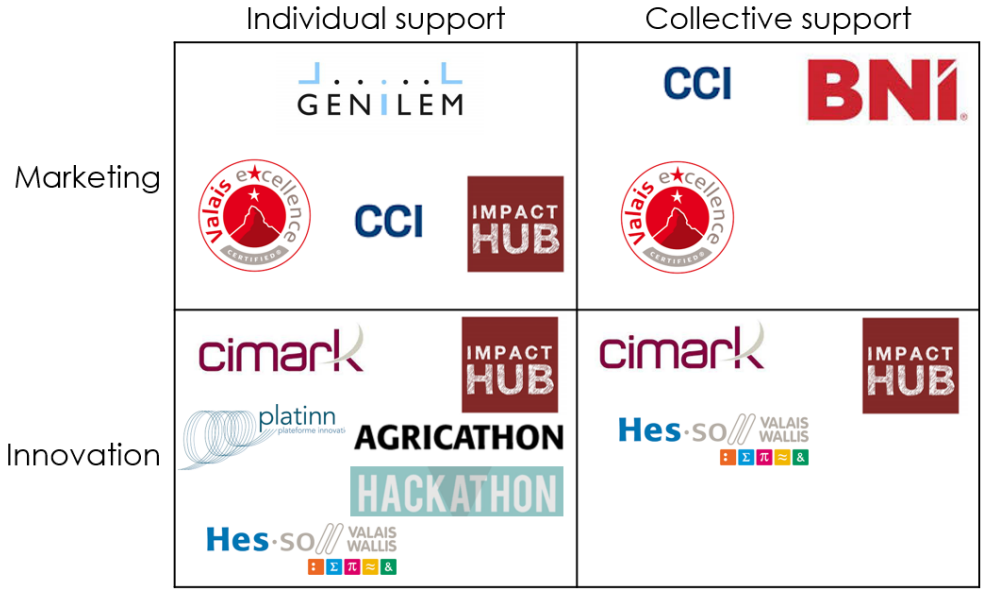
The Business Network International (BNI) states that in Switzerland, it generates 327 million CHF in one year across 2'645 members and 84 Swiss chapters, thanks to the weekly networking events (BNI, 2020). This characterizes the aim of the classical business clubs, as known as bringing together people with the same interests to share experiences and ideas and create new commercial relations. To our knowledge, rare are traditional business clubs providing innovation actively.

Recently, the international network of Impact Hubs has fostered a global community devoted to promoting entrepreneurship as a driver for positive change (Impact Hub, 2020). With 16'500 members in more than 55 countries, the network aims to "gain access and insight into social innovation by co-creating locally rooted, globally connected programs and events". The impact ambition target goes from corporate innovation to ecosystem development (Impact Hub, 2019). The Impact Hubs organize recurrent

resource resource-sharing among their members, which promotes the emergence of innovation.

Figure 1 classifies the main offers of the innovation support organizations in Switzerland. Classification has been made on criteria of several cross-or support (organization/individual or collective support) and the purpose of the support (marketing or innovation). The detailed data are presented in Appendix.

Figure 1
Classification of Swiss innovation support organization



Source: Authors' contribution

The need for prescriptive rules and solution-oriented knowledge

The need for identifying action mechanisms and the consideration of contingency factors is unveiled by literature, especially in the fields of open innovation, such as outside-in innovation, and of coupled open innovation, as open innovation with complementary partners (Gassmann & Enkel, 2004; Bogers et al., 2019, Vanhaverbeke, W. & Roijakkers, N., 2015). Moreover, the literature shows a need for prescriptive rules and recommendations for action (Van Aken, 2005; Gregor & Jones, 2007; Chauvet & Chollet, 2010) at the formation phase of the alliance and specifically regarding the identification of the stage of the emergence of the collaborative innovation opportunity. Several researchers propose a theoretical model to support the coupled open innovation elicitation (Grèzes et al. 2020).

The use of gamification as a lever for action

According to Deterning (2011a; 2011b), "gamification" is the "use of game design elements in non-game contexts". This definition refers to a game where the user is oriented towards achieving predefined objectives. The game elements refer to a solution integrating principles specific to the game sphere without becoming a game on its own. Its purpose is to influence the behavior of the players. Game elements are divided into game mechanisms and game dynamics. For example, game mechanisms are points, challenges, levels, rankings, gifts, virtual goods and spaces, and charity; game dynamics

are rewards, status, achievements, competition, self-expression, altruism. Finally, gamification is used in non-game contexts, such as business contexts.

Gamification aims at generating business results by playing on user engagement and participation. It can potentially lead to any form of participation, such as watching videos, listening to audio files, looking at photos, reading an article, filling out a form, posting on forums, visiting websites, taking quizzes, sharing personal information, evaluating products, creating content, participating in discussions, voting on content, etc.

The drivers of gamification are based on the generic motivational levers from psychology: reward, status, self-fulfillment, self-expression, competition, and altruism. To compare the main mechanisms of gamification with the motivational levers, BunchBall (2010) produced the following matrix illustrating the ability of gamification to play on all the human motivational levers (see Table 1 below).

Table 1

Basic interactions of human desires and game elements

	Human desires					
Game mechanics	Reward	Status	Achievement	Self-expression	Competition	Altruism
Points	●	○	○		○	○
Levels		●	○		○	
Challenges	○	○	●	○	○	○
Virtual goods	○	○	○	●	○	
Ranking		○	○		●	○
Gifts and charity		○	○		○	●

NB: Black dots represent primary desires satisfied by a particular game mechanism; White dots represent other affected areas.

Source: BunchBall (2010)

Research gap

Plenty of solutions exists to create commercial relationships and find a partner, such as business clubs, commercial chambers, dedicated hubs, or events aiming to share knowledge such as conferences, research institutes, or business school events, or events aiming to unveil innovation opportunities such as Hackathons. Nonetheless, a system that combines these features toward the emergence of innovation appears to be missing. Hence our research question is: **How to foster the emergence of inter-firms' coupled open innovation?**

The rest of the paper proceeds as follows. We first present the methodology and artefact we used, then present the results of the quasi-experimentation before discussing the findings and conclusions.

Methodology

We built a prototype (Co-innovation Bingo) based on constructs from a literature review on coupled open innovation mechanisms. We adopted a methodology based on design science (Gregor, 2007) and comparable to grounded theory because solutions emerged by testing a design artefact with companies.

Components of our design theory

According to Gregor (2007), to provide explanations and predictions and be testable, a design theory must rely on eight components. The six core components are: the purpose and scope, the constructs, the principle of form and function, the artifact mutability, and the testable propositions; the two additional components are: the principles of implementation and the expository instantiation. We build on Grèzes et al. (2020) to use their constructs and establish the logic of our pragmatic inter-firm interaction artefact. Table 2 below shows the anatomy of our design theory.

Table 2
Anatomy of the "Co-Innovation Bingo" Artefact

Purpose and scope	Foster discovery of innovation opportunities and the emergence of alliances between professionals
Constructs	a) Joint/Shared Vision b) Joint/Shared Resources c) Joint/Shared Market
Principle of form and function	a) Vision of the project leader b) Underused resources owned by one participant c) Noncompetitive markets that are accessible by one participant
Artifact mutability	a) Project description b) Playing card c) Limited tokens
Testable propositions	a) The project description supports linking professionals (P01) b) Playing card supports stages of completion (P02) c) Tokens materialize exchanges (P03)
Justificatory knowledge	a) Vision for sustainable partnerships (Nidumolu et al. 2014) b) Dynamic capabilities for alliances (Das 2000) c) Service dominant logic for innovation (Vargo et al. 2008)
Principles of implementation	a) Personal gamecard material with limited resources b) Human game orchestration during the event c) Sharing contact details & analyzing results with network analysis
Expository instantiation	Professionals networking events

Source: Author's contribution

Elements of motivation: the gamification

To generate participation, game mechanisms were used, such as a playing card and tokens, time constraints, limited resources, to support game dynamics such as competition, egoism, altruism, rewards (Groh 2012; Bunchball 2010).

Participation conditions (artefact conditions)

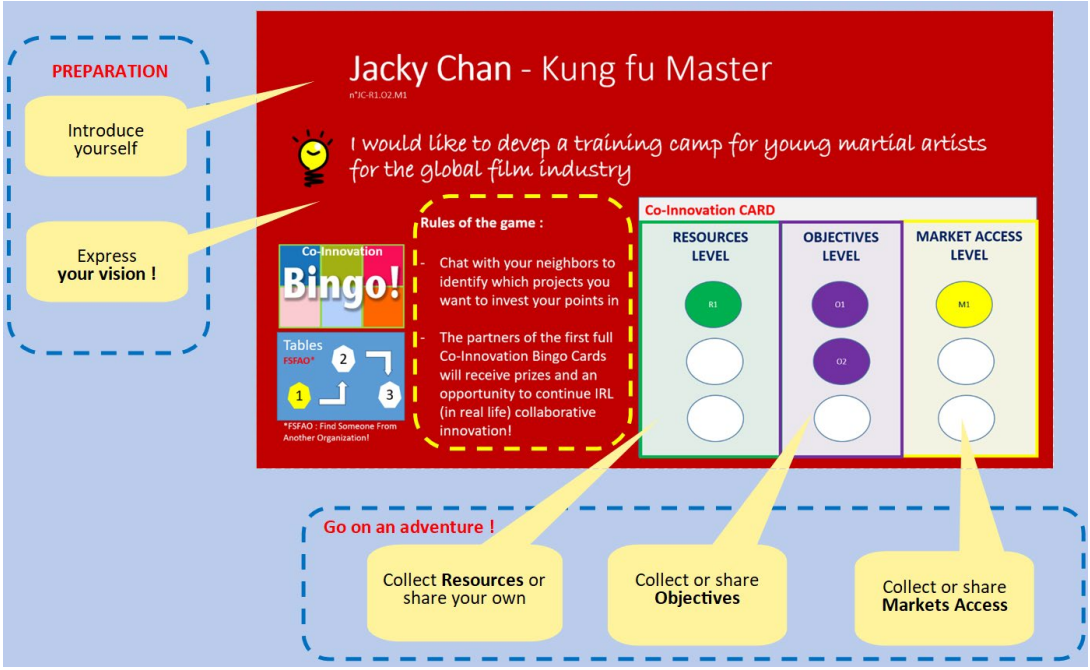
Before the event, participants are invited to describe their vision and starting resources with a preliminary questionnaire (name, activity) to receive their game card and the game points. An alternative to entering the game is to describe a project on a new game card and take a series of game points at the event's entry.

Game Rules (interaction conditions)

Participants are invited to discuss with their neighbors to identify which project they could invest points. They can invest game points in the projects they want and get points regarding resources, markets, and vision to create a consortium. The goal is to totalize 9

points: 3 resources, 3 market accesses, and 3 visions. The low number of points assures simplicity and quick wins. Figure 2 below shows the Bingo cardboard.

Figure 2
Co-Innovation bingo Cardboard



Source: Author's contribution

Artefact description and testable propositions

Accordingly, we state the following testable propositions and settle the circumstance of a quasi-experiment. The Co-Innovation Bingo:

- P1: allows extracting new ideas from a set of existing insights in less than 60 minutes
- P2: has a setup time of fewer than 5 minutes and an overall cost of fewer than 5 euros/ participant
- P3: allows visualizing how participants interacted using a dynamic network of ideas

Description of the quasi-experiment: TEDx Martigny 2019

The quasi-experiment allows settling an interventional study to evaluate the causal impact of an intervention on a population without random assignment (Gribbons et al., 1997). We tested our artefact during the TEDx conference in Martigny in 2019. The general conference topic was "Together", and the attendance reached around 250 participants, including volunteers.

The event was short, and the cadence of the game was handled as follows:

- online preregistration for the game is possible during conference registration
- 90 minutes of pre-conference available to record spontaneous registrations and distribute play materials
- 45 minutes of mid-conference for networking session (active play)

- 105 minutes of post-conference time for the networking session (active play), participant interviews, and collection of game cards.

Results

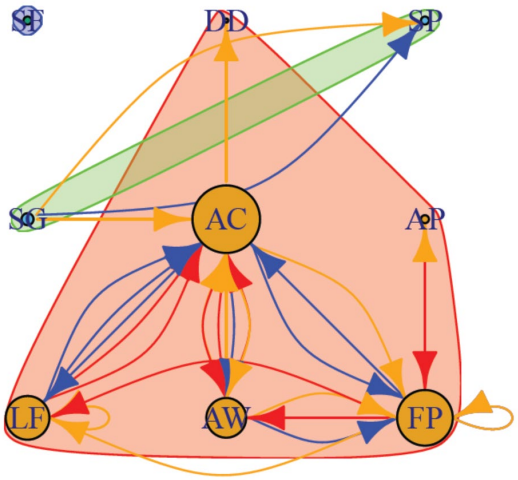
In the remainder of this section, we present first the quantitative results, followed by the qualitative results, and a summary of the quasi-experiment results.

Quantitative results

In this section, we present the quantitative results regarding participation, the mechanisms and dynamism of gamification, the interaction results, and the nature of the exchanges.

- **Participation:** Among twenty-one registrations, fourteen registrations were spontaneous during the on-site check-in, and seven were online preregistrations. Among those twenty-one registrations, eight persons were active players.
- **Results in terms of mechanisms and dynamics:** The experiment allowed thirty formal exchanges. Among nine returned playing cards, seven playing cards had interactions, and one playing card was complete (the winner).
- **Interaction results:** The thirty total interactions were accounted on eight playing cards, representative of eight unique receivers and seven single transmitters. Only one game card returned empty. Figure 3 below illustrates the interactions' network.
- **Nature of the exchanges:** Among the total interactions, we enumerate thirteen resource exchanges, nine objectives exchanges, eight market exchanges, and five self-sharing elements.

Figure 3
Participants' interactions' Networks



Note: Type of relation: Red arrow = Market sharing; Orange arrow = Resource sharing; Blue arrow = Vision sharing; Colored surface = Clusters
Source: Author's illustration with RStudio (libraries: iGraph, rMarkDown)

Qualitative results

In this section, we present the synthesis of the interviews of the participants during the experimentation regarding good points and areas of improvement.

General comments

- "It's a great concept!"
- "Who's in the red card club?"
- "I'll get rid of my stickers!"
- "It's hard to find the contestants in this crowd!"
- "That's great; it works!"

Good points

- "Easy to understand."
- "It's a good opportunity to meet people."
- "It helps you learn things, meet people."
- "It makes you think about what you can share."
- "It's also useful to meet people who didn't have boxes."

Areas of improvement expressed by players (individual quotes)

- "The explanations on the cardboard are not enough."
- "A session to present everyone's visions would be a plus."
- "Cardboards are not visible enough."
- "Not useful if you know people or are introduced to certain people."
- "Depends on people's natural ability to reach out to others."

Quasi-experiment results

Every testable proposition was validated: The project description supported linking professionals (P01), playing card supported stages of completion (P02), tokens helped to materialize exchanges (P03). Moreover, the artefact allows extracting new ideas from a set of existing insights in less than 60 minutes (P1). The artefact had a setup time of fewer than 5 minutes and an overall cost of fewer than 5 euros/ participant (P2). The artefact visualizes how participants interacted using a dynamic network of ideas (P3; see Figure 3).

Discussion

According to Davis (1971), "all interesting theories, at least all interesting social theories, then, constitute an attack on the taken-for-granted world of their audience". Consequently, this section is split into two statements regarding what we consider interesting: the impact of organization and composition and the impact of co-relation and context.

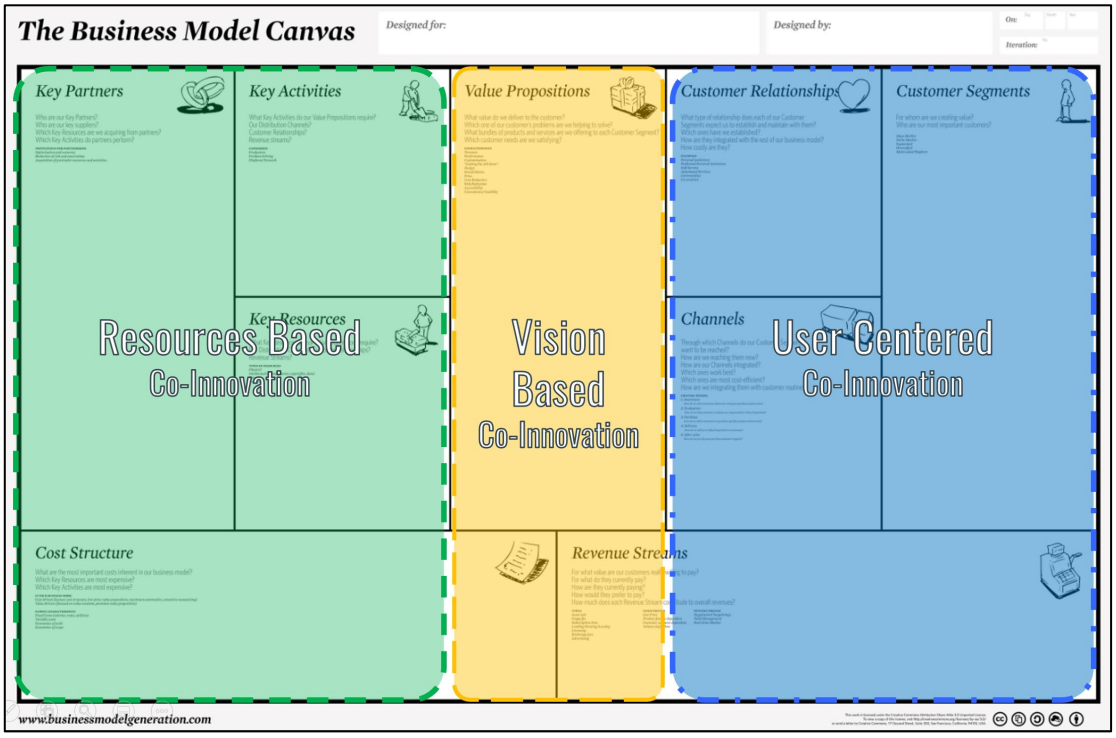
Organization and composition toward simplification

The organization of the artefact seems to be structured and simple, but its simplification allows the unstructured emergence of partnership opportunities. Indeed, the frontier objects of collaborative innovation are reduced to three elements (resources, vision,

markets) proposed by Grèzes et al. (2020) are useful to simplify the emergence of pertinent shared objects and coupled open innovation opportunities.

Moreover, the simple composition can be compared to the aggregation of heterogeneous elements of the business model canvas (Osterwalder et al., 2010). Indeed, the three doors belong to a single business model as "meta-building blocks", allowing potential future partners to discuss the other blocs of the business model. Each construct of the three doors (Joint/Shared Vision, Joint/Shared Resources, Joint/Shared Market) represents a "meta-block" of the business model as a possible source of co-innovation/coupled open innovation (see Figure 4). One technique mutualises costs, one technique increases turnover with a combined offer, and one technique engages partners in a joint process of redefining strategic positioning.

Figure 4
The three doors as "meta-building blocks" of a generic business model

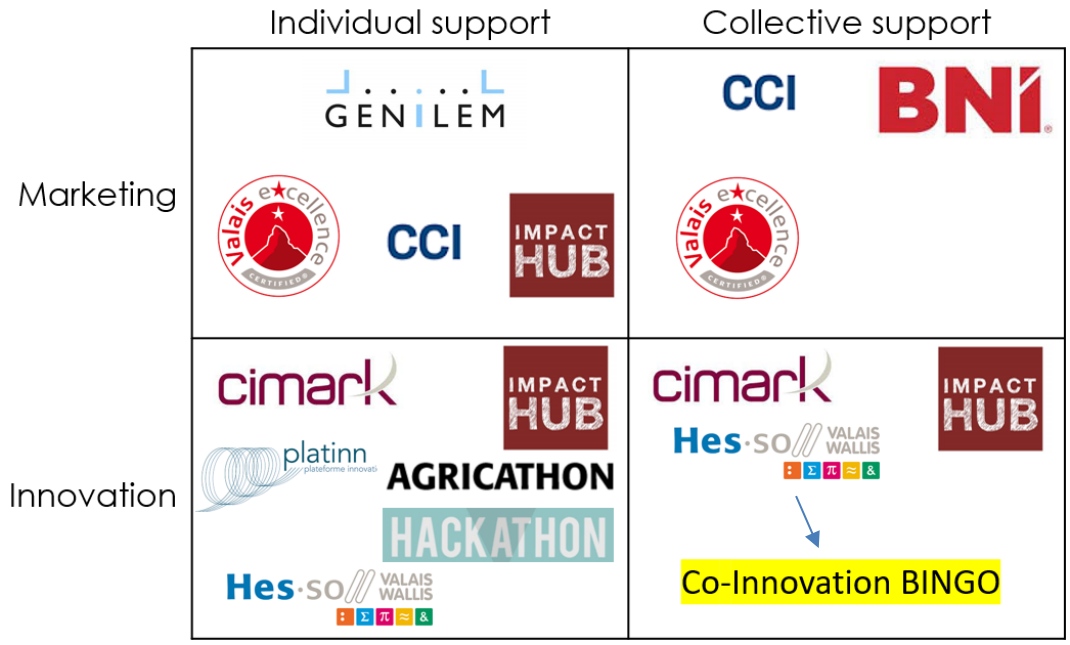


Note: Each construct of the three doors (Joint/Shared Vision, Joint/Shared Resources, Joint/Shared Market) represents a "meta-block" of the business model as a possible source of co-innovation/coupled open innovation
Source: The authors adapted from Osterwalder and Pigneur (2010)

Moreover, not every gamification mechanics was used, and participants were excited to engage in new relationships. Limited time reinforced this effect. The artefact takes advantage of points (tokens), challenges (to complete the gamecard), virtual goods (resources, markets, and vision), and gifts (opportunity to exchange resources, markets, and vision). Those elements had a positive impact on the networking activities. Our solution is innovative in offering an object-oriented networking mechanism to innovation support organizations (see Figure 5 below).

As the current generation of innovators responds to a significant change in their economic environment (Rothwell, 1994), simple tools that quickly foster networking innovation opportunities can reach strategic importance in a regional or national competitive scope. Therefore, this kind of quick and gamified artefact is especially suitable for the current profile of innovators.

Figure 5
Classification of Swiss innovation support organization and positioning of our solution



Source: Authors' contribution

Co-relation & contextuality foster the emergence of innovation

The building blocks and the interactions with unknown people are interdependent to foster the emergence of relations. Projects are changing according to emergent relations and propositions.

Only when you read about the projects that you know if you have something to share; you cannot do it in advance, according to the emergence theory (Clayton et al. 2006). The Co-innovation Bingo can lead to several types of emergencies: the synchronic emergence because the appearance of the property occurs at different, undefined times; the weak emergence in case of a simple sharing of resources or market access; the strong emergence when creating new objectives and redefining the needs for resources and access to markets.

Conclusion

The Co-innovation Bingo allowed participants to share information and create alliances in a limited time and space and for a very low cost. This artefact is useable during the break between two conference sessions. People can identify valuable assets only once they reach enough information about the contact person's project.

The artefact allows researchers to trace the circulation of the tokens through the participants and rank the players.

The game allows gathering a database of projects, specific resource holders, and specific market access holders. To improve the usability of the database, Participants could/should clarify the nature of the resources and markets they share. Then, with more data in the database, it will be possible to print personal profiles and connect people based on current and previous data. Moreover, as the sessions progress, a network modelling tool could report emerging relationships. The effects over time regarding the perennity of the consortium remain to be observed. Unfortunately, we could not evaluate the effectiveness of the partnerships after the experiment, and these effects will have to be tested on another sample.

We have already applied the model internally within an organization. We plan to continue the quasi-experiments internally and externally and continue the analysis of the link between this model and the business model and the value chain. Other applications are being tested, such as internally within an organization.

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Appendix

Table A1

Services' comparison of the Swiss innovation support organisations

Cimark	Platinn	Genilem
http://www.cimark.ch/	https://platinn.ch/	https://genilem.ch/
Innovation in your SME	**Business**	**Diagnosis**
Development of new products/offers	Increased sales	Innovative elements of your project
Diversification and extension of market	Diversification of supply	Idea potential to business
Business processes/organization	Strengthening customer relationships	
Adapting the strategy	Project validation and implementation	
	Evolution of the strategy	
Start-up	**Organisation**	**Accompanying**
Professional coaching	Increasing productivity	Coach in business development
Support for funding	Control of flows and processes	Leadership, strategy, positioning and sales
Help to create business plans	Optimal use of resources	Building and expanding your network
Providing space	Adequacy to the strategy	Strategic thinking, mentoring sessions
Access to networks of specialists	Cost optimization	
Networking	**Cooperation**	
Support for potential customers	Potential analysis	
Networking (BtoB or BtoC)	Partnership creation	
Accompaniment at trade fairs	Access to public funds	
Search for academic partners	Setting up of cooperation projects	
	Negotiation of cooperation contracts	
Management	**Finance**	
Program management	Financing strategy and due diligence	
Tender management	Network of investors and funding sources	
Cluster animation	Investor relations	
Technology valuation	Negotiation and fundraising	
Intellectual property, patent management		
Technology transfer agreements		
Market rating		
Technical feasibility		
Events		**Formation**
Thematic information sessions		Information sessions
Hackathons, ideathons		Intensive courses
Workshops		Workshops

Source: Author's comparison

Table A2
Comparison of different knowledge sharing and networking artefact

	Commercial relationship	*Partnerships to discover/enter markets*	*Innovation results sharing*	*Knowledge sharing*
Business Clubs *(BNI, AEVEX)*	*Yes*	*Yes*		
Innovation Conferences *(TEDx, Jiyu)*			*Yes*	*Yes*
Commercial Chambers events *(Petits déjeuners)*	*Yes*	*Yes*		
Research institute events *(Entremets)*			*Yes*	*Yes*
Business School events *(Hackathon)*				*Yes*
Professional Associations events				
Impact hubs events *(Resources sharing events)*	*Yes*	*Yes*		*Yes*

Source: Author's contribution

Table A2 (continued)
Comparison of different knowledge sharing and networking artefact

	Problem-solving Features	*Innovation alliance development*	*Innovation opportunity discovery*
Business Clubs *(BNI, AEVEX)*	*Yes*		
Innovation Conferences *(TEDx, Jiyu)*		*Yes*	
Commercial Chambers events *(Petits déjeuners)*			
Research institute events *(Entremets)*			
Business School events *(Hackathon)*	*Yes*		*Yes*
Professional Associations events			
Impact hubs events *(Resources sharing events)*		*Yes*	

Source: Author's contribution

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