The network co-creation journey over time and space. The experience of a lighting designer

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ABSTRACT

This paper deals with the evolution of the co-creation journey of a customized technology with the presence of different types of collaboration: more particularly, we want to shed more light on what are the consequences and implications for the collaboration and the co-creation process of such technology when it stretches along different business networks in time and space.

We analyze the case study of a new product which has been developed by a number of different actors and in different forms over time. The process from the discussion of the initial idea up to the first sale of the technology took almost three years. The new product called Porotex represents a new type of lamp initially developed by two companies, namely Antrox – a small lighting designer – and NelDesign – a micro company which develops and produces small custom-made furniture. The basic product evolved through phases as it took shape in interaction via its developers and other actors' engagement work: the 'last' phase concerning the installation of the technology has never been done before. The initial phase was faced by the two aforementioned companies, whilst the next development up to the installation and commercialization of the technology occurred in different settings and involved other parties. The entire process has been affected by different local networks which put heterogeneous actors in contact with each other.

Our research questions are formulated as follows: (1) How does the co-creation process unfold across different business networks? (2) What are the collaborative processes which may affect the co-creation journey from an interactive perspective? (What are the overall effects of the co-creation journey on the different forms of collaboration?)

Methodologically we applied a single case study strategy: data has been collected in two different ways. In addition to semi-structured interviews, the authors obtained access to all e-mails exchanged between the actors involved in the process. Combining interview data with e-mails facilitated a more fine-grained understanding of the research question than would using interviews solely.

The paper's main contribution is expected to deal with the understanding of how the co-

creation process takes shape by crossing different business networks which have an impact on the collaboration.

Introduction

Innovation and technology development have long been core research themes of the IMP approach (Håkansson 1987, 1990; Håkansson & Waluszewski, 2007; Laage-Hellman, 1997). The contribution of this work was and is to show how new services and products are developed in interaction between firms and between a network of firms. Interaction in new product development can take many forms such as supplier network and buyer network coordination of innovation in complex systems, such as drug delivery an auto parts. In the

IMP model, actor roles and development tasks happen across a network and in interaction and may be heavily controlled by few dominant actors or be dispersed across a broader network. This focus adds another layer of understanding to how innovation develops between firms in particular contexts such as with government policy, culture, local concentrations of like firms, socio-technical endowments of resources such as skilled labour, university research, traditions of entrepreneurship. Taking a network perspective provided the base for us to address our research question – how a network of small firm actors co-created a new product realised and further co-created across a network.

Co-creation of new products and services is subject to a diverse theoretical and practice examination in empirical studies (Payne, Storbacka & Frow, 2008; Frow, Nenonen, Payne & Storbacka, 2015) and, in this paper, we limit our scope to business-to-business actors and the notion of co-creation happening in interaction and placing the value potential of co-creation between the actors in a network. This means that the activities and resources used are co-created by the actors in the network and that the value exploited is available to the network (Aarikka-Stenroos & Jaakkola, 2012; Cova & Salle, 2008).

Innovation is central to all organisations' survival and growth, so the exploration of new ideas and exploiting some of them are central research questions in all innovation academic literature. Taking an IMP lens, a changing context and relationship amongst the actors take a prominent role. Studies on the co-creation of new product in the IMP tradition, whilst not large in number, have addressed many themes including the resource contribution of actors to the co-creation process (Håkansson et al, 1987), how ideas have emerged between the actors (Håkansson & Waluszewski, 2007) , network level studies on the first customer (Waluszewski, 2004), relationships to university incubators (Walter, Auer & Ritter, 2006), motivations to engage in co-creation including long term value and value in use (Aarikka-Stenroos & Jaakkola 2012; Möller, 2006).

Our study adds to this literature in two ways: first it focuses on the evolution of the co-creation process which we view as a complex and time-consuming journey, similarly to the "innovation journey" (Dooley &Van de Ven, 1999), and outlines this journey in time and space; and second it provides an in-depth analysis of a very particular context, namely small firms whose customised product technology is realised in a professional network, that is custom-made lighting design realised in a final building project by architects, contractors, and clients.

The IMP literature has focused (La Rocca & Snehota, 2014; McGrath, Medlin & O'Toole, 2017) on the nature of involvement of the small industrial firm as an innovation actor. Small firms may have a more limited network context and available resources but some can be very significant actors in global networks due to their unique technology or other specialised resources/knowledge. IMP studies have mainly focused on physical products co-created across a wide variety of industries. Our study contributes instead insights both on smaller firms and their co-creation efforts driven by being commissioned a part of a customized lighting project in a major building design. The co-creation journey begins in a more localised and highly specialised network which aims to create a technical, design and service

solution which has to be related to a separate contracting network. Taking the particular context of our research along with the focus on the unfolding of the evolution of the co-creation journey, our research questions are formulated as follows: (1) How does the co-creation process unfolds across different business networks? (2) What are the collaborative processes that may affect the co-creation journey from an interactive perspective? (3) What are the overall effects of the co-creation journey on the different forms of collaboration?

The paper's layout is as follows: we start with a literature review where we describe the potential evolution of a co-creation journey in time and space. We follow with our case study methodology and content analysis of emails between the major actors in the network. Preliminary findings are outlined following an abductive logic. Finally, these findings are discussed in the light of our emerging analytical frame and the next steps in the research project are presented.

Conceptualizing the co-creation journey. A synopsis

Co-created new product development takes place across organisational boundaries and, in this model, task and roles ascribed by traditional development modes such as commercialisation, and engineering, will still have to be performed by the actors involved in the network. In network co-creation, tasks and roles are more fluid and can move between partners in time and space across the network. Tasks such as technical design might be conducted concurrently with market testing in a network approach as the product evolves in interaction often being defined in this process. Relational contact norms have to be used in this process as it would be very difficult to specify every eventuality in an alliance agreement among partners at the outset. Using the extant literature to define phases in the development of co-created new products in advance of the study could only be done in outline as, in practice, we developed our contribution as a description of the co-creation journey by cycling back and forth between the data and the literature.

The initial phase of development is likely to be more intense in the network amongst the partners who are developing the idea for the market. Various constellations of resource combining are explored between the partners as they assess the combination of resources and activities that might work best in combination to improve their market position. The partners will have a rationale to cooperate but need to engage the market with the idea configurations and agree on how the combination will be marketed. By the end of this period, the partners are likely to have agreed on inputs and sharing of outcomes of the process. Deciding on the inputs and benefits in this initial phase, between the companies most directly involved in the network, is likely to be relatively simple given the size of the firms. Many buying decisions on bespoke lighting projects take time and new market entry may also take time so the expectation would be for the partners to give this phase enough lead time before its success or failure can be determined.

The second phase in the co-creation process is a reflection/assessment one to decide on whether more resources should be invested in the new product/market or another re-combination of the resources involved be considered. This re-combination period is one of reflection on success/failure and developing further the market or going back and re-

combining activities and resources in the project to further open the network to the new idea. This phase is less about actual development and more about market and network dialogue to assess the value of the new product in use and its potential for growth. At this stage the product will have had ample time to get reaction from the sales channels and network influencers critical to its success. Firms may use trusted actors in these networks to advise them on future prospects and on further investment.

The third period of co-creation development is a marketing and communication one which can be seen as one of adding the intangible service resources of the partners to communicate and market the final combination of ideas in association with their partners and into new networks and with and to existing and new personal contacts. The closer the new product is to an existing network the easier it will be to gain entry. Being in an outsider position would make it extremely difficult to become trusted. However, context also plays a role as regional infrastructure and reputation can have a halo effect on all firms in a particular area lifting the entry potential into a new market. Direct interaction with intermediaries in distribution and architects in this case is likely to be the best form of marketing. Getting the product listed in the distribution system and known is done on a personal basis although this must be complemented by traditional marketing communications collateral standard in this industry. The more difficult side of marketing will be becoming known and suggested by the design architects of new buildings as the companies involved directly in the co-creation will need to be specified as recommended partners. The latter will be necessary due to the price competitive nature of this industry.

The final stage of the co-creation process is the co-creation of the particular lighting installation in a new building and the delivery system around this. This activity structure will be new to the partners and has to be built for this first time. In replicated projects it is likely to be similar but never quite the same. Unique aspects of final use, delivery, logistics, engagement with the on-site contractors will be part of this final network which is layered onto the production and supply network of the lighting design co-creators. The construction project network has its own constraints and resource demands (Crespin-Mazet, Havenvid & Linné 2015) that the partners have to adapt to and invest in especially of their personal time and commitment as a failure would impact on their core network and reputation. This is also the phase at which monetary value is realised for the co-creation partners.

Note on methodology

The single case study strategy has been chosen by the Authors due to the explorative nature of this study. 8 face to face interviews have been conducted with both Antrox and NelDesign representatives. More than 600 e-mails exchanged between Antrox and NelDesign have been analyzed in order to develop a chronology of the key events of the technology development. In addition to the interviews, data was also collected in the form of internal reports and brochures.

The evolution of Antrox LAB

Companies' background and the first period: the birth of the Antrox LAB

Since 2008 Mr. Luca Giraldi - the owner of the compay Antrox[1] (an Italian SME which provides tailored LED and Cold Cathode lighting solutions for buildings) – and Mr. Sauro Raschiatore – the President of a micro company named NelDesign[2], which operates as producer of polystyrene carving for construction and design purposes – had been trying to collaborate for developing new architectural lighting solutions. The idea was to integrate Antrox lighting systems into the 'Porotex' material developed by NelDesign. Porotex is a type of coating material made out of polystyrene which is high-resistant, light and easy to customize.

Up to 2014, the two companies made several attempts together to verify whether the combination of Porotex and Antrox lamps would be possible. However, neither Antrox nor NelDesign decided to fully commit to this effort and therefore the project was mothballed. But from 2014 the two companies decided to make some small joint investments in order to develop a new product family named 'Antrox LAB'. Antrox LAB was conceived like a label to give an identity to the upcoming generation of new products – the LED installed and placed inside the Porotex material.

According to the two companies there were no similar products available on the market and the expected benefits would have been much greater than the proposed price.

Second period: developing Antrox LAB

The combination of LED lamps and Porotex is highly customized and more efficient than the standard and off-the-shelve solutions. But several issues occurred through the whole development process (Mengoni et al., 2017): for example, in order to let LED lamps fit with the polystyrene the average temperature of a LED should not reach more than 70C°. How to design and then cut the shape of the lamp represented another issue since polystyrene required a particular cutting process to be performed at a certain speed. It was mostly Mr. Giraldi and his team who steered the product development process, while NelDesign was more 'passive' due to the lack of knowledge of lighting systems and LED technology's potential applications.

After several months of trials, the product co-developed by Antrox and NelDesign resulted lighter in weight, but a major problem was that polystyrene was considered – according to several opinion leaders involved by Antrox, such as architects and lighting distributors – fragile and a low value material. To overcome the negative perception of their products, Antrox pushed NelDesign to work more on the coating process. The result was encouraging

[1] Antrox was established in 2000 in the city of Ancona, Italy. Antrox has historically worked with cold cathode technology, but about 5 years ago started to get into the LED business. The company's last turnover has been nearly 1M Euro in 2016 and it employs 6 people. The operations of Antrox consist of designing lighting systems, while it outsources the production to local suppliers. As for the commercialization activity, Antrox relies on distributors of lighting products, agents, contractors and only recently on designers and architects.

[2] NelDesign was born in 2010 in the Italian region of Abruzzo and is very close to Antrox headquarters. The company's revenues are less than 500.000 Euro, the customers are only from Italy and totally 3 people are employed. NelDesign is expert in virtual prototyping. The 3D digital models are usually realized together with the customers: once they are created they are sent to production to create tailored shapes. The whole process ends up with a coating to make the structure more robust.

from a technical point of view, but the issue was that the commercialization of this new product was far from satisfactory.

What went wrong with Antrox LAB was a major point to discuss as quickly as possible between Antrox and NelDesign. According to Mr. Giraldi the price level of the final version was perhaps too high and explains why the customers did not react positively. But when Mr. Giraldi investigated in more depth why Antrox LAB did not become a commercial success, he discovered important aspects. Mr. Giraldi asked feedback to about 10 actors – such as designers, architects and old customers – and realized that the issue was the coating. Combining LED lights with Porotex was not really appreciated since that combination did not look attractive from an aesthetic point of view. The product was considered unpolished and since the idea was to promote Antrox LAB towards very demanding architects, Antrox and NelDesign had to step back and think again how to recover from the 'coating issue'.

The two firms did not give up and they together developed a new and different version of the product. The first step was to search for new suppliers of different coatings and Mr. Giraldi found – after several weeks of work – a suitable new supplier 50 km away from Antrox's headquarters. The new development process took about 6 months. The new prototype named Deko could also have particular indoor or even outdoor applications since the lighting system composed by a LED source was integrated into a decorative panel. The first 'wall' containing LED lamps was born.

According to Mr. Giraldi; *'Through the collaboration with NelDesign we are now able to offer decorative lighting systems with styrofoam structure and LEDlights. In the market, there are no highly customizable lighting solutions in styrofoam and we know this solution might be attractive because it is cheap, easy to mount and with thousands of different applications'.*

From the initial idea to the realization of the first prototype of Deko the two companies invested about 40.000 euro –50% of the investment went on promotional activities, and the rest to contacting potential suppliers, devising and learning the processes from the design to the different production steps.

Third period: Giving space to Deko

When Antrox and NelDesign came up with the prototype they realized that they had created something rather special. Deko was shown to some local architects and small lighting distributors located nearby the headquarters of Antrox. It was nice, according to Mr. Giraldi, to have collected so much positive feedback about the technical as well as economic perspective. Deko was positively assessed and Antrox setup an email marketing campaign for informing prospects and established customers about the technical features of Deko and the possible applications. Among the positive feedback Antrox received one request from an old and very close customer, Studitalia Décor (Studitalia) which, despite the name, was operating in Dubai.

And in Spring 2015 Mr. Massimo Rinaldi – technical director and co-owner of Antrox – went to Dubai to introduce the product Deko to Studitalia. Studitalia owned by Mr. Massimo Bertelli had been working with Antrox since 2005.

In the beginning of 2015 Studitalia – which had established an office in Dubai in 2013 specialized in interior design for Hotels and other similar commercial buildings – was asked by one of its major customer to develop an architectural project for the realization of a new hotel in Dubai. While developing the project, Mr. Bertelli decided to include Deko among the specifications and, shortly after, begun to contact different contractors in Saudi Arabia with the customer.

One contractor was identified in the summer of 2015 and quickly the contractor initiated the search for sub-suppliers able to supply and produce the hotel's interiors. While the contractor could decide itself how to implement some activities, for the interiors it had to rely on others and therefore a public 'call for quotations' was launched. The offer presented by the company FourZone – an expert in creating hotel interiors for the Middle-East area –was accepted and they got the contract for constructing the interiors of the future hotel. Since Deko was specified in the project drawings made by Studitalia, in September 2015, Antrox was contacted by FourZone in order to provide technical information as well as the price levels of Deko. FourZone wanted also to know how long it would take Antrox to perform its activities and deliver Deko.

According to the hotel project, Antrox would have the task of designing and building an entire wall which would include Deko lamps.

Fourth period: implementing and selling Deko

'This is going to be a big challenge for us and for NelDesign' claimed Mr. Massimo Rinaldi once he came back to his office in Italy. The project of the new hotel in Dubai required Antrox to develop something never done before, 22 meters of 'Deko wall' and it had to be accomplished with a very short deadline. Moreover, the complexity was related to the fact that only a very small number of Deko walls had been commercialized by Antrox up to that point. But since this new project was worth 240.000 Euro, both Antrox and NelDesign decided to focus mainly on this work.

NelDesign and Antrox developed a prototype in Italy within 3 months and an external professional was involved to support the building phase. The creation of the prototype was an important step, Antrox and NelDesign could understand better how to put together the different components of the 'Deko wall' project and figured out what would be the best way of combining lamps with the wall.

Due to the large size of the wall, it was shipped to Dubai split over 6 containers and then the contractor was supposed to start with the installation. Unfortunately, the contractor had neither experience nor enough knowledge in how to handle Deko and 3 people from Antrox and NelDesign had to travel to Dubai and start the assembly on site. This implementation was jointly carried out by the contractor and Antrox – or it is more accurate to say that Antrox had

to teach the contractor how to install Deko by means of training sessions. Antrox had also to prepare manuals and several instructions to be delivered to the contractor.

The installation of Deko in the hotel was concluded in summer 2017.

Discussion and conclusions

We address now with the help of the Deko and Antrox LAB case the three research questions presented in our Introduction, concerning the unfolding of the co-creation process across different business networks and the mutual influence between the co-creation journey and the interactions and collaboration within these networks.

Our case shows that co-creation implies connecting at least two networks, one centered around the actors dealing with technical development and production (Antrox, NelDesign, as well as several local sub-suppliers and technical experts), and one centered around using and various kinds of customers (hotel owners as final users, but also intermediate users such as architect Studitalia, installer FourZone and also local distributors). The two networks are separate not only because they include different actors, but also because they rely on different economic logics, with the development and production network focusing on technical novelty and production efficiency and the using network focusing on aesthetics, durability, and cost of using or owning (cf. Håkansson & Waluszewski, 2007; Baraldi, Gregori & Perna, 2011). Moreover, the two networks can be separate also because they are located in different geographical and cultural contexts, like Italy and Dubai in our case.

However, despite the separation in terms of composition, logics and localities, it is during the value co-creation journey that the two above networks become more or less connected during the four periods that we highlighted in our theoretical framing. The connecting elements can be particular artefacts such as the product(s) being developed, individuals or other kinds of organizational intermediary (e.g., a distributor) acting as brokers, or a long-term business relationship bridging between the two networks, as the Antrox-Studitalia relationship in our case. However, not all elements perform equally well in connecting the two networks: for instance Antrox LAB was a product that, despite its novelty and technically superior features, did not appeal to the using network. And since there was no broker able to connect it to using networks interested in Antrox LAB's key feature of flexibility (and less concerned with aesthetics), the product had to be basically discarded.

As for our second and third research questions, the case shows how the inter-organizational interactions change along the four periods in the value co-creation journey that we identified in our theoretical framing:

-Initial period – exploration of new resource combination (2008-2014): This period had a very slow start and involved first at a talk and idea level (Håkansson & Waluszewski, 2002) Antrox and NelDesign, the two companies with established actor bonds (Håkansson & Snehota, 1995). But after this slow start and superficial interactions at actor level, in 2014 interactions became more intensive and embraced also the resource layer (Ibid), with the

creation of the new resource combinations (Håkansson & Waluszewski, 2002) behind Antrox LAB.

-Second period – assessment and re-combination of resources (late 2014-spring 2015): In late 2014 the product Antrox LAB started being questioned as sales did not gain momentum. Antrox' interaction with experts and potential users pointed out more or less unsolvable problems with this product. At this point, rather than intensive interaction with a single actor, Antrox got involved in more superficial interactions with many actors with the goal of obtaining a broader picture of the "market" for this product. Relying on the information from these broad and superficial interactions, the decision was made to abandon AntroxLAB. At the same time Antrox opted for deepening its interactions once again with NelDesign in order to test and conduct the complex and profound resource re-combinations leading to the new product Deko. These new intensive interactions Antrox-NelDesign stretched over 6 months. In parallel, Antrox had also more superficial interactions in browsing its own suppliers' network in search of new materials and technical solutions, which then led to identify a particular partner who became the supplier of the new key coating solution for Deko.

-Third period – marketing and communication (2014 and again spring-Sept 2015): This period lasted several months in 2014 for Antrox LAB, but Antrox' communicative interactions with using experts and potential customers did not bear the expected fruits in terms of sales, rather they convinced Antrox to abandon this product. However, the feedback obtained in these interactions about AntroxLAB was fundamental for discarding the initial coating material which had negative associations with potential customers: these interactions opened a cycle in the co-creation process going momentarily back to the second period of resource re-combination leading to the new product Deko. Then, the co-creation process continued again to the third period with new communicative and indeed full marketing interactions conducted again by Antrox between spring and September 2015, but this time for the new product Deko. Importantly, these marketing interactions include now a very deep interaction, indeed a negotiation between Antrox and the architect (Studitalia). Interestingly, during the two times this co-creation journey cycled through the third period of marketing/communication, it was only one of the developing parties involved, namely Antrox, while NelDesign remained in the background.

-Final period – installation & realized co-creation (2016-2017): This period signals the movement from a signed contract to furnish the new hotel in Dubai to actually delivering the solution in the form of a very large lot of the product Deko. Interactions in this period became first very deep and intense on the developing and supply side of the network, with Antrox and NelDesign discussing intensively how to practically perform the production and delivery activities; then, with the product on location at the hotel, the interactions which became very deep and intense were those between Antrox and the installer FourZone, who needed from Antrox both training and written instructions on how to install Deko. At this point all these kind of additional services and support activities became pivotal in order to really create value around the new product together with the local installer. We conclude this discussion by stressing that one of the key preliminary findings of our study is recognizing the changes in intensity and breadth of the inter-organizational interactions that follow along a value co-

creation process. Therefore, an important next step in our research is to dig deeper into the historical process of value co-creation involving Antrox by breaking it down into even smaller elements and sub-periods, including identifying even more key events. This is a promising and relevant avenue for further research because interactions during the co-creation journey seem to have different intensity across the various periods, and indeed seem to cluster and become very intense in particular moments.

Based on our case study, these particular moments of high interaction seem to signal key junctures in the co-creation journey, such as the need to address technical problems or otherwise dissatisfied customers, or the need to connect the three settings of development, producing and using (see Håkansson & Waluszewski, 2007; Baraldi, Gregori & Perna, 2011). For instance, preparing a quotation for tender requires careful attention paid by developers to a customer's specification and implies accordingly connecting the developing with the using setting; while preparing to scale up manufacturing or installing the final solution implies connecting the production with the using setting. Each of these events can be seen as a key juncture in the value co-creation journey, which is all there to be mapped with greater details than what has been done so far in marketing and partly also in innovation studies.

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