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Case Studies on Open Innovation in ICT

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Abstract

This report synthesizes the results of 13 case studies on innovative ICT and ICT-enabled companies across Europe. It aims to assess the impact of Open Innovation strategies (OISs) on their innovation processes and to highlight the role played by ICT.

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Preface

This report was prepared in the context of the three-year research project on European Innovation Policies for the Digital Shift (EURIPIDIS) jointly launched in 2013 by JRC-IPTS and DG CONNECT of the European Commission. This project aims to improve understanding of innovation in the ICT sector and ICT-enabled innovation in the rest of the economy.

The purpose of the EURIPIDIS project is to provide evidence-based support to the policies, instruments and measurement needs of DG CONNECT for enhancing ICT Innovation in Europe, in the context of the Digital Agenda for Europe and of the ICT priority of Horizon 2020. It focuses on the improvement of the transfer of best research ideas to the market.

EURIPIDIS aims to:

1. better understand how ICT innovation works, at the level of actors such as firms, and also of the ICT “innovation system” in the EU;
2. assess the EU's current ICT innovation performance, by attempting to measure ICT innovation in Europe and measuring the impact of existing policies and instruments (such as FP7 and Horizon 2020); and
3. explore and suggest how policy makers could make ICT innovation in the EU work better.

Within EURIPIDIS, the present report offers the synthesis of the results of 13 case studies conducted on innovative ICT and ICT-enabled companies across Europe.

It aims to assess the impact of open innovation strategies on their innovation procedure and also to highlight the role of ICT in the open innovation process.

In particular, this report strives to:

- Provide a better understanding of the key organizational dimensions and the evolution of their innovation models.
- Define the main dimensions related to open innovation and Open Innovation 2.0 strategies.
- Highlight the drivers and barriers of open innovation strategies in ICT and ICT-enabled industries in Europe.
- Assess and evaluate the differences in the way large companies and small and medium enterprises pursue open innovation strategies in Europe.

Executive Summary

The study builds upon 13 case studies of innovative ICT and ICT-enabled European companies. These 13 case studies include four large companies and nine SMEs. The aim of the study is to assess the impact of Open Innovation strategies on companies' innovation procedures and to highlight the role of ICT in Open Innovation processes.

The **Open Innovation (OI) paradigm** is broadly defined as the shift from a traditional closed and controlled R&D and innovation environment towards open and flexible models (Chesbrough 2003, Chesbrough and Crowther, 2006; Gassman and Enkel, 2004; Enkel *et al.* 2009). An **Open Innovation strategy (OIS)** aims to redefine the boundaries between the company and its surrounding environment, making the firm more porous and embedded in loosely-coupled networks of different actors, collectively and individually working towards creating and commercializing new knowledge.

Furthermore, the concept of Open Innovation is related to that of the **open business model**, since the link between technology and new business models is strengthened by the intensive use of Open Innovation. **With the rise of Web 2.0, a new generation of business models has emerged, and converged in the new paradigm of Open Innovation 2.0** (Curley and Salmelin, 2013). This new paradigm involves "principles of integrated collaboration, co-created shared values, cultivated innovation ecosystem, unleashed exponential technologies, and extraordinarily rapid adoption" (Alexy *et al.*, 2013).

Open Innovation is a strategy that extends well beyond the R&D department, and embraces many company functions. Large companies implement Open Innovation strategies in a very different way to SMEs.

In particular, all the large companies in our sample are:

- **Better positioned** -than smaller companies- **to orchestrate research partnerships**, by setting the agenda of large consortia, identifying clear benefits for partners, and boosting and spreading the OIS attitude throughout the industry.
- More likely to give a central role to **Human Resources Management** in order to achieve OIS goals.
- More likely to adopt a **long-term perspective**, focusing not only on the short-term benefits of technology alliances but also identifying future objectives to be achieved along the road.

A comparative review of the main strategic elements that characterize OIS in the SMEs in our sample leads us to the following conclusions:

- **Opening up through business model innovation** represents a strong opportunity for SMEs to extract value from internally developed technologies through strategic partnerships and external collaborations.

- **Participation in large R&D networks and strong engagement in academic ecosystems** help SMEs to gain visibility and reputation, foster expertise exchange, and gather new knowledge and information on R&D priority setting.
- **OI culture and strong appropriability strategies** allow SMEs to open up their R&D strategies successfully, without running the risks related to rising knowledge search costs in inbound search strategies and the loss of business-critical knowledge (reduced value capture) in external collaborations.

In general, Open Innovation proved to be prevalent in many innovation processes. However, in all our 13 cases, the type of Open Innovation that we observed was part of an “open but controlled” innovation strategy. That is to say, it was open in the sense that it was collaborative, and controlled in the sense that companies tried to implement strategies to ensure a proper return on their investment.

While we do not claim that our investigation was comprehensive, it has identified a series of drivers and barriers for an Open Innovation strategy in Europe (and indeed innovation in general).

Drivers:

- **Large EU consortia** can play an important role in enabling Open Innovation Strategies (OISs), particularly as regards explorative R&D activities.
- When implementing OI 2.0 strategies, companies claimed to build communities and **platforms using the assets that they best control**.
- The **control secured thanks to IP** makes companies more prone to build alliances and collaborate when they can protect their own technologies and knowledge.
- The **Horizon 2020 SME Instrument** was seen by the SMEs in our sample as offering a boost for business development of innovative propositions.
- **Embeddedness in a rich ecosystem**, i.e. being a player in a cluster characterized by easy access to complementary assets, and by an intense flow of knowledge and information, was seen as leading to significant advantages and more effective OISs.

Barriers: two different groups of obstacles stand out. They refer to:

- i. **Internal management.** OIS requires the coordination of resources and is a complex strategy to implement. Companies in the sample suggest that reaching the right balance between internal R&D and external sourcing of knowledge and technology remains a serious barrier for implementation of OIS.
- ii. **European and national innovation systems.** Despite the critical role played by EU and national programmes, various companies still report that the lack of institutional support and/or the presence of rules and regulations that prevent innovation constitute a considerable barrier.

Companies in the sample lament the rigidities of policymakers and the public sector, which hinders innovation dynamics in Europe.

The study identifies **seven policy implications** for Open Innovation:

- **Local ecosystems built for Open Innovation.** Innovation does not happen in isolation. Innovators are often working in rich ecosystems. These ecosystems have to be specialized and well connected. The locus of innovation is no longer in individual large companies, but in innovation networks involving a mix of partners: universities, labs, start-up companies, SMEs, multinationals, and governments. Policymakers have a dual role to play: i) they can support the creation of large research campuses as key infrastructures for local innovation ecosystems; ii) they can help SMEs, entrepreneurs, and other institutions to connect and enrich innovation ecosystems.
- **Orchestrating a global ecosystem through open relationships.** While physical interaction plays an important role, competitive advantage needs to be achieved on a global scale. Policymakers can play an important role in encouraging partnerships through projects and between regions. Open Innovation has demonstrated the benefits of these connections and exchanges: most of the companies in our sample have found that groups of industrial allies can represent a formidable competitive asset for any innovative enterprise. Therefore, public authorities should make sure that their programmes encourage the right type of partnerships, which optimize the potential of participants through the alliance.
- **Intellectual property helping Open Innovation.** The case studies suggest that formal intellectual property (IP) protection mechanisms are tools that facilitate collaboration. However, SMEs often struggle to find the appropriate partners. Companies need to acknowledge the complexities of IP management and to develop effective appropriation strategies in order to successfully take their technologies to the market. Policy can also play a role here. First of all, it is important to acknowledge the limits of the patenting system and explore alternatives to formal tools of protection. Second, forms of support could be envisioned that help SMEs to secure proper IP access to external technology. In more general terms, patent offices could ease the patent search processes and attempt to diminish search costs for SMEs.
- **Facilitating users' involvement for OI 2.0.** The involvement of users is crucial for Open Innovation 2.0 communities. The diffusion of ICT and social media during the last two decades has increased the opportunities to create new businesses based on communities and the potential of engaging users in the innovation process. Policy makers can facilitate the dynamics of user-led and user-made innovation by supporting crowdsourcing mechanisms. They can also promote innovation by awarding prizes for innovative solutions to societal challenges (e.g. inducement prizes¹). In

¹ "Challenge prizes (also called 'inducement' prizes) offer a reward to whoever can first or most effectively meet a defined challenge. They act as an incentive for meeting a specific challenge, rather than being a reward for past achievements (prizes that do this, such as the Nobel Peace Prize, are referred to as 'recognition' prizes)." (Nesta, 2014)

addition, they can make sure that European industry is capable of reaping the benefits generated by user communities and monitor how users' contributions are taken into consideration and rewarded.

- **Policymakers should strike a balance between encouraging basic research, applied research, and innovation models.** The companies interviewed acknowledged that with Horizon 2020, the EU investment in research and innovation is becoming more oriented towards supporting applied research and commercialization projects. However, some of these companies, and in particular companies that have more experience with EU funding, emphasized that public investment should continue to support basic research. According to this limited sample, European industry is requesting policymakers to balance their investment in support of activities across the entire value chain, from basic research to commercialization and business expansion. In designing any new research and innovation policy, policymakers should adopt an approach that balances support for basic/applied research with support for the commercialization of research.
- **Remaining open to new forms of Open Innovation and other growth models.** The European economy is extremely diverse and characterized by multiple drivers of growth. Encouraging entrepreneurs to apply Open Innovation can help, but the model itself is evolving and different wherever applied. When designing policy measures to support entrepreneurial commercialization of science and technology, policymakers need to acknowledge that exponential growth is not the only form of business development that leads to new jobs and wealth. Different forms of growth have different limitations. For instance, when growth happens through acquisition and rapid expansion, access to risk finance can be a bottleneck for further development. The availability of venture capital funding is crucial to allow companies to grow and innovate, especially for start-ups and innovative SMEs. In more general terms, consistent with the presence of different modes of growth described in this study, policy can play a role in "bridging" industries (within high-tech sectors or between high-tech and traditional sectors). Policymakers can use their grant systems to encourage cross-sectorial innovation (a pillar of OI 2.0) and ICT-enabled innovation.
- **Policymakers can contribute to creating the conditions for the growth and the diffusion of a strong Open Innovation culture.** Companies experience Open Innovation strategies differently, and their understanding of how to implement OI Strategies matures at different rates. The most experienced OI companies in our sample emphasized the need to educate staff in OI. They also organized initiatives to prepare engineers, doctoral students and managers for the implementation of OI strategies, such as alliances, technological co-development and the like. Policy can play a role here, supporting initiatives that enhance the OI capabilities of people within an organization.

Résumé

Cette étude se fonde sur 13 études de cas d'entreprises européennes innovatrices dans le secteur économique des technologies de l'information et de communication (TIC) ou qui exploitent les TIC. Ces 13 études incluent quatre grandes entreprises et neuf PME. L'objectif est d'évaluer l'impact des stratégies de l'innovation ouverte (Open Innovation) sur les processus d'innovation et de mettre en évidence le rôle des TIC dans le processus d'innovation ouverte.

Les principes d'innovation ouverte sont généralement définis comme le passage d'un environnement de Recherche & Développement (R&D) fermés et contrôlés vers des modèles flexibles et ouverts (Chesbrough 2003, Chesbrough and Crowther, 2006; Gassman and Enkel, 2004; Enkel *et al.* 2009). **Une stratégie d'Innovation Ouverte (SIO)** vise à redéfinir les frontières entre l'entreprise et son environnement proche. Une SIO encourage les entreprises à adopter une approche plus ouverte et intégrée dans des réseaux librement associés avec des acteurs divers, qui travaillent individuellement ou collectivement vers la création et la commercialisation de connaissances.

En outre, le concept de l'Innovation Ouverte est lié au modèle d'affaires. **Avec l'arrivée du Web 2.0, de nouveaux modèles d'affaires ont émergés. Ils convergent vers le nouveau concept de l'Innovation Ouverte 2.0** (Curley and Salmelin, 2013). Ce nouveau concept implique « des principes de collaboration intégrée, des valeurs partagées et co-crées, des écosystèmes développés d'innovation, des technologies au potentiel exponentiel, et une adoption particulièrement rapide » (Alexy *et al.*, 2013).

L'innovation ouverte est une stratégie qui s'étend bien au-delà du département de R&D, et englobe plusieurs fonctions de l'entreprise. Les grandes entreprises mettent en œuvre les stratégies de l'innovation Ouverte de manière différente des PME.

En particulier, les grandes entreprises dans notre échantillon sont:

- **Mieux positionnées** – que les petites entreprises – **pour orchestrer les partenariats de recherche**, en établissant l'agenda de grands consortiums, et identifiant clairement les avantages des partenaires, et stimulant et diffusant l'attitude de stratégie d'innovation ouverte dans toute l'industrie.
- Plus susceptibles de donner un rôle central à la **Gestion des Ressources Humaines** afin d'atteindre les objectifs de la SIO.
- Plus susceptible d'adopter **une perspective de long terme avec ses partenaires**.

Après avoir comparé les principaux éléments stratégiques des SIOs dans les PME, nous concluons:

- **L'ouverture du modèle d'affaires** représente une occasion pour les PME d'extraire la valeur de technologies développées en interne à travers les partenariats stratégiques et les collaborations externes.

- **Une participation aux grands réseaux de R&D et un fort engagement dans les écosystèmes académiques** aident les PME à conquérir une visibilité et une réputation, à promouvoir l'échange d'expertise, à recueillir des connaissances et des informations nouvelles sur les priorités R&D de leurs écosystèmes.
- **Une culture IO et des stratégies d'appropriation** fortes permettent aux PME d'ouvrir leurs stratégies de R&D, sans prendre de risques liés à l'augmentation des coûts de la recherche pour acquérir cette connaissance, et à la perte de connaissance critique aux affaires suite à des collaborations externes.

En général, l'Innovation ouverte s'est répandue dans de nombreux processus d'innovation, mais le type d'innovation ouverte que nous avons observé fait, dans toutes nos études de cas, partie d'une stratégie d'innovation "ouverte mais contrôlée". Autrement dit, ouverte dans le sens de la collaboration et contrôlée dans le sens que les entreprises utilisent des stratégies qui assurent un retour sur leur investissement.

Bien que cette analyse ne prétende pas être complète, elle a identifié une série de moteurs et d'obstacles pour une stratégie de l'innovation ouverte en Europe (et de l'innovation en général).

Du côté des moteurs:

- Notre échantillon identifie un rôle pour **les grands consortiums de l'UE**. Ces consortiums permettent la mise en œuvre des stratégies d'innovation ouverte (SIO) et en particulier d'activités exploratoires de R&D.
- Pour les stratégies IO 2.0, les entreprises ont indiqué avoir bâti des collectivités **et des plates-formes – en partant des atouts qu'elles peuvent mieux contrôler**.
- A propos de la **propriété intellectuelle**, les entreprises ont tendance à construire des alliances et collaborer quand elles peuvent assurer le contrôle de leurs propres technologies et connaissances.
- Les PME de notre échantillon ont souligné que leur participation à **l'Instrument PME Horizon 2020** fut en un moteur pour leur développement de leurs innovations.
- Enfin, un autre moteur identifié est **l'intégration dans un écosystème riche**: la participation dans un cluster régional facilite l'accès à des actifs complémentaires et le transfert conséquent des connaissances conduit à des avantages significatifs et des SIO plus efficaces.

Du côté des **obstacles**, deux groupes différents d'obstacles se démarquent. Le premier concerne la gestion interne et le second concerne les systèmes d'innovation européens et nationaux:

- **La gestion interne**. Les SIO exigent la coordination de ressources. C'est une stratégie parfois difficile à mettre en œuvre. Les entreprises analysées dans nos études de cas

indiquent qu'atteindre le juste équilibre entre la R&D interne et l'acquisition externe des connaissances et technologies reste un sérieux problème pour les SIO.

- **les systèmes d'innovation européens et nationaux.** Malgré le rôle essentiel joué par l'UE et les programmes nationaux, diverses entreprises indiquent encore que le manque de soutien institutionnel et/ou la présence de règles et de règlements qui contrarient l'innovation représentent un obstacle majeur. Elles déplorent les rigidités des décideurs politiques et du secteur public, qui entravent le dynamisme de l'innovation en Europe.

Dans cette étude, nous identifions **sept implications politiques** pour l'Innovation Ouverte:

Des écosystèmes locaux construits pour l'Innovation ouverte.

L'innovation ne se fait pas dans l'isolement. Les innovateurs travaillent souvent au sein d'écosystèmes riches. Ces écosystèmes doivent être spécialisés et bien reliés. L'innovation se fait désormais au sein de réseaux d'innovation avec des partenaires variés: universités, laboratoires, start-ups, PME, multinationales, et les décideurs publics. Ces décideurs ont un double rôle à jouer: i) ils peuvent soutenir la création de grands campus de recherche comme infrastructures clés au centre d'écosystèmes locaux; ii) ils peuvent aider les PME, les entrepreneurs, et d'autres institutions à se connecter et à enrichir les écosystèmes d'innovation.

Orchestrer un écosystème mondial. Alors que l'interaction physique joue un rôle important, l'avantage concurrentiel doit être atteint à l'échelle mondiale. Les pouvoirs publics peuvent jouer un rôle important et encourager des partenariats entre les projets intra-régions. L'Innovation Ouverte a démontré les avantages de ces connexions et de ces échanges: la plupart des entreprises dans notre étude ont démontré que des groupes de partenaires industriels peuvent représenter un atout concurrentiel formidable pour toute entreprise innovante. Par conséquent, les pouvoirs publics devraient faire en sorte que leurs programmes encouragent des partenariats adéquats en sorte d'optimiser leur potentiel.

La protection de la propriété intellectuelle aide l'Innovation Ouverte. Les cas étudiés suggèrent que des mécanismes de protection de la propriété intellectuelle (PI) formelle sont des outils qui facilitent la collaboration. Cependant, les PME ont souvent du mal à trouver les partenaires appropriés. Les entreprises ont besoin de reconnaître la complexité de la gestion de la PI et de développer des stratégies d'appropriation efficaces afin d'optimiser le retour de leurs technologies sur le marché. Les décideurs publics peuvent également jouer un rôle. Tout d'abord, il est important de reconnaître quelles sont les limites du système des brevets et d'explorer des alternatives à cette protection formelle. Deuxièmement, les formes de soutien peuvent être envisagées pour soutenir les PME qui essaient d'importer à l'intérieur la PI dont elles ont besoin et qui a été créée à l'extérieur. D'une manière plus générale, les bureaux de brevets pourraient améliorer la façon dont les

brevets sont consultables et essayer de diminuer les coûts de recherche pour les PME.

Innovation ouverte 2.0: faciliter la participation des utilisateurs.

L'implication des utilisateurs est un élément crucial des communautés de l'innovation ouverte 2.0. La diffusion des TIC et des médias sociaux au cours des deux dernières décennies a amplifié l'opportunité de créer de nouvelles entreprises fondées sur l'engagement des utilisateurs dans le processus d'innovation. Que ce soit une innovation dirigée ou créée par les utilisateurs, les décideurs politiques peuvent faciliter le dialogue entre utilisateurs et décideurs en soutenant des mécanismes d'externalisation (par exemple, le «crowdsourcing»). Par exemple, ils peuvent créer des compétitions et des prix, mais doivent s'assurer que l'industrie européenne est capable d'obtenir les bénéfices générés par les utilisateurs et observer comment leurs contributions sont prises en considération et récompensées.

Les décideurs publics doivent trouver un compromis entre l'encouragement de la recherche fondamentale, la recherche appliquée, et les modèles d'innovation.

Les entreprises interrogées ont admis qu'avec l'Horizon 2020, l'investissement de l'UE dans la recherche et l'innovation soutiendra davantage la recherche appliquée et la commercialisation des projets. Cependant, certaines de ces entreprises, et en particulier des entreprises plus expérimentées avec le financement de la R&D par l'UE, ont soutenu que l'investissement public doit aussi soutenir la recherche fondamentale. Selon notre échantillon limité, l'industrie européenne demande aux décideurs publics d'équilibrer leur investissement à l'appui d'activités couvrant toute la chaîne de valeur, depuis la recherche fondamentale jusqu'à la commercialisation et à l'expansion des marchés. Ces entreprises pensent que les décideurs publics devraient adopter une approche équilibrée entre le soutien à la recherche fondamentale/appliquée et le soutien à la commercialisation de la recherche.

Restant ouvert à de nouvelles formes d'innovation ouvert et d'autres modèles de croissance.

L'économie européenne est extrêmement diversifiée et caractérisée par de multiples moteurs de croissance. Encourager les entrepreneurs à appliquer l'Innovation Ouverte peut aider, mais le modèle lui-même est en constante évolution et il n'est pas appliqué d'une même manière partout. Lors de la conception de mesures pour soutenir la commercialisation entrepreneuriale de la science et technologie, les décideurs publics doivent prendre en compte que la croissance exponentielle des entreprises n'est pas l'unique forme de développement qui mène à la création de nouveaux emplois et de richesse. Différentes formes de croissance ont des limites diverses. Par exemple, lorsque la croissance passe par l'acquisition et par une expansion rapide, la difficulté de l'accès au capital-risque et aux fonds d'investissement peut être un obstacle. La disponibilité de ces fonds est cruciale pour permettre aux entreprises de grandir et d'innover, en particulier pour les start-ups et les PME innovantes. En général, suivant les différents modes de croissance décrits dans cette étude, les décideurs publics peuvent jouer

un rôle dans les industries "passerelles" (au sein de la haute-technologie 'high-tech' ou entre high-tech et les secteurs traditionnels). Les décideurs publics peuvent utiliser les dispositifs de subventions publiques afin d'encourager l'innovation intersectorielle (un pilier d'OI 2.0) et l'innovation facilitée par les TIC.

Les décideurs publics peuvent contribuer à créer des conditions pour la croissance et la diffusion d'une solide culture de l'innovation ouverte. Les entreprises expérimentent de façons différentes la mise en œuvre de stratégies de l'innovation ouverte, et elles arrivent à des taux différents de mise en œuvre à maturité, selon leur compréhension de l'IO. Dans notre étude, les entreprises les plus matures en terme de mise en œuvre de l'IO ont souligné la nécessité de former les ressources humaines à l'IO. Elles ont également organisé des initiatives pour préparer les ingénieurs, doctorants et gestionnaires sur la mise en œuvre des stratégies d'IO, comme les alliances, le co-développement technologique et autres. Les décideurs publics peuvent jouer un rôle en soutenant les initiatives dont l'objectif est d'améliorer les capacités d'OI au sein d'une organisation.

1. Introduction

This report synthesises the results of 13 case studies of innovative ICT and ICT-enabled companies across Europe.

It assesses the impact of Open Innovation strategies (OISs) on the innovation processes of these companies and highlights the role of ICT in the open innovation process.

The report strives to:

- Provide a better understanding of the key organizational dimensions and the evolution of their innovation models.
- Define the main dimensions of open innovation and Open Innovation 2.0 strategies.
- Highlight the drivers and barriers of Open Innovation strategies in ICT and ICT-enabled² industries in Europe.
- Evaluate the differences in the ways open innovation strategies are pursued in large companies and in small and medium enterprises in Europe.

The Open Innovation paradigm is broadly defined as the shift from a traditional closed and controlled R&D and innovation environment towards open and flexible models, in which new value is captured along the whole value chain from “purposive inflows and outflows of knowledge to accelerate innovation and to expand the markets for external use of innovation, respectively” (Chesbrough 2003, Chesbrough and Crowther, 2006; Gassman and Enkel, 2004; Enkel *et al.* 2009).

At the most fundamental level, the Open Innovation concept is embedded in the notion that the sources of knowledge for innovation and technological advance are widely distributed in the economy. In his first seminal work, Henry Chesbrough emphasized the strong interdependencies that occur in the innovation process, in order to demonstrate that the decline in the strategic advantage of closed innovation models, based on internal R&D, is related to the greater range of knowledge producers and to the increased mobility of knowledge workers. This makes it more difficult for firms to appropriate and control their R&D investments and IPs.

An Open Innovation strategy aims to redefine the boundaries between the company and its surrounding environment, making the firm more porous and embedded in loosely-coupled networks of different actors, collectively and individually working towards creating and commercializing new knowledge. Chesbrough also suggests there are many innovative solutions developed at the boundaries between disciplines. Therefore the new model of innovation

² ICT-enabled companies apply digitalization processes to non-digital production processes, mainly in services and in manufacturing traditional industries.

needs to find ways for leveraging these solutions when it is not possible to own all the capabilities in-house.

Central to the reason why the Open Innovation model reflects a paradigm shift is the concept of "erosion factors". These factors undercut the logic of the earlier "closed innovation" model of R&D and changed the conditions under which firms innovate by increasing the potential and decreasing the costs of searching for external innovation.

As Chesbrough and Bogers pointed out (2014), one of the most important 'erosion' factors that allow firms to leverage increasingly distributed knowledge sources by enabling the use of external innovation is the growing availability of Information and Communication Technologies (ICTs).

New Information and Communication Technologies have reduced the perceived distances between the actors in the innovation process. At the same time, they have enabled the integration of customers and suppliers into the design and development process. As a result, the mobility of knowledge has increased over the last few decades (Gassman, 2006). Thanks to modern ICT, virtual teamwork on a global scale has changed from a rather exceptional working mode to a standard one.

Moreover, West and Bogers (2011) argue: "the rise of the Internet has played an important role in enabling searches for external innovation, by facilitating technology intelligence (Veugelers *et al.*, 2010), online communities (Dahlander and Wallin, 2006), crowdsourcing or broadcast search (Ebner *et al.*, 2009; Jeppesen and Lakhani, 2010), and Internet platforms (Vickery *et al.*, 2010)". Open-source software development became possible because of two special characteristics of software: high separability and codability, and its high knowledge intensity.

Furthermore, the concept of Open Innovation is related to the concept of the open business model, since the link between technology and new business models is strengthened by the intensive use of Open Innovation (Chesbrough, 2003; Chesbrough and Crowther, 2006; Chesbrough and Schwartz, 2007; Chesbrough 2012; 2013).

1.1 Open Business Models

Open business models are based on a significant division of labour among partners. These models have two alternative strategic objectives. The first is to get access to external ideas; the second is to use internal key assets, resources, or technology in other companies' businesses (Chesbrough, 2003, 2006, 2007). From this perspective, open business models are strictly linked to the innovation activities of the firm, or to its external innovation partners.

Business models determine which external technologies have to be sourced (because they are indispensable for the business model) and which technologies have to be monetized externally (because they are not aligned with the business model). In recent works on open innovation and open

business models, Vanhaverbeke (2012) and Vanhaverbeke and Chesbrough (2014) point out that these models may lead to better financial performance. On the one hand, they can reduce the costs of innovation. On the other hand, they can generate extra revenues through monetizing technologies, by means of licensing agreements and spin-off activities, when a technology cannot be adopted profitably in the product markets of the company.

Several scholars agree that the Internet and the related advances in Information and Communication Technologies (ICTs) act as catalysts for business model experimentation and innovation (Timmers, 1998, Massa and Tucci, 2013). They have disclosed new opportunities for organizing business activities. Entire industrial sectors have evolved along radically new trajectories of innovation and offer new logics of value creation.

With the rise of Web 2.0, a new generation of business models has emerged and converged in the new paradigm of Open Innovation 2.0 (Curley and Salmelin, 2013). This new paradigm involves “principles of integrated collaboration, co-created shared values, cultivated innovation ecosystems, unleashed exponential technologies, and extraordinary rapid adoption” (Alexy *et al.*, 2013). This means that Open Innovation 2.0 is based on openness to change rather than resistance to it. Moreover, innovation is a relational activity, which involves not only different sectors and functions, but also different people and teams working in collaboration to achieve common goals.

This understanding shaped the spirit of a recent paper, promoted by the European Commission and released by the EU Open Innovation Strategy and Policy Group (OISPG) at the conclusion of the Open Innovation 2.0 Conference, held in Dublin in 2013. The paper (Curley and Salmelin, 2013) highlights the new paradigm of Open Innovation 2.0 as a wide networking and co-creative collaboration that involves all the actors of modern society in co-generating and enabling innovation and creating shared competitive advantages.

To deploy this new model, Open Innovation 2.0 refers to the “quadruple helix” (Asplund, 2012), a model that involves the participation of government, academia, industry and people in order to create structural changes and shared value that could not be achieved by actors working alone. Moreover, the Internet and the phenomenon of globalization has led to a growing level of connectivity that influences companies’ models of innovation, making them shift away from the traditional R&D-led models toward more distributed ones (Alexy *et al.* 2013).

In this context, inter-organizational collaboration plays an important role in collaborative R&D and product development (Faems, Van Looy and Debackere, 2005).

Depending on how consistent they are with firms’ existing business models, ICTs can be seen as either disruptive or sustaining (Christensen and Raynor, 2003). Furthermore, the shift away from the enhanced role of knowledge and

information in transactions, and the exponential increase in the degree of interaction between innovation actors, has forced firms to move from a transactional paradigm to a relational one (Kalayanam and McIntyre, 2002).

Customers and web users play a greater role and the environment for knowledge exchange is wider as a result of the interaction of Open Innovation strategies and new technologies. This has forced firms in most industries to rethink their existing business models.

Social ICTs (SICTs) play an important role in the Open Innovation paradigm. The growing phenomenon of Web 2.0 is the latest result of a gradual evolution towards enriched transactions and a variety of knowledge sources. SICTs broaden the relevant sources of knowledge involved (university, competitors, government, users, etc.). In addition, SICTs enrich the depth of knowledge interactions between firms and the external environment.

1.2 Methodology and Companies Investigated

The 13 companies included in the research project whose results are summarized in this report were selected from a list of 40 candidate European ICT and ICT-enabled companies.

Candidate companies were identified through a variety of sources: academic networks, Open Innovation 2.0 networks, R&D Management Conference Network, partnerships in other European projects, and informal professional contacts of the team supervisors. The selection further benefited from the professional contacts of the researchers in the network of European delegates in Horizon 2020 Committees.

We selected the final 13 companies using a multi-dimensional approach which took into consideration the company industry (ICT/ICT-enabled, product/services), the size of the company, and the different market approaches (B2C/B2B), in order to capture heterogeneity and increase the significance of the findings.

The company selection procedure aimed to ensure that the various dimensions of EU countries, industries and firms were fully represented, taking into account the evidence resulting from the mapping of previous case studies on open innovation in ICT.

Moreover, one of the rationales of the selection was that of “tell us a story”; not only relevant from a business perspective but also to highlight the obstacles that these companies faced in pursuing OI and developing open business models in new technological environments. Every case was chosen for the potentially relevant information it might add to the research framework.

In-depth desk research on the selected companies allowed us to collect four main blocks of information, related to:

- the relevance of ICT in the company's open innovation strategy,
- the company's business model,
- the company structure,
- the latest financial performance figures available³.

Table 1 provides the basic company-level data for the year 2014.

³ Companies' key financial information was collected from reported official data from balance sheets (Source: Bureau Van Dijk Amadeus database)

Company name	Company type	Country of origin	NACE CODE DESCRIPTION (main activity)	No. of countries of operation ^a	No. of employees ^a	Operating revenues (turnover)	R&D intensity (% of turnover)	IPR (no. of patents)
BlaBlaCar	Private	FR	63.12 - Web portals	14	250	N.A.	N.A.	N.A.
Zappar Ltd.	Private	UK	Development of augmented reality-enabled products	1	21	€867.000 (2013)	6% (intangibles)	1
ST Micro-electronics	Publicly Quoted	CH	721909 - Experimental R&D in natural sciences and engineering	12	43600	US\$7.4B (2014)	21% (expenditure)	15.000
IBSEN Telecom	Private	NO	7219 - Research and experimental development in natural sciences and engineering	1	3	N.A.	N.A.	N.A.
Celoxica Ltd.	Private	UK	26.2 - Manufacture of computers and peripheral equipment	4	32	€2.628.000 (2013)	37.5% (expenditure)	24
BCB	Private	ES	ICT (software development)	2	10	€1.000.000 (2014)	6% (intangibles)	1
Supponor OY	Private	FI	73.119 - Other advertising activities	1	19	€1.352.000 (2013)	N.A.	
Loccioni	Private	IT	32.7 - Mechanical Engineering	5	382	€70.500.000 (2013)	5% (intangibles)	20 patent fam.
Guger Technologies OG	Private	AT	25.6 - Machining	3	40	€30.000.000 (2013)	40% (employees)	2
ENTRANET	Private	GR	45.34 - Other building installation	3	8	€100.000 (first product in 2015)	90% (employees)	-
Graphenea	Private	ES	72.19 - Research and experimental development in natural sciences and engineering	3	8	€500.000 (2013)	30% (expenditure)	4
Primo 1D	Private	FR	Micro-electronics	1	8	N.A.	N.A.	18 patent fam.
PHILIPS	Publicly Quoted	NL	2790 - Manufacture of electrical equipment	28 (plants) 150 (sales outlets)	120000	€23,452M (2013)	36% (intangibles)	80.000

^a(worldwide)

Table 1: Basic company-level data

An explorative case study analysis (Eisenhardt, 1989) was conducted in order to shape hypotheses and to further verify them through recursive cycling techniques (Eisenhardt and Graebner, 2007). At the end of the research, emblematic cases or observed cross-case patterns were used to fully describe the underlying relations between emerging new models, in order to add further theoretical contributions to the research framework. Cross case study results were delivered by building an innovation strategy roadmap for each company. The roadmap emphasizes the following dimensions:

- Originality of the idea/nature of the technology,
- Early technology development,
- Advanced technology and/or product development,
- Commercialization strategy,
- Business model evolution.

Moreover, in line with relevant studies on company approaches to technology transactions (Van De Vrande *et al.* 2009; Brunswicker and Vanhaverbeke, 2011, 2014; Parida *et al.* 2012), two important activities that form part of firms' approaches to Open Innovation were investigated:

- **Knowledge exploration activities:** "innovation activities that aim to benefit from external sources of knowledge in enhancing current technological development" (e.g. new ideas/technologies discovered in partnership with suppliers, direct customers, and users involved in the definition of the product concept).
- **Technology exploitation activities:** "innovation activities that aim to leverage existing technological capabilities outside the boundaries of the organization and to discover new paths to the market through access to complementary resources and capabilities" (e.g. strategic partnerships for product co-development, manufacturing, and commercialization).

1.3 Roadmap

This report is structured as follows.

Chapter 2 provides an overview of the main reasons the interviewed companies had for adopting open innovation practices. Cross case study results highlight the main benefits and challenges arising from open innovation practices in Europe.

Chapter 3 describes the interviewed companies' different innovation models, based on information gathered at the interviews. It considers the level of adoption of open innovation practices by the various companies by mapping their different approaches to open innovation. In addition, it looks at the specific issues that characterize the main strategic aspects of the relationship between the companies and their innovation ecosystem.

Chapter 4 summarizes the findings about drivers and barriers to open innovation in Europe and offers conclusions according to relevant dimensions, such as the company's industry (ICT/ICT-enabled, product/services), its size and its marketing approach (B2C/B2B).

Chapter 5 and Chapter 6 provide general conclusions from the study, and in particular those related to innovation process management and policy implications, respectively.

For detailed information about the companies, please refer to the Annex.

2. Open Innovation in Europe: Motives and Challenges

"Open innovation is about involving far more actors in the innovation process, from researchers, to entrepreneurs, to users, to governments and civil society. We need open innovation to capitalize on the results of European research and innovation. This means creating the right ecosystems, increasing investment, and bringing more companies and regions into the knowledge economy. I would like to go further and faster towards open innovation. We owe it to the European Citizens. We owe it to the future generations. Let's dare to make Europe open to innovation, open to science and open to the world."

Carlos Moedas

Commissioner for Research, Science and Innovation
Open Innovation, Open Science, Open to the World
June 22, 2015

The Blueprint of the High Level Group on Innovation Policy Management⁴, in Recommendation 1.3, suggests that, in order to compete in a globalized and ever more competitive environment, large and small companies are increasingly cooperating. They are entering into partnerships, often with academia, public authorities or user groups.

Open Innovation 2.0 identifies the priorities for Open Innovation that will be illustrated in the following paragraphs.

2.1 The main motivations for adopting Open Innovation practices: benefits and challenges

Open Innovation is not only a strategic option available to companies but it is also – more and more often - a necessity, an indispensable way of bringing innovation to the market.

The cases described in this study present different situations, but for each of them innovation took place with some level of collaboration with external players. In this first part of the document, we describe the different reasons that led companies in our sample to engage in some form of open strategy. These reasons have to do with the execution of a business plan, specific innovation sourcing strategies, and precise positioning choices. We also indicate when unexpected benefits and challenges were identified.

⁴ High Level Group on Innovation Policy, Inspiring and Completing European Innovation Ecosystems - the way forward to improve people's lives, Blueprint, August 2014.

Open Innovation Strategies (OIS) take different forms. We will discuss them later on but, independently from the different forms of OIS adopted by companies in our sample, the main reasons for employing an OIS can be grouped into five categories. The first has to do with the commercialization of research and technology developed in academic institutions. The remaining four unlock market potential through business alliances.

Research institute spin-off to commercialize a technology. Some of the companies in our sample have come out of a pure research setting and are taking their technologies to the market. Their very existence, therefore, represents the manifestation of the OIS of the research institute that generated the science and technology behind the spin-off process. In most cases, these companies maintain close ties with the academic/scientific communities they were part of, contributing to research projects and hiring qualified people from academic institutions. This is the case for g.tec, Graphenea, and Primo1D. It is also worth mentioning that Celoxica, Zappar and IBSENtelecom originally developed their technologies as part of doctoral research projects.

Sharing qualified resources. In a few cases, the goal of an OIS was not so much the development of products or services, but rather the sharing of qualified resources over a longer time horizon, and without a clear product/service already in mind. This is the case for Graphenea, Entranet, Philips, and in part STM and BCB Informática y Control.

Technological co-development. This is the most typical reason for an OIS. Companies with different and synergic technological competences create technological partnerships not only to share qualified resources on a long-term basis, but also to develop and bring to the market new products and services. The exchange of technical knowledge is motivated by the need to design and commercialize new solutions. See Loccioni, Zappar, STM, IBSENtelecom and, in part, Graphenea.

Business model co-development. Some companies enter into alliances in downstream phases, towards commercialization. From a technical perspective, these alliances provide not much more than a "customization" of the solution with respect to product/services. However, according to the interviewees, they were significant in shaping the development of the business models that ultimately were adopted to commercialize the developed solution. In other words, while these partnerships were not particularly relevant for the development of a specific technology, they were very important for the identification of the most appropriate business case/application of the technology already developed. See the cases of Primo1D, BCB Informática y Control, Supponor and Celoxica.

Engage a community of users. ICT often enables an interaction between a producer and a community of users. Companies in our sample have used an Open Innovation 2.0 strategy to engage with users, or communities of users, in order to enrich their offering, grow their dimension, and expand into new

markets. See the cases of BlaBlaCar, Zappar, and in part STM (Arduino compliant products) and g.tec (BCI labs).

According to business literature, most partnerships underperform or do not perform as expected. In the same way, when companies attempt to implement OIS, results can differ from expectations. OIS may indeed underperform or deliver unexpected positive outcomes.

We summarize five different categories of unexpected benefits and problems that deviated from the initial reasons for engaging in an OIS. Below is a brief description of the issues, and a list of unexpected benefits and challenges can be found in Table 2.

- **Collaboration may cause distraction.** Opening up a company's knowledge base to external ideas and possible contamination has the undoubted benefit of leading to new opportunities and enriching the knowledge base of the company. However, such openness can result in greater distraction of resources, lack of focus, and failed attempts to find synergies between a new project and the core business of a company. This may become a problem, particularly for SMEs engaged in OIS, such as BCB and Celoxica. Still, as the case of STM shows, this is an issue that large companies know they have to face and solve.
- **Underestimation of cost/time.** Planning the appropriate resources to dedicate to any innovation project is not easy and requires some tolerance for unexpected problems. In some cases, OIS implementation required more resources and time than companies had originally planned. The main problems faced were: a) underperformance of partners (IBSENtelecom), b) increased complexity due to the mismatch of goals in alliances of universities/industries (g.tec); c) dimensions of costs beyond the control of individual companies (standard setting for online identity checks for BlaBlaCar, confidentiality within consortia for Graphenea); d) trial and error processes/long learning curve (Loccioni, Philips).
- **Eat or be eaten.** This issue regards unexpected exit strategies. In fact, engaging in collaboration for a precise set of reasons may result in unexpected and positive results. The most obvious one is when an SME enters into an alliance with a larger company (see the Celoxica case), since this alliance can turn into an acquisition. Vice-versa, when engaging in a significant number of technological alliances, a company (such as STM) might realize the need to establish a more structured programme of corporate venturing.
- **Evolution of alliance.** Quite often when alliances meet their original expectations they subsequently evolve into more complex and ambitious partnerships, to achieve faster time to market and more intense knowledge exchange. The main aspect that characterizes this evolution relates to the definition of a new avenue of collaboration between involved partners. OIS studied in this sample follow this same

pattern: Graphenea (through their participation in the Graphene EU Flagship Initiative), Loccioni, Primo1D and BCB (as these companies started to learn from their customers about possible new applications). This supports the idea that initial successful implementation of OIS may lead to more ambitious goals.

- **From OI1 to OI2.** Most of the companies in our sample engaged in OIS to develop their knowledge base through interactions with industrial partners and technology/knowledge providers, based on a one-to-one relationship. Only BlaBlaCar emphasized the need to engage the community of users in the development of their offering from the very beginning. The active participation of users is a fundamental dimension for Open Innovation 2.0 strategies. In various cases in our sample, companies evolved or are planning to evolve their innovation strategy to include the active contribution of general users or lead users, for example, Zappar (through the diffusion of the Zapcode creator platform) and STM (via the Arduino-based offering). Loccioni is also trying to engage in close co-development activities with certain specific lead users.

BlaBlaCar	Loccioni	G.Tec
<ul style="list-style-type: none"> • Motivations: engage a community of users • Acquiring to scale up visibility • Copies the best solutions • Unexpected benefits: new avenues of collaboration • Faster than expected scale-up • Quicker development and adaptation of existing solutions • Challenges: underestimation of cost/time • Difficulty in guaranteeing the identity checks online 	<ul style="list-style-type: none"> • Motivations: Co-development • Entering into a deep understanding of customers' processes • Multiple sources of creativity • Unexpected benefits: new avenues of collaboration • Project goals focus on transfer of competitiveness to clients • Intimate understanding of clients' processes • Cross-fertilization of ideas • Unexpected benefits: from OI1 to OI2 • Identification of key lead users to co-develop new service offering • Challenges: underestimation of cost/time • Finding the right partner • Significant investment in order to align language/procedures • Selection and prioritization among diverging opportunities 	<ul style="list-style-type: none"> • Motivation: spin-off • DNA of a research-intensive company coming out of research and continuing to contribute to academic areas • Unexpected benefits: engage a community of users • Visibility within the scientific community and keeping in tune with the development of technology • BCI labs • Challenges: underestimation of cost/time

<h3 style="text-align: center;">Celoxica</h3> <ul style="list-style-type: none"> • Motivations: spin-off/business model co-development <ul style="list-style-type: none"> • Target of corporate venturing • Integration with customer's offering • Focus on a market niche • Maintained ties with academic community only for new FPGA modules prototyping • Unexpected benefits: eat or be eaten. Exit strategies: <ul style="list-style-type: none"> • Investment by customer • Exit: be acquired? • Challenges: collaboration causes distraction <ul style="list-style-type: none"> • Too many external knowledge sources may represent a disadvantage and lead to less reliance on these external knowledge sources 	<h3 style="text-align: center;">Graphenea</h3> <ul style="list-style-type: none"> • Motivations: sharing qualified resources/Technological co-development <ul style="list-style-type: none"> • Sharing/proximity of highly qualified resources • Networking and first-hand knowledge developed in large consortia • Unexpected benefits: new avenues of collaboration <ul style="list-style-type: none"> • Significant learning opportunities from EU flagship initiative • Challenges: underestimation of cost/time <ul style="list-style-type: none"> • Problems with confidentiality and rules of engagement within large consortia 	<h3 style="text-align: center;">Zappar</h3> <ul style="list-style-type: none"> • Motivation: technological co-development • Unexpected benefits: from OI1 to OI2 <ul style="list-style-type: none"> • Evolution from a closed business model to an OI 1.0 to an OI 2.0 business model relying on users involvement • Challenges: underestimation of cost/time <ul style="list-style-type: none"> • Challenging to find the right balance between internal and external resources/activities in innovation mix
<h3 style="text-align: center;">Entranet</h3> <ul style="list-style-type: none"> • Motivations: technological co-development <ul style="list-style-type: none"> • Technology in-licensing • Unexpected benefits: technological co-development <ul style="list-style-type: none"> • ICT and non-ICT knowledge integration • Challenges: collaboration causes distraction <ul style="list-style-type: none"> • Difficulties in identifying the right business model • Risk of lack of focus, distraction • Risk of not being able to move away from a non-scalable business model 	<h3 style="text-align: center;">STM</h3> <ul style="list-style-type: none"> • Motivations: technology co-development/ engage community of users <ul style="list-style-type: none"> • Co-development and sharing of the technology roadmap • Engage with the community of users/developers (Arduino-compliant products) • Unexpected benefits: exit strategies <ul style="list-style-type: none"> • Development of corporate venturing strategy (with quite some difficulties) • Unexpected benefits: from OI1 to OI2 <ul style="list-style-type: none"> • Reaching out to the Arduino community of developers • Challenges: collaboration causes distraction <ul style="list-style-type: none"> • The company has had problems engaging with an ecosystem when there is no clear "common interest" that the group of partners can agree upon. 	<h3 style="text-align: center;">IBSENtelecom</h3> <ul style="list-style-type: none"> • Motivation: sharing qualified resources • Unexpected benefits • Challenges: underestimation of cost/time <ul style="list-style-type: none"> • Fragility of OIS as partners face difficulties

Primo1D	Philips	BCB
<ul style="list-style-type: none"> • Motivations: spin-off / business model co-developemnt • The company was a “spin-off” of a research centre • Identification of the right application for the technology • Unexpected benefits: new avenues of collaboration • Going from technology push to business pull, through opening process 	<ul style="list-style-type: none"> • Motivations: sharing of resources • HR: selection and hiring of qualified people at entry level. <ul style="list-style-type: none"> • Joint development: work with external partners • Challenges: underestimation of cost/time • Very long learning process not in line with expectations. 	<ul style="list-style-type: none"> • Motivation: business model co-development • Educate customers about technology • Sharing of resources • Joint participation with SMEs instruments in H2020 for the development of longer-term projects • Unexpected benefits: new avenues of collaboration • Learn from customers the “next areas” of application of technology • Challenges: collaboration causes distraction • Risk of lack of focus, distraction, not being able to move away from a non-scalable business model
Supponor		
<ul style="list-style-type: none"> • Motivation: business model co-development • Identifying a sustainable business model for application of a potentially disruptive technology 		

Table 2: Benefits and challenges arising from the adoption of Open Innovation

2.2 Large companies’ competitive advantage in implementing Open Innovation strategies

In our sample, we had four large companies, which are defined as companies employing 250 or more people (BlaBlaCar, Philips, STM and Loccioni). Examining these cases, it became obvious that Open Innovation is a strategy that extends well beyond the R&D department and embraces many (if not all) company functions. Three of the large companies interviewed explicitly recognized that they apply an OIS. BlaBlaCar does not explicitly refer to an OIS, even though the company has rapidly grown through acquisition and has quickly identified and integrated groups of people and specific competences in the acquired firms.

As regards the three other large companies (Philips, STM and Loccioni), we find interesting similarities that suggest that large companies may be in a position to implement OIS that are different from those adopted by SMEs.

In particular, we can claim that all the large companies in our sample are:

- **Better positioned** -than SMEs- **to orchestrate research partnerships**, by setting the agenda of large consortia, identifying clear benefits for partners, and boosting and spreading the OIS attitude throughout the industry.
- More likely to **give a central role to Human Resources Management** in order to achieve OIS goals⁵.
- Likely to adopt a **long-term perspective**: they focus on the short-term benefits of technology alliances but also identify objectives to be achieved in the future.

BlaBlaCar (ICT)

- BlaBlaCar does not explicitly implement an OIS. The company grows through an "acquiiring" model. Acquiiring consists of absorbing start-up competitors into the parent's company brand, hiring existing teams. Mastering acquiiring strategies and complexities related to integration of new businesses has been cited by the company as a source of competitive advantage.

Loccioni (ICT-Enabled)

- The company case study shows that learning by doing is a significant component of OIS. The result is that the company is very good at identifying partners, determining the correct alliance structure, choosing the right projects where OIS is necessary or where alternatively it is not feasible.

STM (ICT)

- The products that STM has developed are in general platforms that integrate many components, and are also component modules of larger platforms. Being open is in the DNA of the company. The case of this large company shows that this OIS in ICT is indeed scalable through the module/platform architecture. STM shows that OIS has scale advantages, as the company was able to leverage its global presence and connect pieces of knowledge from various ecosystems.

Philips (ICT/ICT-Enabled)

- The company gives a lot of attention to accountability of OIS, considering dynamic checks and balances of opportunities and costs. The other lesson arising from the history of Philips is that the implementation of OIS happens gradually. Philips moved step by step, evolving from past mistakes and incrementally adopting OI.
- Philips leveraged their big company name/reputation to establish long-term relationships/integration with Universities and Public Research Labs

Table 3: The advantages of Open Innovation in large companies

⁵ Business literature and practitioners emphasize that implementation of OIS encompasses various company functions; the two most obvious are R&D/technology management and business development. Still, various other functions need to get involved in order to implement OIS strategy. One of the least obvious is HRM (Human Resource Management), considering that, quite often, OIS leads to higher degrees of experts' turnover. They enter the company at various stages of project development and might leave as projects and technologies get transferred.

2.3 Opportunities for SMEs in implementing Open Innovation strategies

OI in SMEs is substantially different to OI in large companies, as it is always a consequence of a radical change in their strategic objectives. The need for fast decision-making, the general absence of a portfolio of innovation projects and the short organizational distance between R&D objectives and management objectives (as, for example, in the case of “academic entrepreneurs”) give the entrepreneur a central role in managing different forms of OI.

SMEs’ “entrepreneurial” attitude to OIS leads to a huge heterogeneity of approaches. The identification of relevant external knowledge sources, the incorporation and adaptation of external knowledge domains in the firm’s context, and the transfer of knowledge to external recipients are the key processes in which most managerial challenges in OI governance are found. SMEs’ OI models can be described as a sequence of flexible and rather unstructured entrepreneurial attitudes, due to the counterbalance of the opportunities and costs of collaborative R&D for OI projects. Moreover, performance determinants are significantly different according to the model applied by each company (Di Minin *et al.*, 2014). We envisage the role of policy makers in designing flexible measures to reduce the costs of collaborative innovation in SMEs as crucial to exploit their growth potential⁶.

SMEs in our sample (Graphenea, g.tec, Primo1D, Supponor, Entranet, BCB Informática y control, IBSENtelecom, Zappar, Celoxica) have three to 40 employees, and most of them are “one-project companies” with a high level of R&D commitment. They pursue a variety of OI approaches, both in the inbound and the outbound perspectives.

The inbound strategic dimension of OI is undoubtedly a significant source of opportunities for all the companies. SMEs in our sample benefit from external explorative learning through participation in large R&D networks (research consortia, as in the cases of g.tec, BCB Informática y Control, IBSENtelecom), and/or the active involvement in local research ecosystems (as in the cases of g.tec, Graphenea, Primo 1D, and IBSENtelecom).

Our data also confirm the relevance of outbound OI practices for SMEs in technology development and commercialization phases. Cooperation agreements for product development (Entranet, Primo1D, IBSENtelecom), purposive alliances (BCB Informática y Control, Primo1D, Supponor, Graphenea), corporate VC (Celoxica), and customer and user community involvement through platforms (Supponor, Zappar) are the most effective approaches.

The advantages of pursuing outbound OI strategies for SMEs relate to the opportunity of combining internally-developed knowledge with external technological knowledge and complementary assets (market/ product/

⁶ See *infra*, Section 6.

knowledge). In most cases, the reasons for adopting OIS are co-development with customers for technology exploitation and user involvement in the phases of creation and scale-up of an open business model.

A comparative review of the main strategic elements that characterize OIS in SMEs in our sample leads us to the following conclusions:

- **Opening up through business model innovation** is an opportunity for SMEs to extract value from internally-developed technologies through strategic partnerships and external collaborations. We observe an evolution of OI strategies through BMI in:
 - Companies that evolve from closed innovation models based on proprietary technologies to OI 2.0 models based on platforms and ecosystems. In these companies, the balance between appropriation strategies and community involvement represents a critical governance choice.
 - Companies operating in ICT-enabled industries and pursuing OI in order to integrate internally-developed knowledge with new knowledge in the technology exploitation and product development phase.
- **Participation in large R&D networks and strong engagement in academic ecosystems** help SMEs (and especially science-based companies, as in the case of g.tec and Graphenea) to gain visibility and reputation, foster expertise exchange, and gather new knowledge and information on R&D priority setting. Collaboration with universities and Public Research Centres is a very strong driver for “academic” companies. It helps SMEs to overcome the main barriers to entering into science-based industries (e.g. reaching the scale benefits of large R&D investments, sharing the risk of scientific knowledge revealing and basic research exploitation).
- **Open Innovation culture and strong appropriability strategies** allow SMEs to open up successfully their R&D strategies, without running the risks related to increasing knowledge search costs in inbound search strategies and the loss of business-critical knowledge (reduced value capture) in external collaborations.

G.Tec (ICT-Enabled)

- The company grew organically out of a science-based market through active participation in EU projects (reputation building, opportunities for scientific knowledge sharing) and a strong linkage with the academic community it came from.

Celoxica (ICT)

- Corporate VC helped the company to innovate its business model by focusing on a specific value proposition (financial market applications) in the exploitation phase of a very transversal knowledge solution.

Graphenea (ICT-Enabled)

- The company's embeddedness in the local HT cluster helped create trust and synergies to get access to high-quality HR and infrastructures. The company benefited from participation in the Graphene Flagship initiative and the H2020 program while initiating co-development with key partners/clients.

IBSENtelecom (ICT)

- Market pull technology collaborations (through requests from key potential client) helped the company to open up its innovation process, by creating the need to supplement internal know-how and external technological expertise to establish a technology alliance.

Entranet (ICT-Enabled)

- Internal expertise and a strong OI culture proved fundamental for a successful search strategy, aimed at the recombination of internally developed technologies in the construction industry with external ICT knowledge (speech recognition software). This transition enabled BMI through the recombination of technologies into a new value proposition.

Supponor (ICT)

- The company developed a sustainable 2.0 OIS by effectively managing appropriability in knowledge revealing, through the integration of the main stakeholders in the advertisement industry. The company shifted from a product-centered offering in a closed setting to a service-based open one through BMI.

BCB (ICT)

- Large EU framework projects and H2020 SMEs instrument program helped the company to focus on BMI and on a specific value proposition in order to pursue effective exploitation strategies for its general-purpose technology.

Zappar (ICT)

- The company evolved to an OI 2.0 strategy starting from a proprietary technology. The company created a new and high scalable BM by balancing the need to keep close control of its technology with the engagement of a large community of users, in order to set up a new industry standard.

Primo 1D (ICT Enabled)

- The company was able to extract value from its technology through a business pull approach (identification of the market application, working with potential clients), and a successful search strategy, in order to integrate microelectronics into textile products.

Table 4: The advantages of Open Innovation in SMEs

Box 1: Open Innovation in SMEs

Based on Di Minin A., Marullo, C., Piccaluga A. (2014) "Heterogeneous determinants of SMEs growth: A comparative look at open, closed and user-led innovation strategies in Technology-Based Firms" – 1st World Open Innovation Conference, Dec. 5-7 2014 Napa (CA)

Although Open Innovation is a well-developed business practice in large corporations, how it is managed in SMEs is still underexplored. Despite the recent surge of empirical research on Open Innovation in SMEs (Van De Vrande *et al.*, 2009; Parida *et al.* 2012; Brunswicker and Vanhaverbeke, 2011, 2014; Chesbrough and Bogers, 2014), mixed evidence has been provided about the "creative use of OI that many innovating SMEs around the globe are implementing" (Vanhaverbeke *et al.*, 2012: 9). The way SMEs manage and organize OI strategies is very different with respect to large corporations as a result of multiple elements that at the same time may represent opportunities and risks (Spithoven *et al.*, 2012; West and Bogers, 2011).

Empirical studies on Open Innovation in SMEs agree that collaborative R&D and open innovation strategies represent a strong opportunity for SMEs to overcome their structural limitations ("liability of smallness"): namely, the lack of financial resources, low market influence, less formalized R&D procedures, small innovation portfolio and limited ability in R&D planning and management compared to large firms (Acs and Audretsch, 1988; Vossen, 1988; Van De Vrande *et al.* 2009; Brunswicker and Vanhaverbeke, 2011, 2014). In particular, undeveloped internal capabilities (e.g. the capabilities necessary to transform inventions into products and processes) and the absence of a multidisciplinary competence base lead SMEs to take rather unstructured approaches to the organization of innovation processes compared to large firms (Vossen, 1998; Chesbrough and Crowther, 2006; Bianchi *et al.*, 2011).

Open Innovation is a multidimensional phenomenon. As Dahlander and Gann (2010) put it: light, multiple and different forms of openness emerge from evidence of empirical research in the field.

As regards the implementation of OIS by SMEs, empirical studies show:

- the importance of non-pecuniary (but strategic) interactions with network partners in inbound open innovation (Van de Vrande *et al.*, 2009; Brunsvicker and Vahaverbeke, 2011);
- the beneficial effects of outbound open innovation for SMEs in the commercialization phase (Spithoven *et al.*, 2012);
- the role of open business models in innovative entrepreneurship (Vanhaverbeke, 2012; Massa and Tucci, 2013; Vanhaverbeke and Chesbrough, 2014);
- an increasing convergence between open innovation and user-led innovation, where users play a central role in open innovation strategies (Bogers *et al.*, 2010; Bogers and West, 2012).

Spithoven *et al.* (2012) highlight the fact that, as regards inbound innovation, SMEs can engage in long-term external R&D collaborations with research partners. These often lead to a recombination of the internal knowledge base with the externally-developed knowledge. In this sense, "smaller firms have to open up more than their large counterparts" (:540). The outbound OI process

is still considered crucial in SMEs' OI strategies. Indeed, the market is important in giving value to technology (Lee *et al.*, 2010; Spithoven *et al.*, 2012; Vanhaverbeke and Cloudt, 2014). Vanhaverbeke *et al.* (2012) present evidence that the way SMEs engage with OI is often the result of a strategic choice that can lead to major changes in a firm's business model (Chesbrough, 2003; Vanhaverbeke and Chesbrough, 2014). Based on these considerations, recent research agendas claim that OI has to be considered a specific characteristic of SME *entrepreneurship*. Vanhaverbeke (2016 forthcoming) lists the most interesting elements that differentiate SMEs' entrepreneurial approach to OI from OI management in Large Enterprises (LEs): the substantial absence of a portfolio of innovation projects; the role of the founder/entrepreneur in developing OI; the importance of boundary spanning linkages in innovation strategies, and the characteristics of SMEs' value network governance

3. Open Innovation Models

The cases observed provided examples of various innovation strategies and different approaches to Open Innovation.

The companies emphasized the importance of the inflow of information, and their participation in the information flows of other companies. They also suggested that participation in platforms (including EU projects, local clusters, communities, etc.) was a very effective tool, which goes beyond one-to-one partnerships. We also found evidence of the increasing importance of collaboration with user communities, supported in many cases by the diffusion of key enabling ICT and digital business processes. We also found evidence of Open Innovation that became manifest when we looked at the development of business models rather than technological projects. Collaborations and alliances also proved fundamental in taking to market key technologies that required an innovative approach to commercialization.

Open Innovation is frequently an aspect of innovation processes, but the type of Open Innovation that we observed in all our cases was part of an “open but controlled” strategy. That is to say, open in the sense that it was collaborative, and controlled in the sense that companies tried to implement strategies to ensure a proper return on their investment.

All the cases we analysed emphasised the need to exploit an innovative solution to identifying the right avenues for commercialization. They stressed the importance of opening up to ideas and alliances, and also of paying close attention to the appropriation strategy to be adopted in order to take advantage of the new value generated.

All our case studies are producers or expert adopters of ICT systems. As such, in many cases they interact in business-to-business contexts. As part of their product offering, they need to customize their solutions to serve the individual needs of their customers. Co-development and customization were indeed a central focus for most of the innovation strategies that we observed. It is easy to speculate that the very nature of ICT has led to this high level of customization and co-development.

3.1 Observed modes of Open Innovation

Open Innovation literature traditionally recognizes three modes of Open Innovation - Inbound, Outbound and Coupled. Scholars also tend to distinguish between Open Innovation that is developed through traditional business partners and Open Innovation which is developed with the involvement of users. We therefore divide the 13 cases analysed into four different categories.

- **Inbound Open Innovation** “[...] is the practice of leveraging the discoveries of others: companies need not and indeed should not rely

exclusively on their own R&D" (Chesbrough and Crowther, 2006: 229). Inbound Open Innovation activities, then, refer to the acquisition and transfer of external knowledge, ideas and technologies into a firm through stable partnerships, R&D agreements, IP in-licensing, technology acquisition, and customer/user involvement in the product concept definition (Gassman and Enkel, 2004; Van de Vrande *et al.*, 2009). The emphasis is on the information, knowledge and technology that are brought into the company, which combines these new developments with its existing knowhow and technology portfolio to bring to market new products and services through its own business models. Knowledge can be brought into the design phase of new products through formal partnerships with academic/research institutes and other companies. This was the strategy chosen by most of the companies studied (Loccioni, g.tec, Entranet, Graphenea, Philips, BCB). Most of them said that it was a fundamental way of engaging clients in co-development and joint-design of new products. We also considered the case of BlaBlaCar, which integrated knowledge and markets through acquisitions, and that of Celoxica, the target of an acquisition by its clients who wanted to reach higher levels of integration and co-development.

- **Outbound Open Innovation** "[...] suggests that rather than relying entirely on internal paths to market, companies can look for external organizations with business models that are better suited to commercialize a given technology". (Chesbrough and Crowther, 2006: 229). Outbound Open Innovation activities refer to the transfer of technology, ideas and knowledge outside the firm's boundaries for external exploitation, strategic alliances, joint ventures; IP out-licensing, technology selling, and venture spin-outs (Gassman and Enkel, 2004; Van de Vrande *et al.*, 2009). The emphasis is on the development of new open business models and new ventures in take-to-market technologies. Zappar and STM scaled up their business model through platforms, in order to engage with a community of users/partners for the development of new solutions. Other companies in our sample, such as Supponor and Loccioni, innovate their offering by opening up their business models and building inclusive interfaces with partners. Some of the large companies that we considered also mentioned the use of programmes to encourage managers to spin out their activities into new and controlled ventures (Loccioni and Philips), while other SMEs were established as part of spin-off programmes from their own institutions (Primo 1D, g.tec, Celoxica).
- **Coupled innovation** is the combination of both inbound and outbound innovation processes. The large companies in our sample (STM, Loccioni and Philips) participate in both inbound and outbound innovation activities. IBSENtelecom also provided evidence of both inbound and outbound innovation activities, even though the company's open business model has not reached maturity. Managing these flows can be complex, and we can talk about a coupled OIS only in the presence of a

comprehensive strategic approach, which was clearly emphasized in the large companies in our sample.

- **User-Led Innovation.** There is increasing evidence in the ICT sector that users are becoming part of the innovation process. User involvement in innovation should be considered part of an OIS. This is a phenomenon that has been widely recognized by scholars, and more recently by policymakers (see the work of the Open Innovation 2.0 community). In our sample, we have companies such as BlaBlaCar that base their offering on the contribution of user-generated content and activities, and that innovate this offering in the light of the suggestions and requests of users. Other companies create user-oriented platforms around their technologies (Zappar), products (STM) and services (Loccioni) to orchestrate a community of users, making use of their contribution in a process of co-development.

Industry	Company	MODES OF OI MODELS			
		Inbound	Outbound	Coupled	User/Customer-led
ICT	BlaBlaCar	Acquihiring			With users
	Zappar	Product co-development with clients	Integration of Zapcode in clients' platforms		With customers and in perspective with community of users
	STM			Open (but controlled) platform architecture	With customers and lead users
	IBSEN-telecom	Partnerships IP in-licensing for reinvention	Leveraging a network of complementary capabilities for new product development	Experimentation and development of new business models within a closed ecosystem	
	Celoxica		Technology Spinout from Oxford Modules to university		
	BCB	R&D networking new tech knowledge in-sourcing Client co-development	Partnership for new product co-development		
	Supponor		Integration among partners to balance IP management and BM evolution		
ICT ENABLED	Loccioni	Selective OI strategy "governing the dialogue"	Development of open business models with partners and Corporate Spin-Offs	ONLY within the Ecosystem	With selected customers
	g.tec	Appropriation (patents) Retention (HR) Close links with academic communities A model of "intense research-based organization"	Tools for clients' customization -marketing- (very weak outbound open innovation)		
	Entranet	Technology In-licensing High relevance of users' feedback in product development	Product testing with clients		With community of users
	Graphenea	Co-development with partners and clients (very weak) Confidentiality Close links with academia	Collaboration in networks		
	Primo 1D	Technology spinout from the CEA/MINATEC open ecosystem		ONLY within the Ecosystem	
	Philips	Co-development with partners and Selective OI strategy	Corporate Spin-Offs	Integration with universities	

Table 5: Modes of Open Innovation models

We looked at the level of adoption of Open Innovation strategies in the various companies, and mapped their different approaches. We ranked these approaches on an “openness” scale, from closed - i.e. very little evidence of any OIS, either inbound or outbound - to fully open, with significant levels of collaboration, co-development, insourcing and outsourcing of technologies, and users’ engagement. The following can be used as a guide for examples of companies that are adopting a more or less collaborative innovation strategy. In our ranking, g.tec is the company that presents the least evidence of an open innovation strategy. At the other end of the scale, Loccioni and Philips have explicitly implemented an OIS.

In order to elaborate this ranking we took into account the following dimensions:

- Type of OI: inbound, outbound, coupled,
- Partners/entities involved: companies, universities/public research labs, users,
- Depth of each involvement/interaction,
- Explicit reference to OIS during the interview or in company’s material.

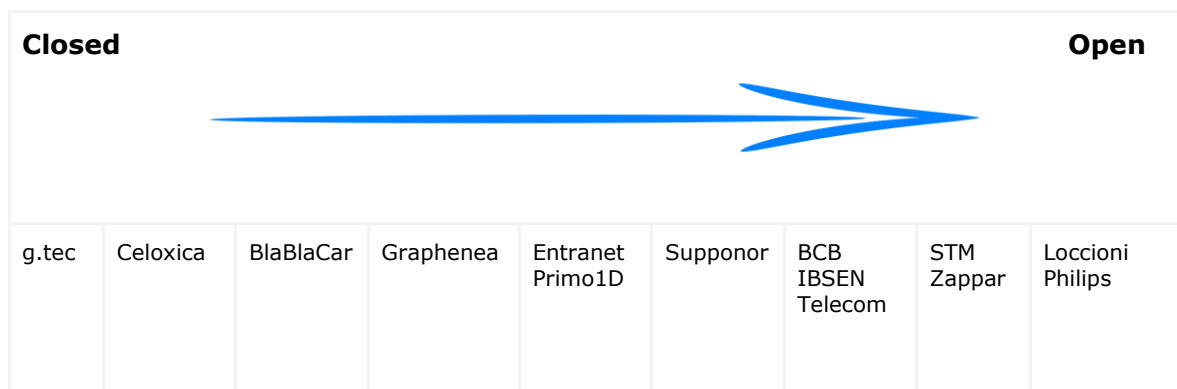


Figure 1: Open Innovation depth in the interviewed companies

3.2 Main characteristics of the companies' innovation ecosystem

The companies that were considered for this study were part of different innovation ecosystems and interacted with different partners. The following table summarizes the type of partnerships that the companies established in order to develop their solutions. Universities and public research organizations were the most common research partners for inbound OIS. Half the companies in our sample said they collaborated with these institutions. Many of the companies also discussed the centrality of co-development partnerships, either within their value chain, with other industries or with users. Investors also played a role in this process, providing not only financial resources, but also ideas and competences.

INDUSTRIES & FORM OF RELATIONSHIPS		
Type of non-industrial partners	ICT	ICT-Enabled
Spin-Offs	STM	g.tec Loccioni Philips
Universities	Celoxica BCB STM IBSENtelecom	g.tec Graphenea Entranet Philips Loccioni
HT Clusters	BCB STM	Graphenea Primo1D Philips
INDUSTRIES & FORM OF RELATIONSHIPS		
Type of industrial partners	ICT	ICT-Enabled
Corporate Venturing	Celoxica (being invested by Credit Suisse) Graphenea (being invested by Repsol) STM (establishing a corporate investment fund)	Loccioni (investing in corporate spin-offs)
Venture Capitalists	BlaBlaCar Celoxica Supponor	
Beneficiaries of significant public investment	BCB, Supponor (H2020 SME Instruments) IBSENtelecom (Regional/National programmes) BCB, STM (European Programmes FP7/Structural)	g.tec, Graphenea (H2020 SME Instruments) Entranet, Primo1D (Regional/National programmes) Entranet, Graphenea, Primo1D, g.tec, Loccioni, Philips (European Programmes - FP7/Structural)
Industrial Partners in the same value chain⁷	IBSENtelecom Supponor STM	Loccioni
Industrial Partners not in the same value chain	BCB Celoxica Zappar	Entranet Loccioni Primo1D
Co-development with customers	Zappar BCB STM Celoxica	Loccioni Primo1D
Final Users/crowdsourcing	BlaBlaCar Zappar	Entranet

Table 6: Nature of companies' relations in the open innovation ecosystem

⁷ A value chain is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market (Porter, 1985).

4. Drivers and Barriers to Open Innovation Strategies

This study provides a snapshot of the different approaches adopted by companies to innovate in ICT sectors or to take to market ICT-enabled products/services.

Different strategic choices obviously led to different obstacles and vectors of growth. While we cannot claim that this analysis is comprehensive, it has identified a series of drivers and barriers for open innovation strategies (and innovation in general) in Europe. Here we try to generalize some of our findings regarding different managerial strategies and cluster companies according to their commonalities. For a detailed description of the findings regarding different managerial strategies for each of the companies considered, please refer to the Annex.

Below we list the main drivers and barriers highlighted by the majority of the companies in our sample (see Table 7).

Drivers:

- The sample identifies the clear role that **large EU consortia** can play in enabling Open Innovation Strategies (OISs), in particular regarding explorative R&D activities. G.Tec declared that EU consortia represent the backbone of its development because they provide a source of inspiration, knowledge and new expertise. Primo1D acknowledged the role of European PASTA Project (FP7) in boosting the development of its technology. Graphenea considered that its participation in the European Graphene Flagship was a milestone in the history of the company. Being a partner of the Flagship gave the company access to high-quality knowledge and helped it to evolve according to the changing needs of the graphene marketplace.
- Furthermore, it is interesting to note that where the companies implemented OI 2.0 strategies, they claimed they had built communities and **platforms starting from the assets that they could best control**. For example, Zappar is building an Augmented Reality (AR) distributed ecosystem around a platform based on its proprietary technology.
- Another important driver of OI identified is **control through IP assets**. We found evidence that companies tend to build alliances and collaborate when they can secure control of their own technologies and knowledge. While companies are likely to recognize the importance of collaborations to boost their R&D capacity, they also want control mechanisms to ensure a proper return on investment in innovation. Supponor explicitly said that working openly and collaborating with the other stakeholders operating in its market sector was essential in developing its business. Nevertheless, the company pointed out that the only way to implement an open and cooperative innovation strategy is by controlling the technology through an effective IP strategy.
- The SMEs in our sample attributed significant importance to the **Horizon 2020 SME Instrument** because it provides a booster for

business development of innovative propositions. Thanks to an SME Instrument (Phase 2) award, Supponor now has the opportunity to develop a new product, starting from its expertise and expanding its business towards new market. It can also enter a potentially huge new dimension of business and growth. Participation in an SME Instrument project made BCB shift from a general research guidelines approach to bottom-up approach, based on market implementation of technology and on business model innovation. BCB declared that participating in this project helped the company to set the right priorities to go to market.

- Finally, another driver identified is **embeddedness in a rich ecosystem**. Being a player in a cluster characterized by easy access to complementary assets, and by an intense flow of knowledge and information, leads to significant advantages and OISs that are more effective. Graphenea reported that CIC nanoGune, the nanoscience research centre in which it is located, played a fundamental role. This ecosystem gave Graphenea access to essential high quality human resources and infrastructures at a relatively low price. Furthermore, the company benefits from knowledge sharing, synergies and trust among the members of the cluster. Primo1D grew up in the CEA (French Commission on Alternative Energies and Atomic Energy - Commissariat à l'énergie atomique et aux énergies alternatives), an ecosystem conducive to creating innovative breakthroughs.

Barriers:

Two different groups of obstacles stand out. The first refers to internal management and the second to European and national innovation systems:

- **Internal management.** An OIS requires coordination of resources and is complex to implement. Companies in the sample suggest that achieving the right balance between internal R&D and external sourcing of knowledge and technology remains a serious barrier for the implementation of OIS. In implementing an OI strategy, it was necessary for Zappar to find the right balance between what is internal and proprietary, and what is external and the object of co-development with partners. Currently, Zappar is working closely with its customers to co-develop AR contents and applications, but the technology is still developed internally by Zappar employees exclusively.
- **European and national innovation systems.** Despite the critical role played by EU programmes, various companies still report that a large barrier is the lack of institutional support and/or the presence of rules and regulations that prevent innovation. Companies in the sample complain that the rigidity of policymakers and the public sector hinders innovation dynamics in Europe. Loccioni highlighted the bureaucratic difficulties in European project development: they delay the speed of innovation and complicate collaboration. Concerning the rise of a European "sharing economy", BlaBlaCar noted that the absence of some key infrastructures and regulations (such as digital identity standards) prevent Europe from turning into a truly unique digital market. Graphenea and g.tec lamented the lack of industrial integrators in

European innovation ecosystems. This lack prevents companies from developing technological excellence and from establishing strong collaboration with big industrial players.

General Ranking	
Drivers	Barriers
Large EU Consortia (Explorative R&D)	Establishing the right Innovation Mix
OI 2.0 Starting from proprietary technologies	Institutional Barriers
IP Protection	
SME Instrument - H2020	
Embeddedness in Innovation Ecosystems	

Table 7: Drivers and Barriers to Open Innovation: general overview

For a better understanding of how different drivers and barriers affect different typologies of companies, we split the sample into four groups. Table 8 shows which barriers and drivers are relevant for: i) academic spin-offs/science-based companies; ii) ICT companies; iii) SMEs; and iv) large enterprises (LEs).

Spin-offs/Science-Based Companies		ICT Companies	
Drivers	Barriers	Drivers	Barriers
Participation in Large EU Consortia	Establishing the right Innovation Mix	IP Protection	Establishing the right Innovation Mix
Participation in/Coordination of Networks	Institutional Barriers	Embeddedness in Innovation Ecosystems	Institutional Barriers
Business Model Innovation	Distraction of Resources		
SMEs		Large Enterprises	
Drivers	Barriers	Drivers	Barriers
SME Instrument – H2020	Establishing the right Innovation Mix	Integration of Existing Teams	Institutional Barriers
Participation in Large EU Consortia	Difficulties in Establishing Partners	Embeddedness in Innovation Ecosystems	Establishing the Right Innovation Mix
Business Model Innovation	Distraction of Resources	Large EU Consortia	Long Learning Curve
OI 2.0 Starting from proprietary technologies	Institutional Barriers	OI 2.0 Starting from proprietary technologies	
IP Protection		IP Protection	
Embeddedness in Innovation Ecosystems		Internal OI Culture	
Co-development with customers			

Table 8: Drivers and Barriers to Open Innovation: groups of companies

Spin-offs and science-based companies in our sample reported that two very important drivers in the implementation of their OISs are (1) participation in EU consortia, and (2) participation in and coordination of networks. This is consistent with the fact that this category of companies needs to find strong partnerships to get to market. Quite often, these companies are the result of EU projects, and are embedded in research-intensive settings. Therefore, they must quickly identify research, industrial, and commercial partners. In addition, these companies suggest that identifying the right business model is a critical step for the implementation of their OIS. Without a proper business model, science-based enterprises fail to move out of their original purely academic setting.

Concerning the barriers, spin-offs and science-based companies identify obstacles that are similar to those experienced by the general sample. They cite the challenge of finding the right innovation mix between internal R&D

and the external sourcing of knowledge and technology, and the presence of institutional barriers to the profitable implementation of OISs. They also suggest that another barrier for the implementation of an OIS is distraction of resources. Lacking managerial focus, distracting resources from the main project, and spending too much time and energy while searching for useful information and knowledge, are seen as serious obstacles for this group of firms as they try to establish themselves on the market.

The ICT companies in our sample, i.e. those companies that serve a **digital market**, recognize the relevance of IP protection for their OISs. They also identify proximity to a rich ecosystem as a useful driver, and agree that local connections are relevant even for the ICT industry. Regarding barriers, ICT companies are most affected by institutional obstacles: rigid policies and public programmes, and rules and regulations that do not adapt fast enough for a rapidly evolving industry.

Considering the traditional distinction between **SMEs and large enterprises**:

- Drivers identified by SMEs overlap with those identified by spin-offs and science-based companies in our sample. Small companies need partners and to be part of a network to bring their new technologies to market.
- Also, for nearly all the SMEs in the sample, institutional barriers were among the obstacles to the implementation of OIS.
- For most of the large companies in our sample, proprietary assets were the starting point for the design of an OIS 2.0. These strategies were based on the idea that "you share what you can control". Due to their size, these companies are likely to orchestrate new platforms and collaborative forms of interaction with users, leveraging assets that they can firmly control.
- Quite interestingly, large companies do not consider "search costs" as a burden for an OIS. On the contrary, they think that a search strategy is one of the drivers for their approach to innovation.
- The main barriers identified by large companies are found in the implementation phase of an OIS. Once a strategy for partnership, technological acquisition, or licensing is designed, companies struggle to carry out the various stages to fully accomplish the plan. In other words, companies face difficulties when shifting from the theory of OI to its practice. This implies a pattern of trial and error in which they learn the right steps to take in a gradual implementation of OISs.

5. Open Innovation Process Management Findings

We list below 11 management findings from the cases analysed, of interest to managers of open innovation processes in Europe. We mention which cases relate to each finding.

- i. Balancing the internal and external in Open Innovation.** Companies entering into partnerships need to select and nurture relevant and synergic internal capabilities to benefit from a joint development with external partners. Open Innovation is not about simply outsourcing R&D processes. Companies failing to pay attention to the development of internal knowhow may lack the relevant absorptive capacity to engage in fruitful open innovation strategies (Zappar, Loccioni, g.tec, Philips).
- ii. Business models matter.** The development of key technologies is not enough to go to market. As companies identify ways to exploit their own technologies, they need to adapt their business models. Applying the right business model⁸ will give them a competitive advantage. In partnerships, business models need to align partners' incentives towards a win-win solution. Not having a suitable business model may prevent the alliance from being successful (Zappar, Celoxica, BCB, Supponsor).
- iii. Experience matters.** The case studies presented a vast amount of evidence that first attempts at commercialization of new technologies were doomed to fail. Companies of various dimensions experienced significant levels of trial and error. Building resilience (and internal consent) to an initial failure is fundamental in order to give business developers the opportunity to try again (IBSENtelecom, Loccioni, g.tec, Graphenea, Primo1D, Philips).

⁸ According to Chesbrough (2006), a business model embeds two essential functions: the creation of value and the capture of a portion of the value created. On one hand, the creation of value refers to a company's activity (providing services or products); on the other hand, capturing value consists in gaining competitive advantage from the company's activity. "Open business models enable an organization to be more effective in creating as well as capturing value. They help creating value by leveraging many more ideas because of their inclusion of a variety of external concepts. They also allow greater value capture by utilizing a firm's key asset, resource or position not only in that organization's own operations but also in other companies' businesses" (Chesbrough, 2012). Open business models regulate the flow of ideas from the invention to the market between, at least, two companies that shared the work of innovation. The open business model provides the structure and the guidance to the flow, through the orchestration of the activities developed by actors involved and through the effective management of the IP, bringing to the market the innovation (Chesbrough, 2006). Development costs and time of innovation decrease, and companies are not limited to act in the single market they serve, as they might be able to penetrate different segments through OI means (licensing, joint ventures, spin-offs, etc.) (Chesbrough, 2012).

- iv. Human resources management matters.** Successful business development is the result of combining a great technology with a business model. A range of conditions needs to be met to achieve these combinations, but ultimately success is about engaging the right people to work on the right projects. Still, little attention is paid to the way that internal incentives, instructions and procedures are presented to staff (technical, operational, managerial), how to manage turnover, and how to preserve tacit knowledge. Savvy management of HR is found to be critical for the successful implementation of technology transfer, commercialization and partnerships (BlaBlaCar, IBSEntelecom, Loccioni, g.tec, Graphenea, Philips).
- v. Organizational culture matters.** Within a company a common language needs to be developed. Managers need to be actively encouraged to take up initiatives that deviate from business-as-usual, and to cross functional barriers. A common language, shared values and the definition of clear measurements of success are also vital between partnering institutions for the successful implementation of an OIS. Organization studies have emphasized that shared cultures are extremely difficult to achieve and preserve. This study presents evidence of the importance of organizational culture in open innovation (BlaBlaCar, Loccioni, g.tec, Entranet, Philips, Primo1D).
- vi. Accountability matters.** The importance of accountability is connected to organizational culture and the building up of experience for successful OIS. Investing resources in innovation is, by definition, risky. Companies follow standard control procedures for project management that mitigate risk and keep performance under control in business-as-usual settings. These control procedures need to be adapted for business development, internal entrepreneurial activities and strategic partnerships. For these types of activities, clear accounting procedures also lead to better allocation of resources, and prevent waste of precious resources (IBSEntelecom, Celoxica, Loccioni, g.tec, Philips).
- vii. Unfocused innovation may cause distraction.** Lack of focus can be a risk, as the development of enabling ICT opens various avenues, not all of which will be profitable. "Falling in love" with the technical characteristics of a technology and lacking a sense of direction to go to market leads to the development of unsuccessful commercialization. The cases presented here suggest that a pivotal moment in the innovation life cycle is the identification of a possible commercial application, and the focalization of resources (Celoxica, BCB, Primo1D).

6. Policy Implications

"Open innovation is about involving far more actors in the innovation process, from researchers, to entrepreneurs, to users, to governments and civil society. We need open innovation to capitalize on the results of European research and innovation. This means creating the right ecosystems, increasing investment, and bringing more companies and regions into the knowledge economy. I would like to go further and faster towards open innovation."

Commissioner Carlos Moedas, June 22 2015

We identify here below seven policy implications for Open Innovation, based on the cases analysed, that could be valuable for policymakers and managers dealing with ICT innovation in Europe.

i. Local ecosystems built for open innovation

Innovation does not happen in isolation. Innovators are often working within rich ecosystems, such as clusters. These ecosystems have to be specialized and well-connected. The locus of innovation is no longer in individual large companies, but in innovation networks, which involve a mix of partners: universities, labs, start-up companies, SMEs, multinationals, and governments. The relationships between these players largely determine the overall performance of an innovation ecosystem. Open innovation is essential to the correct functioning of these ecosystems, as it relies on the exchange of ideas and inside/outside exploitation of resources. These exchanges function better when Open Innovation participants are in close proximity and can physically communicate and share.

Being located and interacting within a "rich" and specialized ecosystem can provide companies of all dimensions with key competitive advantages. Large multinationals are able to create their own physical campus where they invite other companies to come and be part of this ecosystem. For instance, Philips was not only a participant in an ecosystem, but also the main actor and the orchestrator. It opened its research campus to other companies to join its research; it invited public actors (government) and helped them open their own centre (e.g., the Holst Centre, set up by IMEC and TNO), and actively cooperated with universities locally and abroad.

On the flipside, smaller companies may not be able to orchestrate their own local ecosystems. However, they may be able to join or locate within rich ecosystems. For instance, Primo1D resulted from the endeavours of an employee of one of the larger entities on a research campus of this kind. Its founder worked for the CEA, the French Commission on Alternative Energies and Atomic Energy (Commissariat à l'énergie atomique et aux énergies alternatives). Graphenea represents another example in which close proximity to a research lab mattered a lot. On the other hand, not being able to connect to the right ecosystem (IBSENtelecom, Entranet) may compromise the effectiveness of OISs. Companies must coordinate and network with the

appropriate foci in order to grow. The co-location of companies at different stages of research, technology exploitation and commercialization enables cooperation for knowledge-sharing activities, enhancing open innovation effectiveness. For instance, some of the case studies failed in their first attempts at the commercialization of new technologies or did not succeed as planned; but through trial and error and resilience they were able to find new paths to growth. For example, Loccioni benefited from its association with much larger companies for the application of existing technologies in new markets.

Policymakers can play a dual role in the development of rich ecosystems: i) they can encourage the creation of large research campuses as key infrastructures for local innovation ecosystems; ii) they can help SMEs, entrepreneurs, and other institutions to connect and enrich innovation ecosystems. Building large infrastructures often requires a large fixed cost and low variable costs that any company would find difficult to afford without coordination. Moreover, SMEs can struggle to develop their technologies in an isolated and poor innovation ecosystem. They may find their business development process rather difficult.

ii. Orchestrating a global ecosystem through open relationships

While physical and local interactions play an important role, competitive advantage needs to be achieved on a global scale. Here, policymakers can indeed play an important role in encouraging partnerships through projects and between regions.

A number of the companies included in our sample were involved in EU Projects such as FP7 and Horizon2020. These companies highlighted the fact that EU-financed initiatives played a significant role in empowering and connecting innovation ecosystems. Open innovation is a strategy for reaping the benefits of connection and knowledge exchanges at the local level on a global scale. On one side, participation in large R&D networks and research consortia with public clients and partners (FP7) as in the cases of Graphenea, g.tec, Loccioni and BCB enables external knowledge in-flows (inbound open innovation⁹), and provides opportunities to:

- Gain visibility and reputation,
- Foster expertise exchange,
- Gather new scientific knowledge, and
- Define priorities for internal R&D processes.

On the other side, EU-financed projects reduce the risks of external technology exploitation through outbound open innovation¹⁰. Proactive technology alliances (e.g. partnerships funded by the H2020 SME Instrument) help SMEs to pursue a bottom-up approach to technology exploitation through

⁹ For a definition of inbound open innovation, please refer to section 3.1, pp.28-29.

¹⁰ For a definition of outbound open innovation, please refer to section 3.1, pp.28-29

access to complementary innovation assets (external technological knowledge, product/market knowledge, financial resources, shared risks, access to professional coaching). Engaging in alliances for the purpose of technology exploitation enables SMEs to focus on a specific value proposition and to set priorities to go to the market.

Policymakers can play a pivotal role by sponsoring conglomerates and projects, which act as hubs where companies can meet. The orchestration of this kind of intervention needs to find a fine balance:

- First of all, to avoid public funds crowding out other partners, risk-sharing is fundamental in order to have engaged and committed enterprises on board, and the current forms of co-investment (rather than 100 percent public funding) should be encouraged. For instance, after receiving venture capital funding in 2015, Supponor was awarded a €1,207,500 grant through the Horizon 2020 SME Instrument (Phase 2) to carry out a three-year project on augmented reality cameras. These grants act as signals: they provide winners with visibility and reputation, and recipients seem to be able to attract further funding.
- Second, public authorities, such as the EU, national or regional authorities, as orchestrators, should ensure that big industry players are also involved in the public-led initiatives. Their presence facilitates the growth of the SMEs that apply to these co-investment instruments. For instance, Graphenea benefited from the EU Graphene Flagship Initiative, that included a number of larger companies. One of these was Repsol, which ended up investing in Graphenea.
- Third, rules and regulations need to allow flexibility and experimentation. A significant aspect of open innovation has to do with the ability to coordinate research and innovation consortia, as the large companies in our sample (such as Loccioni and Philips) revealed. The case studies present evidence for the claim that successful management of partners represents a delicate and fundamental component of any strategy. Companies need to identify searching criteria and incentives, align capabilities and recognize a common language. Once the proper characteristics of partnerships have been identified, a lot of trial and error (such as can be seen in the cases of Philips, Loccioni, Supponor and IBSENtelecom) and significant reputation building is involved.

In conclusion, most of the companies in our sample demonstrate that groups of industrial allies can represent a formidable competitive asset for any innovative enterprise. Therefore, public authorities should make sure that their programmes encourage the right type of partnerships that will optimize the potential of their participants.

iii. Intellectual property helping open innovation

The case studies suggest that formal intellectual property (IP) protection mechanisms are tools that facilitate collaboration. For instance, Entranet was able to license-in and bring in knowledge and software from Nuance Communication on their speech recognition technology, while Celoxica was

able to sell part of its business to raise funds in order to exploit its IP and grow another section of its business.

However, patents, trademarks and copyrights provide protection that is far from perfect. In addition, when trade secrets and retention of key employees are the only tools for effective protection of core technological assets (see for example g.tec), sharing knowledge with partners and co-developing solutions with external players may prove to be extremely difficult. Companies need to be aware of the complexities of IP management and develop effective appropriation strategies. Only thus can they take their technologies successfully to market and overcome the issue of IP protection as an obstacle to the scope and potential success of research consortia (Zappar, STM, Celoxica, Supponor, g.tec, Graphenea, Primo1D, Philips).

Policy could also play a role here. First of all, it is important to acknowledge the limits of the patenting system and explore alternatives to formal tools of protection. Second, SMEs often face significant search costs when looking for the right technology to exchange and partners to interact with. Therefore, support could take the form of providing help to SMEs that are trying to secure proper IP access to external technology. More generally, patent offices could improve the way patents are made searchable and attempt to diminish search costs for SMEs.

Third, various companies in our sample rely on OI intermediaries to take their know-how and technologies to the market. For science-based companies, for instance, these intermediaries are universities (in the cases of g.tec and Celoxica), public research centres and incubators (Graphenea and Primo1D). These intermediaries are responsible for helping companies to identify the right appropriation strategies. Therefore, public programmes should continue to enhance the professionalization of IP intermediaries, and monitor or assist the creation of IP marketplaces.

Finally, companies such as g.tec rely on trade secrets and retention of key employees for protection because IP protection can be expensive and often hard to enforce. These obstacles make core technological assets difficult to share with partners and make it difficult to co-develop solutions with external players. Policymakers may wish to promote easier ways of enforcing IP protection when formal IP tools are not suitable.

iv. Facilitating users' involvement for OI 2.0

The involvement of users is a pivotal component of Open Innovation 2.0 communities. The diffusion of ICT and social media during the last two decades has increased opportunities to create new businesses based on communities and the potential of engaging users in the innovation process.

Cases in our sample such as Zappar and BlaBlaCar suggest that ICT companies are increasingly developing new and highly scalable business models based on platforms and collaborative communities, where producers and users emerge in very diverse industries at an incredible speed. Policy

makers can promote the emergence of these dynamics in both user-led or user-made innovation by promoting crowdsourcing mechanisms and challenge prizes, making sure that European industry is capable of reaping the benefits generated by users' communities and monitoring how users' contributions are taken into consideration and rewarded.

In addition, policymakers should keep up with a fast-changing digital industry. They should monitor very closely, regulate when necessary, and support when desirable new standards for user-producer interaction. For instance, BlaBlaCar raised issues of ID verification and asked for the development of a common European standard to help online communities like BlaBlaCar expand in the common digital single market.

v. Policymakers should strike a balance between encouraging basic research, applied research, and innovation models

The companies interviewed acknowledged that the EU investment in research and innovation is becoming more oriented towards applied research and commercialization projects. However, some of these companies, particularly those which have more experience with EU funding, emphasized that public investment should continue to secure support for basic research.

According to our limited sample, European industry would like policymakers to balance their investment in promoting activities across the entire value chain, from basic research to commercialization and business expansion.

In addition, policymakers should encourage companies to focus on profitable technologies to remain competitive in the global market. Companies, and in particular high technology SMEs (where often the entrepreneur personally developed the technology) may lack complementary innovation assets (e.g. product/market knowledge), which are important to pursue successful commercialization strategies.

In designing a new research and innovation policy, policymakers should adopt an approach that balances support for basic/applied research and the commercialization of research.

vi. Remaining open to new forms of Open Innovation and emerging growth models

The European economy is extremely diverse and characterized by multiple drivers of growth. Encouraging entrepreneurs to apply Open Innovation can help, but the Open Innovation model itself is evolving and different wherever applied. As discussed in the various cases presented in this study, companies keep developing business models that are very different and often unique. When designing policy measures to boost entrepreneurial commercialization of science and technology, policymakers need to acknowledge that exponential growth is not the only form of business development that leads to new jobs and wealth. Different forms of growth have different limitations. For instance, when growth happens through acquisition and through rapid expansion,

access to risk finance can be a bottleneck for further development. In our sample, BlaBlaCar relied on venture capital markets to grow through "acqui-hiring" (see annex for more details) and on occasion had to seek financing abroad. Policymakers should continue to support access to risk finance, in order to assist the development of a lively venture capital industry in Europe. The availability of venture capital funding is crucial to allow companies to grow and innovate, especially for start-ups and innovative SMEs, e.g. Celoxica.

On the other hand, some companies prefer to opt for organic growth and self-financed incremental expansion. In this case, access to key competences (rather than financing) and industrial partners may become the most important areas for policy intervention. Graphenea had these needs when it joined the EU Graphene Flagship Initiative and benefited from what this conglomerate of companies could offer. Policymakers could organize more conglomerates, immune to anti-competition scrutiny, to encourage cooperation and open innovation.

Finally, policymakers should not discard gradual changes as valueless. Linear and slow-paced maturation of a business is consistent with the go-to-market process of cutting-edge and enabling technologies. For instance, Celoxica had to reinvent itself before it became the successful and growing company that it is now. Loccioni's growth is an example of expansion of a family-based, highly innovative company. Policy makers should consider offering direct encouragement for the reinvestment of profits into innovative activities or in the definition of OI strategies.

More generally, consistent with the presence of different modes of growth described in this study, policy can play a role in "bridging" industries (within high-tech or between high-tech and traditional sectors). Policymakers can use their grant programmes to encourage cross-sectorial innovation (a pillar of OI 2.0) and ICT-enabled innovation. For instance, Primo1D benefited from the backing of CEA in introducing an ICT-enabled e-thread that can be used in the more traditional laundry and textile industries.

vii. Policymakers can contribute to creating the conditions for the growth and diffusion of a strong Open Innovation culture

Companies experience Open Innovation strategies differently, and their ideas on how to implement OI strategies mature. The most experienced OI companies in our sample, such as Philips or Loccioni, emphasized the need to educate human resources in OI. They also organized initiatives to prepare engineers, doctoral students and managers in the implementation of OI strategies, such as alliances, technological co-development and the like. Policy can support these initiatives to enhance the OI capabilities of people within an organization.

Moreover, various cases such as Primo1D and Supponor agreed that OI is the result of an integration of various competences, and that OI strategies should be implemented by people who have mastered these competences.

Policymakers could promote industrial doctorates or executive training that can contribute to the blending of different competences and the creation of conglomerates or corporate-campuses. Companies need to identify ways to exploit their own technologies, business models need to be adapted, and competitive advantage is the result of exploiting scientific and technological knowledge through an open business model. Exposing students and junior employees to new business models and business practices, and also co-development and technology transfer initiatives early on in their education will help them become better integrated in environments where an Open Innovation model is applied.

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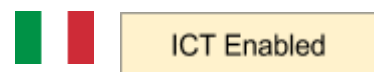
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Annex – Company Cases

1. Loccioni



Via Fiume, 16
60030 Rosora, Ancona (IT)
Web: www.loccioni.com

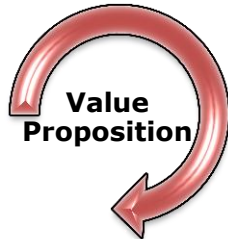


Company description - Loccioni is an ICT-enabled company established in 1968 by Enrico Loccioni. Growing up around its core competence of measurement, the company offers technology-tailored solutions. The company has five main business units, namely Energy, Environment, Industry, Healthcare, and Mobility, and two emerging ones, Train & Transport and Electronics. Loccioni has two branches in Italy and three around the world: Shanghai (China), Washington D.C. (United States), and Calw (Germany). Loccioni provides customized, customer-tailored solutions in the field of productivity management and quality control. The company conducts integration activities in which ICTs play an essential role: sensors and robotics enable the company to collect data more precisely and accurately in many different environments. Loccioni uses ICT to produce smarter solutions and reduce its costs, integrating products with sensors and managing data that these sensors produce. *"We give value to data"* is the motto of the company: Loccioni applies its technologies to collect precise data, and its knowhow to extract information from them.

Company Status - Loccioni has about 400 employees (2014) distributed in five branches (two in Italy, three in the rest of the world). Loccioni has a long term R&D function, called RforI (Research for Innovation), and one R&D within each business unit. Loccioni recurs to multiple external sources of creativity, but it also benefits from a cross-fertilization of ideas within the firm. Almost 50 percent of the collaborators have a Bachelor's Degree or a PhD, and the RforI team has more than 40 researchers.

Financial Results - In 2013, Loccioni's turnover was about €70.5M, and R&D expenditure was about five percent of the sales turnover. Nine percent of direct personnel costs were allocated to train internal human resources.

Innovation Roadmap



The core competence is the “measurement” and the motto is “to give value to data”.

Loccioni provides solutions about quality measurement systems.



Ideas for product development come from both inside and outside the company.

The company has one R&D function for each business unit and one corporate long-term oriented R&D (named RforI).

The company co-develops with strategic suppliers and clients.



For projects developed within each single business unit, the business unit interacts with clients. For projects developed within RforI, the Business Development function is in charge of looking at new market opportunities.

Loccioni attributes to its employees the key role of promoters of company solutions.

Innovation Strategy - Since its establishment, Loccioni has followed an open innovation strategy. Company top managers explicitly mention open innovation as one of the drivers of their R&D and business development activities. Loccioni co-develops with clients through a flexible organization, which allows the Group to adapt to different environments and make quick changes, often needed when implementing innovation strategies that involve cooperation with external partners, clients and universities.

Open Innovation Relevance - Loccioni's growth relies not on acquisition, but on organic growth: the company devotes a lot of attention to human resources and strongly promotes the entrepreneurial activities of its own employees. Employees often develop projects and ideas then start up spin-off companies that share Loccioni's values.

Loccioni faces its major challenges in selecting key clients and finding the right partners for efficient cooperation, re-using unexpected results of R&D activities to avoid resource waste, and improving internal communication to align internal collaborators.

The company has a long and strong experience with European Projects, which feed company's creativity and allow Loccioni to work on long-term solutions.

Drivers - *Open innovation as the main strategic approach for business development.* Open innovation is a pervasive aspect of corporate culture.

Significant emphasis on application of core competences through scouting of opportunities in other areas.

High absorptive capacity towards Open Innovation opportunities. High capability to identify new innovation opportunities and to redesign and apply specific open innovation strategies to exploit them. High level of co-development with a subset of partners is identified as strategic.

Barriers - *Attention to detail.* Implementation of an OI strategy is extremely demanding. There is no easy way, no fast track to open innovation (it takes time to develop a common language, set the right incentives, set the reputation, and choose the right partners).

Interviewee: Cristina Cristalli, Chief Technology Officer (CTO)

Cristina Cristalli graduated in Electronic Engineering at University of Ancona in 1990 and got a Ph.D. in Bioengineering at University of Bologna in 1995. She worked for the Electronic Design Centre of the Case Western Reserve University of Cleveland (1994-1995) and for the Instrumentation Laboratory S.p.A. in Milan (1996-1998). Since 1998 she has worked in AEA-Loccioni as the responsible of Research and Development (CTO).

2. BlaBlaCar



32 rue Blanche
75009 Paris (FR)
Web: www.blablacar.com



Company description - BlaBlaCar is a two-sided web platform for long-distance ridesharing founded in France in 2006. The company's business model focuses on two types of users: drivers offering rides, and passengers submitting trip requests.

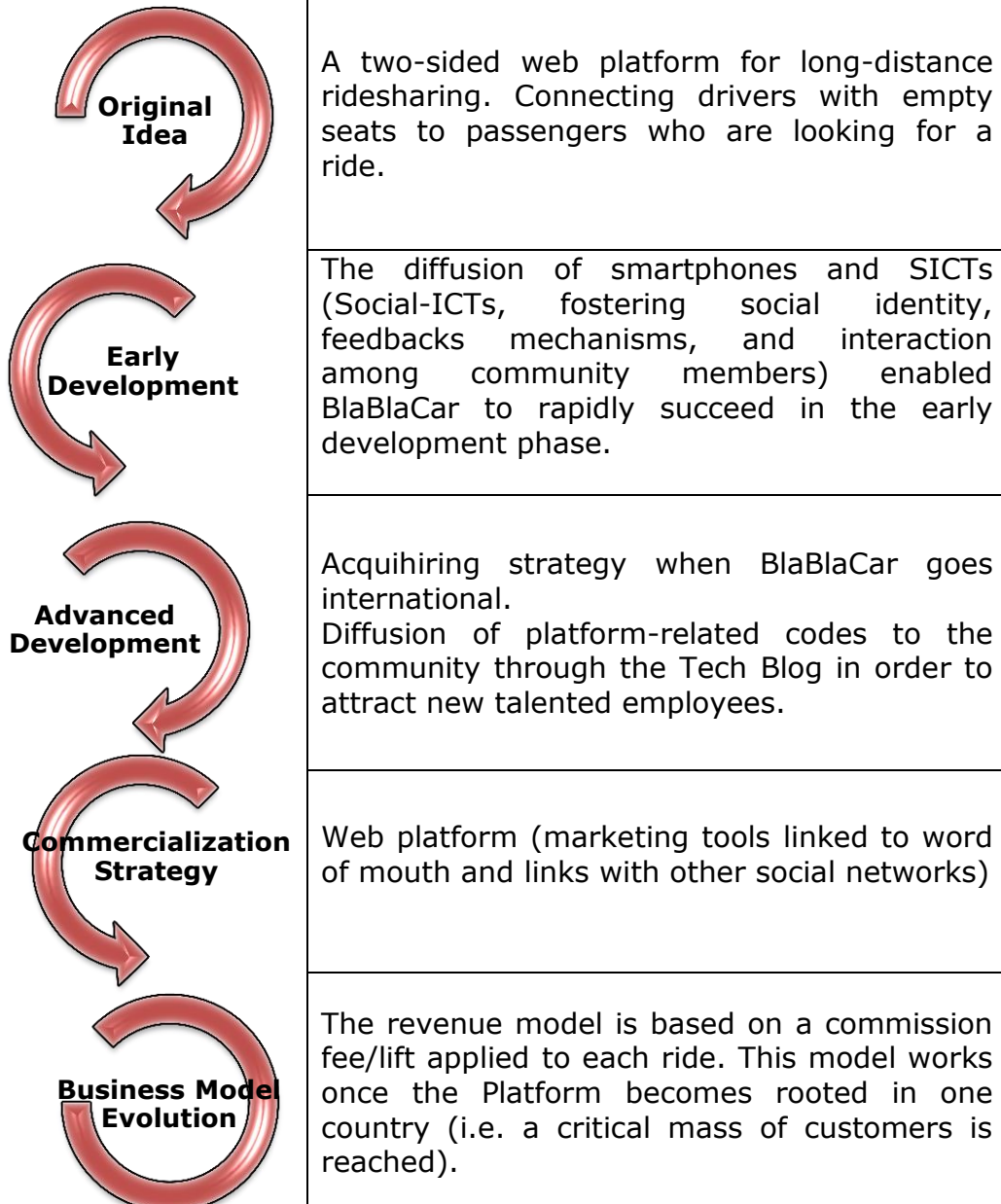
BlaBlaCar creates value by connecting drivers with empty seats to passengers who are looking for a ride. The revenue model is based on a commission fee/lift applied to each ride. This revenue model works once the Platform becomes rooted in one country (i.e. a critical mass of customers is reached). Like many Internet start-ups, the company is currently scaling up new markets all over the world.

Company status – BlaBlaCar has a community of 20 million people who travel across Europe and beyond. The company's market growth has been impressive. Today, it operates in 14 countries with 300 employees and 12 offices worldwide: Paris, Madrid, Milan, Hamburg, Moscow, London, Warsaw, Istanbul, Budapest, Mexico City, Munich, and New Delhi. In October 2014, BlaBlaCar counted more than two million rides per month.

Financial results - The company is not publicly traded and, by policy, does not give financial results. However, BlaBlaCar's increasing market value is well described by the considerable amount of funding the company raised in the last few years.

BlaBlaCar's first round of funding—US\$600K in 2009—aimed at making it the first ride-sharing service in France. Subsequent rounds—US\$1.2M from ISAI (in 2010) and US\$10 million from Accel Partners, ISAI, and Cabiedes & Partners (in 2012) were targeted at proving the reliability of the business model for revenue and replicating its model in other European countries. The latest round of US\$100M from Index Ventures (2014) with the participation of existing investors Accel Partners, ISAI, and Lead Edge Capital is the next step to globalize the operations and enable further expansion.

Innovation Roadmap



Innovation Strategy - The core technology of BlaBlaCar consists in a two-sided web platform for long-distance ridesharing.

As with all technological platforms, BlaBlaCar has a front-end component and a back-end component. The former is what users see and with which they interact: it is the BlaBlaCar website, with people profiles, feedback, information, usability features, etc. The latter is made by the systems, IT and technological solutions that support the operations. BlaBlaCar considers both of them as fundamental for its development. As an example, the company created its own blog (BlaBlatech) that integrates back-end contents in the front-end component. Through the blog, the company shares relevant information (platform-related codes) on the technological solutions that it has developed. Through the blog, the company builds communities of early users/developers (potential new talented employees) when entering a new market.

Open Innovation Relevance - BlaBlaCar is an example of business model innovation that applies Social ICTs features (network economies, feedback mechanisms, high customization, and social identity) to optimize idle resources (empty seats in cars) and create a new mobility segment. BlaBlaCar does not explicitly refer to an open strategy, but it is possible to spot some open innovation practices. A community of users is at the centre of BlaBlaCar's innovation strategy: BlaBlaCar bases its offering on the contributions of user-generated contents, and innovates its offering on the basis of users' suggestions. The company is rapidly growing at the international level through an "acquiiring" strategy. Acquiiring consists of absorbing (when possible) start-up competitors into the parent's company brand, hiring existing teams, and thus integrating specific contextual competences, complementary market assets, visibility, and scale. Acquiiring allows BlaBlaCar to start with a solid user-base and valuable knowledge of the new market, once the culture and vision are aligned.

Drivers - *Acquiiring for non-organic growth.* Integration of various platforms through "acquiiring" (innovation through M&A); integration of existing teams (emphasis on HR); fast absorption of knowledge on local culture, traditions, regulations.

Barriers - *Institutional barriers to the development of an EU Market.* The rise of an EU "sharing economy" is slowed down by the absence of some key infrastructures and regulations (such as a common digital identity among countries), to turn the European Union into a fully integrated digital market.

Interviewees: Francis Nappez, Co-founder and Chief Technical Officer (CTO), LinkedIn profile: <https://www.linkedin.com/in/fnappez/>;
Nicolas Brusson, Co-founder and Chief Operation Officer (COO), LinkedIn profile: <https://uk.linkedin.com/in/nicolasbrusson/it>

3. Graphenea SA



Avenida de Tolosa, 76
20018 Donostia/San Sebastián (ES)
Web: www.graphenea.com



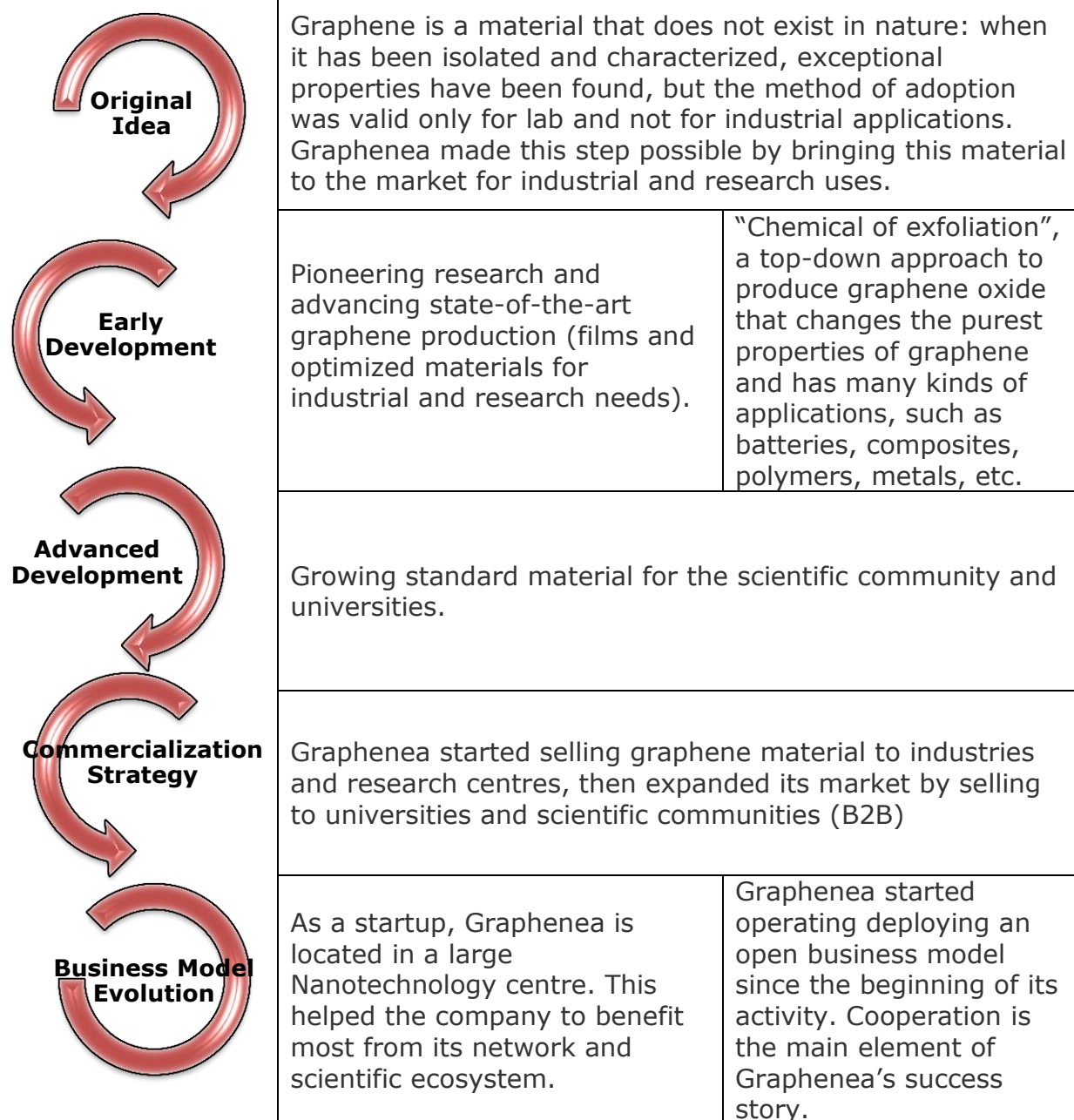
ICT Enabled

Company description – Graphenea SA is a Spanish company founded in 2010, with a subsidiary location in Cambridge (MA - United States). Graphenea is currently operating in the B2B market with two main lines of products: a) *Graphene oxides*: this product line is the result of strong investments in R&D for chemically exfoliated graphene to meet the global demand for high quality, cost-effective graphene. b) *Graphene films*: Graphene films are used in R&D for electronics, solar cells, ultra-capacitors, batteries, membranes, touch screens, and others. Main clients are universities, research centres, and industries.

Company status - Graphenea directly employs 12 people in three operating offices, and exports graphene materials to 40 countries through more than 10 local distributors. The company is characterized by a strong R&D commitment: the share of intangibles over total assets is almost 30 percent. The company has four patents: one granted, two filed, and one pending.

Financial results - In 2013, Repsol invested €1M in Graphenea, entering the equity with 10 percent of shares to bring more financial capacity to the company. The company's turnover was about €500K in 2013 (last available year); it almost doubled with respect to 2012 (€270k).

Innovation Roadmap



Innovation Strategy - Graphenea is one of the main European producers of graphene, and is part of a growing cluster of nanotechnology companies based at the CIC nanoGUNE research centre in Donostia – San Sebastian. Graphenea participates in five European projects and is a partner of the Graphene Flagship Initiative, one of the biggest EU investments in R&D for the development of graphene applications. At the end of 2013, Repsol, a petrochemical company engaged in the production of polymers, entered the equity of Graphenea with 10 percent of shares. The partnership developed the polymer composite; it is one of the key products that Graphenea foresees in the midterm future will hit the market. Within the partnership, one of the main issues that Graphenea had to address in implementing its innovation strategy concerned confidentiality in product development. In particular, big companies are not usually willing to share their knowledge and contribute to material development.

Open Innovation Relevance - Graphenea collaborates with its clients and partners in order to develop customized nanotechnology applications in the ICT sector. It cooperates within the CIC nanoGUNE nanotechnology cluster on R&D projects. Moreover, Graphenea can rely on both internal research capabilities and a scientific advisory panel, comprising six graphene experts who work part-time for the company.

Furthermore, Graphenea closely works with its partners and clients in the co-development of the products and customization according to customers' specific needs: the company cooperates with universities, which are both partners and clients, and that allows it to develop widespread knowledge about the material.

The case of Graphenea shows that cooperation is essential for a start-up, especially when technology is at its early stage of development. Start-ups often have to operate in a very difficult market in which they have to build the market themselves for a new material. Graphenea benefits from European projects and from the role they play in the development of graphene. The Graphene Flagship, in particular, represents an excellent example of cooperation among small companies, universities, and big players in the development of an actual niche product.

Drivers - *Embeddedness in local innovation ecosystem*: participation of SME in activities of local high-tech cluster creates trust and synergies and is very important to get access to high-quality HR and infrastructures at a relatively low price.

Participation of SME in large research consortia/EU initiatives: the company benefited from participation in the Graphene Flagship initiative, where EU had technological leadership. This participation was key to initiating co-development with partners/clients.

H2020 SME instrument provided the company with further visibility and improved the company's reputation.

Barriers - *Lack of a clear IP strategy* within a research/business partnership slows down OIS implementation. Because of this, key players stayed out of the EU Graphene Flagship Initiative.

EU ecosystem lacks industrial integrators: an SME developing technological excellence in materials needs to work closely with large industrial leaders downstream. The case suggests that the EU lacks the significant presence of such players.

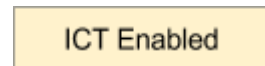
Interviewee: Iñigo Charola, Business Development Director.

Charola joined Graphenea as Business Development Director in September 2013. He has an extensive experience in industrial related products at marketing and sales positions. 15 years ago he started his career at ASSA ABLOY, a global leader in security products, then as Sales and Marketing Director at an industrial processes private company. Before joining Graphenea he is been working in the Electronic Manufacturing Services industry as a Sales Director. He holds a Bachelor's Degree in Business Administration from University of Wales, a Master in Marketing and Sales Management from ESIC Business & Marketing School and an Executive MBA from Deusto Business School.

4. Guger Technologies OG (g.tec)



Sierningstraße 14
4521 Schiedlberg (AT)
Web: www.gtec.at

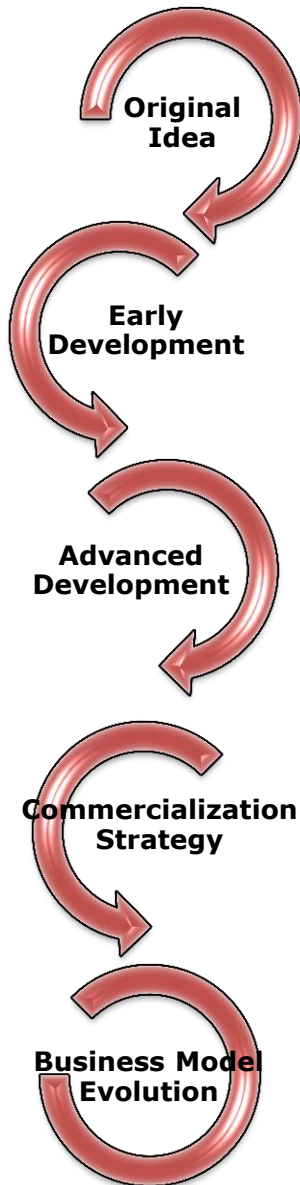


Company description - Guger Technologies OG (g.tec) is a medical engineering company founded in 1999 as a university spin-off around the development of Brain Computer Interface (BCI) systems. BCI is a direct communication pathway between the brain and an external device. BCIs are often directed at assisting, augmenting, or repairing human cognitive or sensory-motor functions. The idea of g.tec's technology started from developing a conceptual design and real-time processing environment, that is, an operating system (OS) intended to serve real-time application process data as it comes in, typically without buffering delays. G.tec developed the first commercially available BCI system in 1999 and now sells this system in more than 60 countries. The company's products work with all major BCI approaches (motor imagery, P300, SSVEP, and slow cortical potentials). From 1999 to 2002, g.tec developed a very flexible platform to fit the needs of customers, who are mainly hospital patients. The g.tec team tests different BCI technologies on more than 500 subjects internationally to guarantee a perfect working system. The company is progressively expanding its business model from the B2B to the B2C (business-to-consumer) market; its main customers are universities, hospitals, research centres, companies, and end-users (patients).

Company Status – G.tec currently employs 40 people: 12 of them work in the R&D departments. Because of its high R&D commitment, the company currently holds two registered patents. g.tec has two branches in Austria (Guger Technologies OG, research development and production, and g.tec Medical Engineering GmbH, sales, marketing/PR and research) and one branch in Spain (g.tec Medical Engineering LC, sales and research). Moreover, g.tec is establishing a new branch in the United States.

Financial results - The only available information about g.tec's operating revenue refers to 2013 (€30.000.000). The company experienced a huge turnover increase in the first three years of its life (+50 percent between 2008 and 2010), as a result of an organic growth path (i.e. the evolution of a university spin-off towards a mid-sized company).

Innovation Roadmap



The idea of g.tec's technology started from developing a conceptual design and real-time processing environment that was part of the founders' PhD theses.

While presenting their research in international conferences and receiving feedback and input, the company founders came up with the idea of setting up as a spin-off.

IntendiX was the first commercially available BCI system for home use, and developed to detect different brain signals with an accuracy of 99 percent. In 2014, g.tec started developing the first end-user product for patients.

In the beginning, g.tec started to commercialize its technologies by selling to other enterprises such as research centres, universities, and large firms (B2B). G.tec started to sell its offerings also to individual customers in the later phases of development (B2C).

G.tec has seemingly shifted its business model – from targeting businesses to targeting consumers. However, this shift should be seen as a move to create more opportunities for g.tec to capture values from different sources.

Innovation Strategy - G.tec evolved into a mid-sized company that has not abandoned its academic DNA: it not only successfully commercializes its products but also contributes to the production of knowledge through publications and teaching activities. The company owns two patents. The team of researchers, engineers, and developers does all hardware and software development in-house. G.tec internally creates its designs and inventions, and relies on trade secrets. The main risk for g.tec's innovation strategy concerns the low appropriability of scientific knowledge.

Open Innovation Relevance - The company is very active in international research projects, developing new technology through scientific knowledge in-sourcing in many different fields, including BCI, physiology, virtual reality, real-time processing, and spike analysis. G.tec is also a member of a number of national and international research projects and is very active in scientific publishing. Publications are the company's side products of collaboration with universities and European projects. G.tec is working together with international partners to push the technology exploitation phase in order to offer state-of-the-art equipment. Moreover, the company performs open innovation practices through different forms of collaboration with clients. Product co-design projects are mainly devoted to technological knowledge sharing, while product customization projects benefit from external product/market knowledge. G.tec's open innovation strategy relies strongly on formal IP protection and human resources retention.

Drivers - *Marketing/promotion through academic engagement.* The company keeps publishing and remains engaged in conversation with the scientific community, but primarily as a strategy for marketing and visibility.

Active participation in EU projects to build reputation, find new OIS partners and strategic resources.

Barriers - *Appropriation strategy based on confidentiality/retention.* Confidentiality problems related to the low appropriability of scientific knowledge make it difficult to collaborate in an OIS perspective.

Coordination with academic/scientific partners is difficult to achieve, because of the mismatch of goals and priorities.

Interviewee: Christoph Guger, Chief Executive Officer (CEO)

Christoph Guger, CEO of Guger technologies, studied biomedical engineering at the University of Technology Graz and Johns Hopkins University in Baltimore, USA and received his MSc. in 1997. From 1997 he carried out research work at the Department of Medical Informatics at the University of Technology Graz and received his PhD degree in 1999. The topic of his PhD work was the design of an EEG-based brain-computer interface. He is co-founder of g.tec where he works since 1999. 2004 he founded g.tec medical engineering GmbH, which is, situated in Upper Austria and sells the Guger Technologies products on the international market. Research interests are invasive and non-invasive brain-computer interfaces, real-time place cell analysis, high-altitude medicine, sport medicine and monitoring of neonates.

5. Celoxica Ltd.



20 Craven Terrace
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Web: www.celoxica.com



ICT

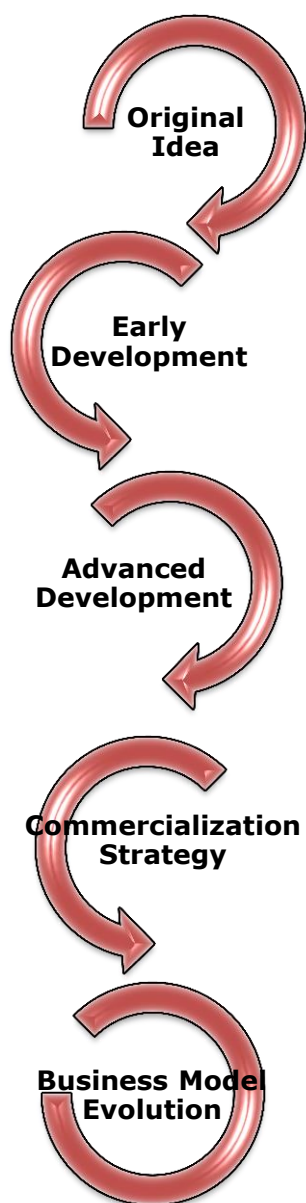
Company description - Celoxica is an ICT company established in 2000 by incorporating Embedded Solutions Ltd. (ESL), a technology spin-out from Oxford University. Based on previous ESL research and development of HANDELC language, Celoxica developed hardware acceleration solutions targeted to the global financial services industry. Celoxica's products (FPGA¹¹ applications) optimize the performance of trading applications across multiple asset classes (Equities, Futures, Options, FX, and Fixed income).

Company Status - The group had 32 employees at the end of 2013, with independent branches in Paris (Celoxica EURL, engineering R&D with seven employees), Chicago, and New York (Celoxica Inc., commercial offices). In Celoxica's R&D branch (Celoxica EURL, seven employees), R&D expenses for the last available year (2012) account for 37.5 percent of the total revenues. The company owns 24 patents based on FPGAs programming technologies. In 2013, intangibles represented 98 percent of the company's total fixed assets.

Financial results - From 2000 to 2014, the company received US\$34.4M in eight funding rounds. The most recent funding round (US\$1.5M) was secured in September 2014 from Beringea Growth Finance. Furthermore, two major clients and former partners invested in the company to develop their own market information access solutions: Goldman Sachs and Credit Suisse (10 percent of equity each).

¹¹ FPGA integrated circuits are designed to be configured by a customer firm and/or a designer after manufacturing (hence, "field-programmable"). The FPGA modules configuration is generally specified using a hardware description language (HDL), needed to build the system architecture and to develop language protocols needed in the specific application field. Specific applications of FPGAs include digital signal processing, software-defined radio, ASIC prototyping, medical imaging, computer vision, speech recognition, cryptography, bioinformatics, computer hardware emulation, radio astronomy, metal detection and a growing range of other areas. (Source: "History of FPGAs" at the Wayback Machine Stored on April 12, 2007).

Innovation Roadmap



1 st phase: Embedded Solutions Ltd (ESL)	2 nd phase: Celoxica
Development of the Host Data Collector (HDC) language, at Oxford University	Hardware acceleration solutions for ultra-low latency FPGA-based architectures for the financial industry and electronic trading community.
FPGA programming hardware configurations (modules) based on HDC	Embedded Solutions Ltd (ESL) IP on the Host Data Collector (HDC) language Research market (universities) for the development of prototypes of new FPGA modules
Internal	Clients co-development enabled by corporate venturing
Research market and a variety of industries (IT hardware, telecommunications, and the oil, gas and satellite industries)	A limited but highly customizable product portfolio for financial markets worldwide
Not focused	Strongly focused on financial markets (high scalability in terms of number of assets classes and geographical markets)

Innovation Strategy - Celoxica's innovation strategy evolved from a closed to an open setting, across two phases of the company's life. In a first phase, the model was typical of a science-based spin-off company. It was characterized by the participation in multiple R&D projects for FPGA exploitation, rather than being focused on a specific market. The ESL model ignored the need of complementary knowledge and expertise needed to build FPGA system architectures in each partner industry. This lack of focus in the ESL innovation model and the missing internal expertise required the company to redesign its innovation model in order to find more areas of application for the technology. Nevertheless, ESL's R&D costs increased, leading to almost negative operating margins from single products. The evolution of the innovation strategy in the second phase of the life of Celoxica was a direct consequence of the first strategic mistake that led to the decision to focus just on one application of FPGA technology. A strongly focused strategy based on a single FPGA application for the financial industry characterized the new round. The company realized that complementary external product/market knowledge was essential to successfully exploit transversal technologies (FPGA). Consequently, Celoxica's business model shifted from products to specific services solutions (ultra-low latency solutions) for the electronic trading community based on FPGA technology. With the management team renewal, the composition of the company's internal capabilities fundamentally changed: technological competences arising from 15-year R&D on FPGA technologies were balanced with a new management team coming from a financial market environment. A deep integration between technical background and trading expertise was the key to develop the new business.

Open Innovation Relevance - Co-development remained a pivotal part of Celoxica's innovation strategy, but given the critical need to know its clients' processes and systems, the relationship had to become much more intimate. Goldman Sachs and Credit Suisse, two of the most important clients, decided that a direct investment in Celoxica was appropriate to enable even more significant interaction in product co-development. In turn, the company gained important expansion opportunities through the development of one product portfolio based on needs/standards of a great variety of markets (e.g. equities, futures, options, FX and fixed income for different countries.). The shift to a more focused innovation strategy allowed Celoxica to redefine its business model as a first mover in its sector and portray themselves as "*creating the worldwide standard for reliable, proven and ultra-low latency electronic trading*". The active role of key partners and investors in the GMAC (Generalized Market Accelerator product series) early co-development enabled the company to rapidly scale up the new business model. The combination of internal technical expertise with partners' (and investors') knowledge in the functionalities design phase allowed the new product to match the huge variety of protocols that characterize exchange markets across multiple asset classes and geographic communities.

Drivers - *Clients became investors.* Co-development with key clients matured the conditions for clients to become investors. Corporate VC helped the company to focus on a specific value proposition and, consequently, to build a new high-scalable business model.

Barriers - Lack of focus. The former Celoxica (ESL) risked not finding its way to market. A potentially disruptive and transversal technology is not enough. The company struggled to find market application, in spite of cutting-edge technology.

Interviewee: Antoine Rescourio, Company Secretary and Chief Operating Officer (COO)

Antoine Rescourio joined Celoxica in May 2008. He combines more than 20 years' experience working at an executive management level, in both capital markets (for the buy side, sell side and exchanges) and financial technology providers. Previously Antoine was Chief Operating Officer at a leading hedge fund; Senior Vice President at AEMS; and Vice President at Morgan Stanley, where he spent eight years managing technology in continental Europe and implementing the European e-Trading platform. His earlier career includes ten years in technology and operations management with Reuters.

6. Zappar Ltd.



20 Forth Street
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Web: www.zappar.com

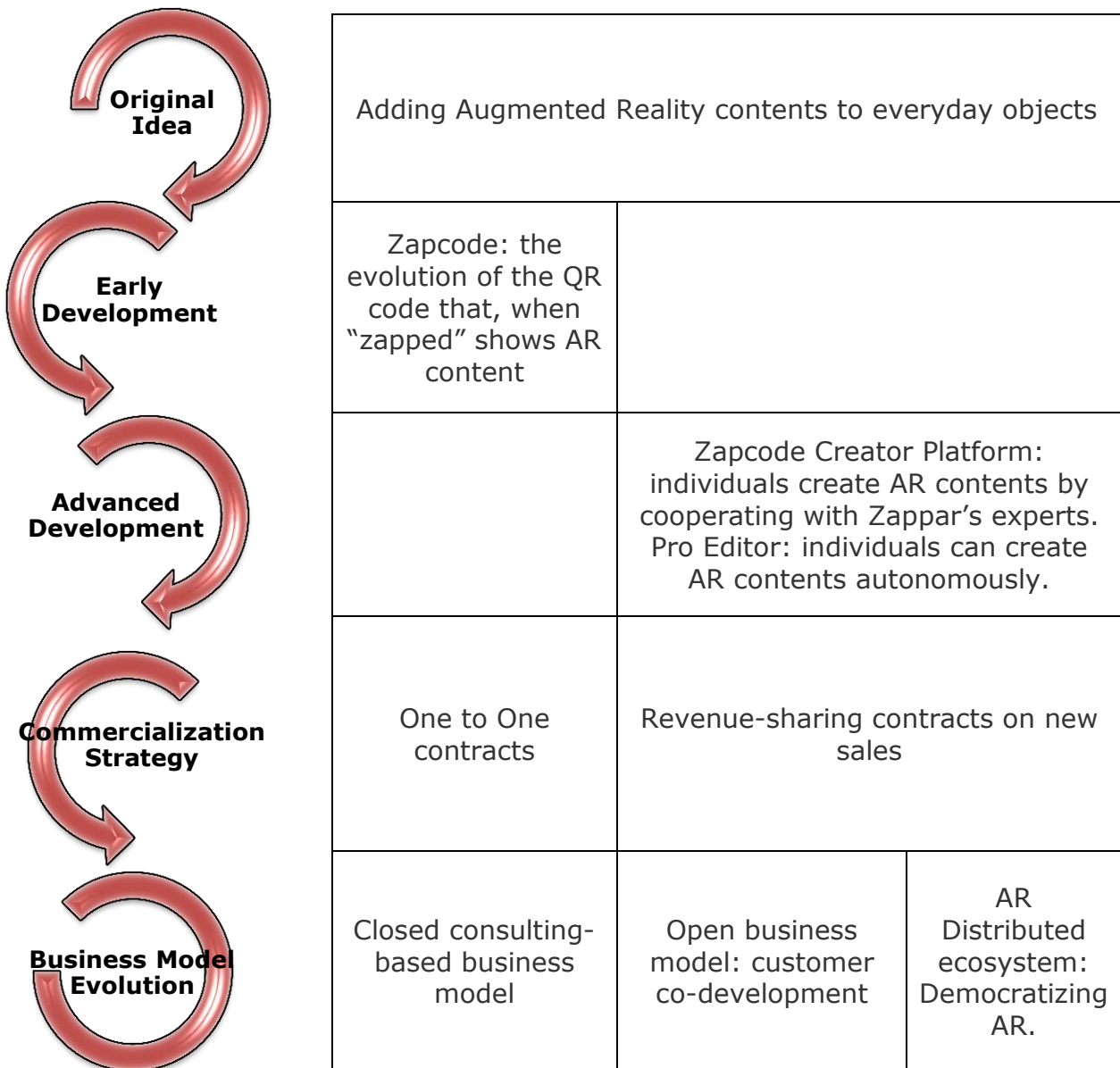


ICT

Company description - Zappar Limited is a British company started in 2011 and operating in the ICT sector. Born as a spin-off from Cambridge University (UK), it develops augmented reality (AR) applications for smartphones, tablets, and wearables. AR is a technology that, through a camera or head-mounted display, connects digital contents to real images in the field of vision, making the virtual elements part of the real world. Zappar is a free-to-download application for iOS and Android devices using AR. The app, launched on the market in 2013, allows the user to “zap” things in the real world and explore hidden virtual content, which brings things to life. The company invested in becoming the market leader for a community of content creators. Today, it is pioneering the development of market-leading tools that will enable both technically gifted and unskilled users to create their own AR contents independently. This is already evident through the Zapcode Creator, launched in January 2014. Zapcode Creator is an online tool offering the simplest, most detailed, and cost-effective AR creation tool on the market for big corporates, small businesses, and individuals.

Company Status - The company currently has 21 employees and its operating revenue in 2014 was €867K, which almost doubled the operating revenue of 2011. The share of intangibles over total assets is six percent. A US patent on Zapcode technology was filed in December 2012.

Innovation Roadmap



Innovation Strategy - Throughout the entire company life, Zappar was aware of owning a technology able to overcome issues that other AR systems are still facing. Therefore the company decided to keep the technology proprietary and to develop it internally. In doing so, Zappar was still able to advance its business model. Expanding from the entertainment industry to a wider spectrum of possible markets, Zappar keeps re-inventing its business model, shifting from a closed to an open business model.

Open innovation relevance - The company started to work in the entertainment sector with a closed business model, implementing a traditional

advertising agency model. This closed approach changed when Zappar expanded to additional businesses and started to involve customers, coming from a variety of sectors, in the development of the products. In this second phase of the company's evolution, Zappar worked under revenue-sharing contracts on new sales. Finally, developing the Zapcode Creator platform, the company decided to open up the world of AR (including to technically unskilled people). In this process, Zappar's final goal is to become the central engine of an ecosystem in a democratized AR, in which this small company enables operations of aggregation and crowd-sourced AR through its own proprietary technology around the world.

Drivers - *Business model innovation matters.* Even when the technology was developed, the company gained significant experience and grew through the evolution of its business model.

OI strategy starting from a proprietary enabling technology. Keeping close control of the Zapcode and promoting it as an industry standard, the company planned to expand its business by engaging a large community of users.

Barriers - *Establishing the right innovation mix.* The case shows how complex it can be to balance internal R&D activities and external co-development.

Interviewee: Max Dawes, Marketing & Partnership Director

Max started his working life as an account man in the world of advertising, at the boutique agency Campbell Doyle Dye on brands including Mercedes Benz, Invesco Perpetual and The Macallan whiskey. Learning the trade from Caspar Thykier (now Zappar Co-founder and MD), Walter Campbell (now Creative Director at TBWA), Tom Ewart (Founder of The Corner), and Gav Thompson (Director of Marketing Innovation at O2). He joined Freud Communications in 2008 to work on what was then called "digital", across the Freud stable. Highlights included managing the social media outreach for the T-Mobile Dance and Sing campaigns. An internal move at Freud saw him join a team to deliver the events celebrating the 250th anniversary of Arthur Guinness signing the lease at St James's Gate Brewery. This became an annual event and went on to be one of the most awarded marketing platforms in Diageo's history, with Max heading up the talent procurement side of the activity and running the budgets for four years across five territories. Leaving Freud in 2012, Max re-joined long-term collaborator Caspar to take the role of Head of Partner Relations at Zappar. Since joining Zappar he has managed and developed the Asda partnership, as well as working across business development with brands including Nissan, Sony Music, Sony Pictures, Warner Brothers, Universal, Disney, Dunkin' Donuts and many more. In January 2014 he was promoted to Partnerships Director at Zappar and the focus for the year will be on launching the self-serve Zapcode Creator system, the Zappar for Broadcast proposition as well as overseeing Zappar's global expansion and continuing to work with their partners (both existing and new).

7. ENTRANET Ltd.



44 Plataion Str.
54249, Thessaloniki (GR)
Web: www.entranet.gr



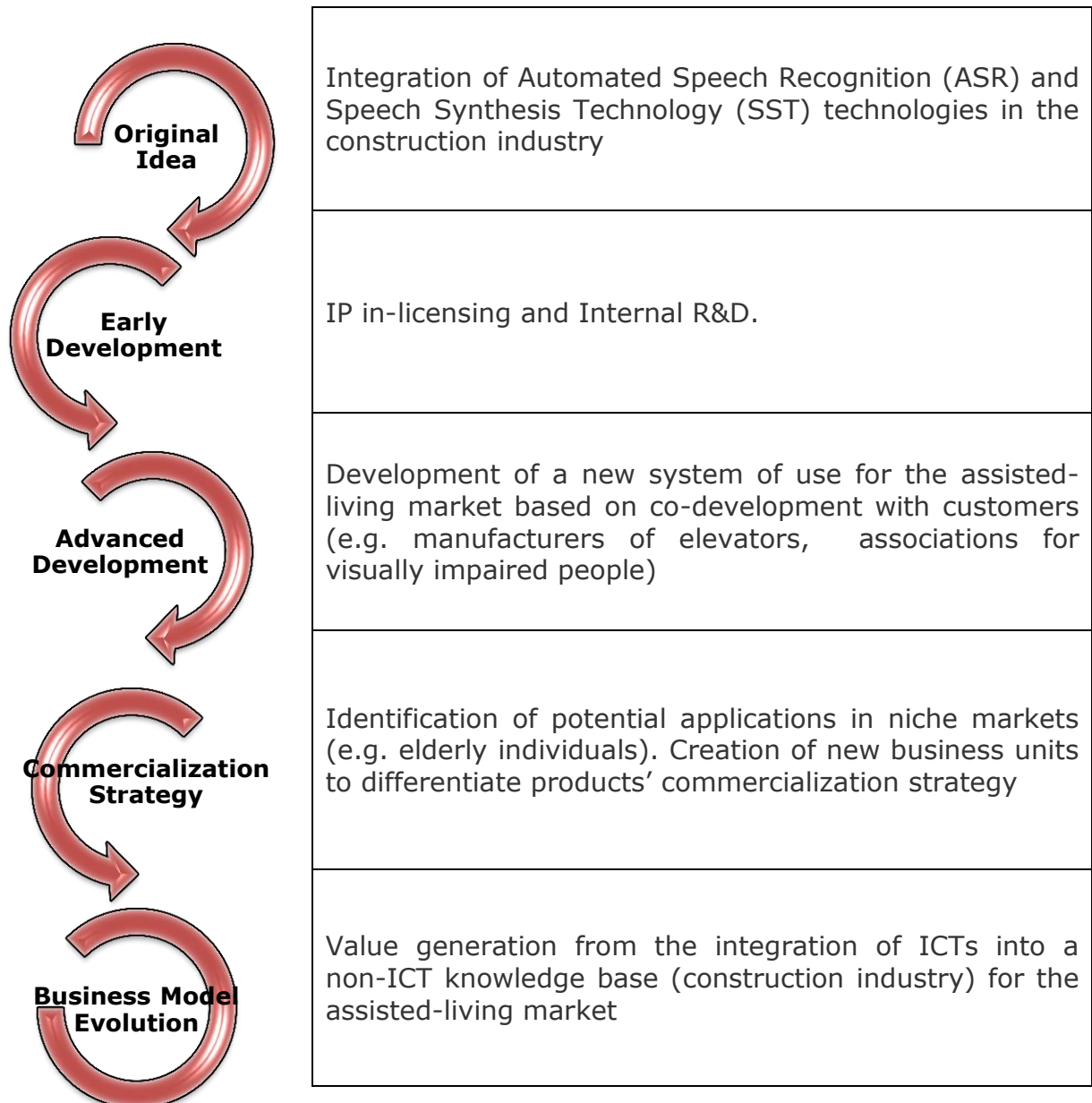
ICT

Company description - Entranet Ltd. is an IT research and development company founded in 2009 in Thessaloniki (GR) to design and develop innovative embedded systems, enhanced by Automated Speech Recognition (ASR) and Speech Synthesis Technologies (SST). Entranet's core business is filling the usability gap between buildings and technologies. The company is developing new products for the Smart Home System: (1) Talk2lift™ is the first device worldwide enabling passengers to voice-control an elevator; (2) Housemate™ is a device that provides complete smart home control to users through voice commands; (3) MyCane™ (to be released in 2018) is a voice-controlled "smart" white cane for blind or partially-sighted people.

Company status - Entranet currently employs 10 people, five of whom are shareholders. Nine people work in R&D, including interns from Greek and Macedonian universities. The company operates in three countries: in 2014, Entranet Inc. was established in Florida (US) to commercialize their product in the US market; Entranet Ltd. was established in London (UK) to address the needs of the European market. Moreover, Entranet has built a network of manufacturing partner companies around the world. Its main production partners are located in China and Germany (board manufacturing), Poland and the US (chip manufacturing), while software development and the final product assembly are performed in Greece and commercialized through offices in the UK and the US.

Financial results - Talk2lift™ was commercialized in 2015. Currently, the product is generating approximately €100K in turnover. Sales growth forecasts for Talk2lift™, HouseMate™ and MyCane™ are expected to increase to US\$3M in the next five years. In the first months of 2015 Entranet Inc. has started the process of going public on the OTC (Over The Counter) stock market, both in Europe and the US.

Innovation Roadmap



Innovation Strategy - Entranet pursued an inbound open innovation strategy based on IP in-licensing from Nuance, an American pioneering firm leader in speech recognition technologies. The company licensed the ASR and SST technologies and combined them with the internal R&D to develop noise reduction algorithms and integrate ICTs into its own products. After four years of R&D, the company acquired sufficient knowledge to integrate ASR and SST

into its hardware and software systems. Entranet used public funding to finance internal R&D activity (European Regional Development Fund, Greek Government funds through the Competitiveness and Entrepreneurship Operational Programme (NSRF 2007-2013)).

Open Innovation Relevance – Company’s OIS strengths can be summarized as follows:

- *IP Licensing*: Entranet recognized a strong opportunity in a new and high-growing market niche (the assisted-living market). The company pursued a successful search strategy aimed at the integration of construction knowledge and external ICTs (in-licensing ASR and SST technologies).
- *An Innovative Technology*: Entranet leverages on the innovative voice/speech recognition technology and applies it broadly to facilitate users' lives. Its technology enables highly accurate voice recognition thanks to a unique noise rejection algorithm internally developed.
- *An Industry Standard*: Entranet is currently one of the very few companies worldwide positioned to establish new standards for the assisted-living market and possibly other new markets (e.g. MyCane).
- *The Importance of Social Innovation*: Entranet will contribute to society by offering the growing aging and visually-impaired population the possibility of enhancing their daily lives by improved movement, interaction, and communication.
- *Company’s Business Model*: ENTRANET's added value comes from the integration of ICTs into a non-ICT knowledge base (construction industry) for the assisted-living market.

Drivers - *R&D collaborations to connect ICT with other industries*. The company used licensing contracts to integrate technologies across sectors.

Internal expertise and a strong OI culture proved fundamental for a successful search strategy, absorptive capacity building, and recombination of technologies into a new business offering.

Barriers - *Lack of access to qualified/cutting-edge resources*. The company is not located in a vibrant innovation ecosystem. It took the company significant time to develop its solutions and find the right partners and competences locally.

Interviewee: Lefteris Papageorgiou, General Manager

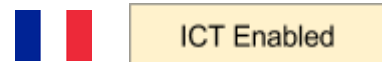
Lefteris Papageorgiou is a Civil Engineer with more than 15 years vast experience in construction projects and sustainable energy. He has established and managed 10 successful companies in different areas of construction and manufacturing. This helped him to develop outstanding business skills like strategic thinking, decision-making, financial programming and more¹².

¹² Source: Company website

8. Primo 1D



c/o MINATEC Entreprises
BHT 7, parvis Louis Néel
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Web: www.primo1d.com

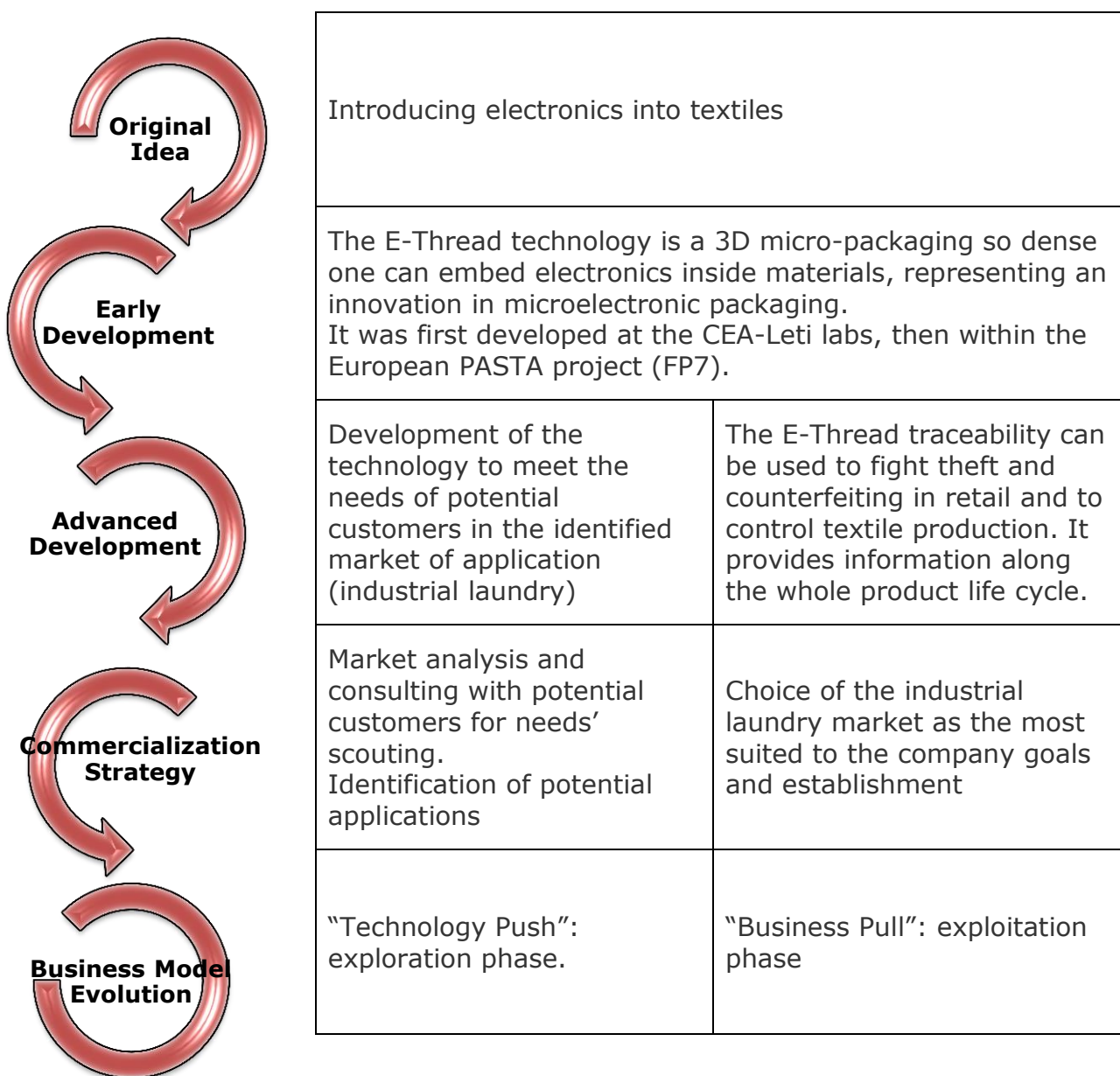


Company description - Primo1D is a French company started in August 2013. It offers solutions for embedding intelligence in objects and materials using the E-Thread technology, a yarn embracing electronic functions. At the time of founding, a 15 percent share of the company belonged to CEA, the French Commission on Alternative Energies and Atomic Energy (Commissariat à l'énergie atomique et aux énergies alternatives). The CEA is a French public research body established in 1945. The E-Thread technology was initially developed in the CEA-Leti nanotechnology centre, part of the Grenoble high-technology cluster. Primo1D also developed its technology by participating in the European PASTA Project consortium, funded by the 7th European Framework Programme. The project combined research on electronic packaging and interconnection technology with textile research to realize an innovative approach of smart textile. Primo1D is industrializing the E-Thread technology, with production planned for end of 2015. E-Thread allows the connection of a chip to a set of two conductors acting as an antenna, a power, and/or a data bus. The E-Thread technology guarantees traceability, production monitoring, and temperature monitoring. Potential further applications include anti-theft, anti-counterfeiting, enhanced customer shopping and recycling.

Company Status - The company currently employs eight people (four individuals compose the management team). In 2015, Primo1D was among the 14 shortlisted innovators competing for the Innovation Radar Prize, a DG Connect support initiative started in 2014, which focuses on the identification of high potential innovations among European ICT-related projects (FP7, CIP and H2020), and the key organizations best placed to deliver these innovations to market.

Financial results - Primo1D spent a year raising funds. In September 2014, it secured €3M from venture capital funds and, in the same year, it obtained bank loans (between €1M and €2M).

Innovation Roadmap



Innovation Strategy: – Primo1D was born out of Open Innovation principles and its innovation strategy rests on collaboration with its local and global ecosystem.

Open Innovation Relevance – Whether by happenstance or by design, the following elements highlight Primo1D's OIS approach.

- *Spin-out:* Primo1D is the spin-out of a technology developed at the CEA.
- *Ecosystem:* Its ecosystem enabled the company to grow. First, it incubated at the centre's innovation incubator (GRAVIT). Second, Primo1D was in close proximity of other university spin-offs because

they shared R&D laboratories within the MINATEC campus. This proximity allowed the company to build up its industrial project.

- *Inbound*: The company does not own its technology. Instead, CEA filed 18 families of patents on the E-Thread technology (i.e. technology, its improvements, its applications) and Primo1D has an exclusive license on it, which is paid through a mix of fixed fees and royalties on future turnovers.
- *Technology push*: Primo1D's founder actively attempted to make the technology useful. He performed in-depth market analysis, identified applications and formed a business around technology.
- *Business pull*: Primo1D's founder also used the feedback from potential customers to derive further applications. In particular, Primo1D moved from its initial traceability idea to anti-counterfeiting or recycling, which were identified through these business contacts.

Drivers - *From technology push to business pull*. The case suggests that the true value of the technology developed is discovered only through an inbound/outbound OIS (i.e. identification of market application via close consultation and work with its potential clients).

Organizational incentives for corporate spin-out. The entrepreneurial leave policy of the institute where the founder was working allowed the inventors to take a paid sabbatical in order to start up their own tech venture.

Participation in large research consortia/ EU initiatives. The company benefited by participating in the PASTA project aimed at technology development.

Barriers - *R&D investment is not enough*. The risk for a high-tech start-up may be to become obsessed with the development of technology, without a precise market application in mind.

Interviewee: Dominique Vicard, CTO

Dominique Vicard, Primo 1D CTO, has an Engineering Degree and PhD from Telecom ParisTech, and more than 20 years of experience in industrial jobs in the private sector in operational and management jobs focused on R&D.

He is the inventor of the «E-Thread®» concept. As CTO, Dominique will take care of the definition and management of the Primo1D R&D programmes (including the common lab with CEA) and will carry a continuous competitive scouting and analysis.

9 IBSENtelecom



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ICT

Company description - IBSENtelecom was founded in 2009 in Norway to develop solutions to wireless radiation effects on the human body. In particular, it developed an electronic device based on optical communication: the Li-Fi (Light Fidelity) technology for data transmission. In 2011, IBSENtelecom founded the Li-Fi Consortium together with the Fraunhofer Institute, based in Germany, and Supreme Architecture, based in the United States and Israel – all leaders in optical communication technology. They aim at developing a concept and roadmap to establish new wireless technologies with better speed bandwidth and security than current wireless technology.

Presently, IBSENtelecom is focusing on finding a market for the Li-Fi technology and raising funds to adapt different applications of Li-Fi devices. Its devices are designed to cover different markets through two business lines:

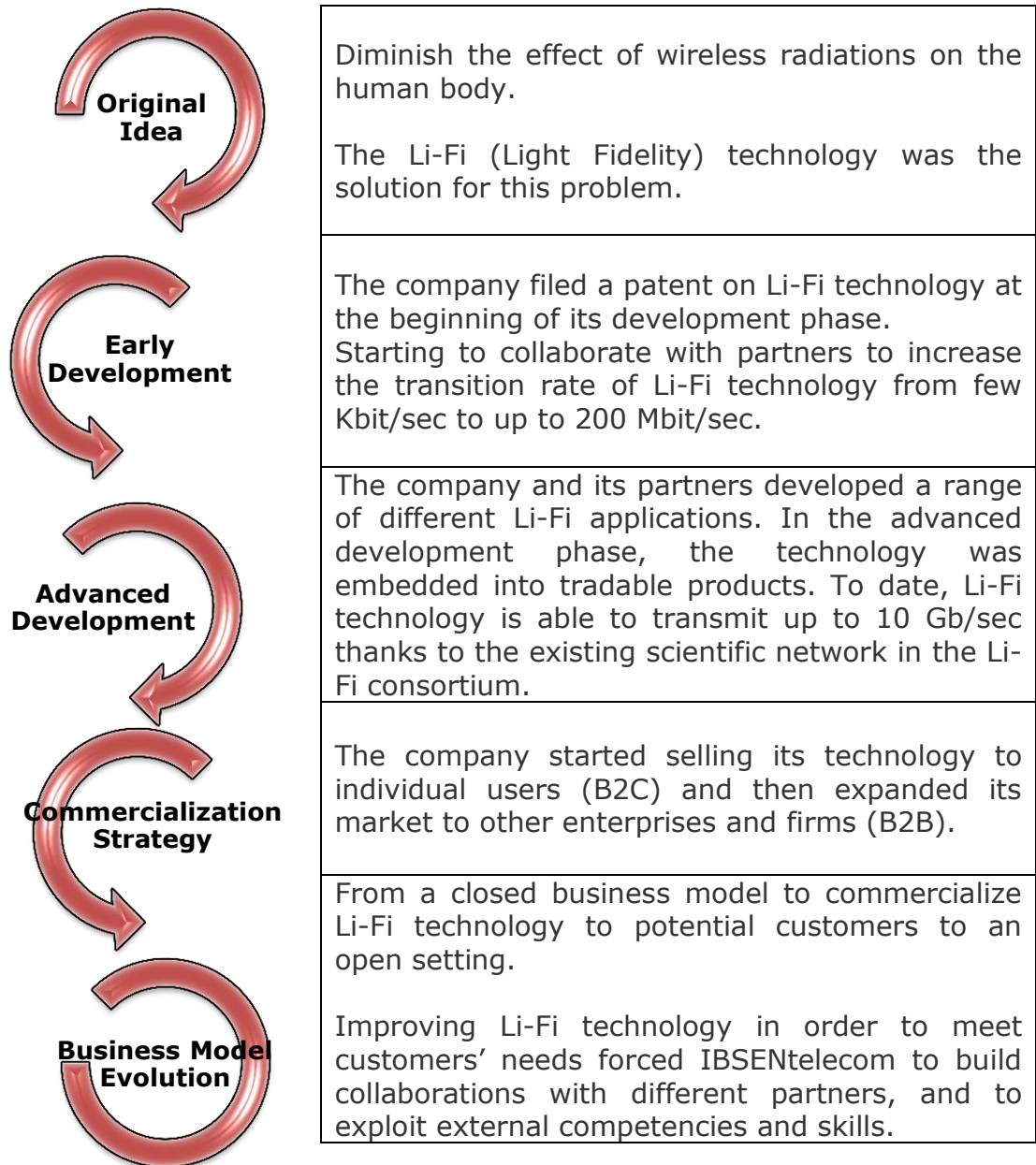
- a) *Devices for individual users* – Through a small device connected to computers or routers, users will get high-speed two-way communication (up to 2 Gb/sec) through a USB port. These devices are based on laser technology and serve point to multiple-point high-speed communication.
- b) *Devices for businesses* – Li-Fi devices can provide higher security levels than comparable Wi-Fi technologies because they require direct line of sight with the data source.

IBSENtelecom is working on the development of a new technology, the “Fly Eye Receiver Chip Technology” project, which should overcome the main technological inhibitions of the technology and make the technology usable by mobile devices.

Company status - IBSENtelecom is a micro-company (a high-tech start-up) with three employees. The regional government of Saxony, through a German manufacturing partner, currently sponsors the company’s R&D activities.

Financial results - The company is currently classified as an active company on the Business Register but its trade status is that of a dormant company (no revenues in the last years). Therefore, no financial data are available at the moment.

Innovation Roadmap



Innovation Strategy: IBSENtelecom relied on technological enhancement and development after identifying a problem and looking for a solution. IBSENtelecom changed to become an open company through its business model evolution because an important potential client had suspended the first technology development project.

Open Innovation Relevance – The following points highlight how IBSENtelecom ended up performing OIS:

- *Collaboration:* the first product was the result of collaboration with partners (mainly experts in the field) on a focused project where the

technological knowledge from different partners was integrated through close ties.

- *Technological Push:* After the main potential client left the partnership, it was imperative for the Li-Fi consortium to find a way to survive. The consortium through collaboration and data attempted to develop and advance the Li-fi technology.
- *Inbound strategy:* IBSENtelecom's innovation strategy is today based on bringing outside knowledge into the company. Technology exploitation and new products' development are made through partnerships and IP licensing.
- *Network Orchestration:* Collaborations evolved into long-term partnerships through the creation of a large network of complementary capabilities in the optic and photonic fields.

Today, the company is still searching how to expand in new markets.

Drivers - *Market pull technology collaboration.* In this case, a request from a key potential client created the need for the company to supplement internal knowhow with external technological expertise and to establish a technological alliance.

Barriers - *Failure of key partnerships.* The implementation of effective open innovation strategies depends heavily on the choice of partners. Trust and flexibility in defining clear exit strategies are needed for SMEs, especially when partnering Large Enterprises.

Weak orchestrator of technology alliances. The company tried to keep the technological partnership alive by assuming the role of orchestrator of the alliance. Because resources of the company were still limited, the scope of the alliance had to be kept confined and time to market goals had to be revised.

Absence of European Original Equipment Manufacturing (OEM). The level of confidentiality regarding the technology required close proximity with strategic partners downstream. The fact that the leading OEMs were absent prevented the company from establishing strong ties with partners.

Interviewee: Walter Kraus, Chief Executive Officer

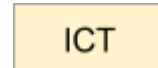
Walter Kraus (CEO) has a seasoned c-level executive with extensive international start-up and business development experience in both high technology telecommunications and renewable energy. He has mainly worked with high technology transfer between Europe and the US and hold currently positions at GGSI (Executive Vice President), MarkeTech Partners LLC (Managing Partner), IBSENtelecom Ltd. (CEO) and the Li-Fi Consortium (Chairman), speaking 3 languages at University level (English, German & Norwegian).

Walter Kraus founded IBSENtelecom in 2009 in Norway. IBSENtelecom has been restructured to its current form in 2012. Walter has his background in RF shielding technology and developed also patents using optical wireless communication technology for mobile phones. Walter is also chairman of the Li-Fi Consortium. He is responsible for OEM contacts, contractual engagements, concept development as well as company and concept strategy.

10 STMicroelectronics



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Company description - STMicroelectronics (ST) is an ICT company born in 1998, but its roots date back to 1987 when the Italian SGS Microelettronica merged with the French Thomson Semiconducteurs to become the SGS-Thomson Microelectronics. In 1987, the new company suffered from losses and overcapacity. In 1993, it received \$1 billion in financing from the Italian and French Governments to reduce its debts. In 1994, it was publicly traded while the governments remained major stakeholders. In those years, SGS Thomson reached a five percent share of the world's semiconductor industry. Today ST is quoted on the Milan, Paris, and New York stock exchanges for 72.4 percent of its shares. The remaining 27.6 percent of shares are controlled by STMicroelectronics Holding II BV, which belongs to the French and Italian Governments.

ST is one of the world's largest semiconductor companies, controlling about three percent of the worldwide semiconductors' market. It is a B2B (business-to-business) company and provides to its clients a broad portfolio of solutions in two main areas, "sense and power and automotive products" and "embedded processing solutions".

The company created and relied on a wide network of strategic alliances (e.g. Nokia and Nintendo) with customers, suppliers, universities, and competitors. ST's products are used in many contexts: ranging, aerospace, defense, amplifiers, comparators, Integrated Circuits (ICs), automotive analogic and power ICs, automotive infotainment and telematics, data converters, interfaces, radio frequency transistors, wireless connectivity, etc.

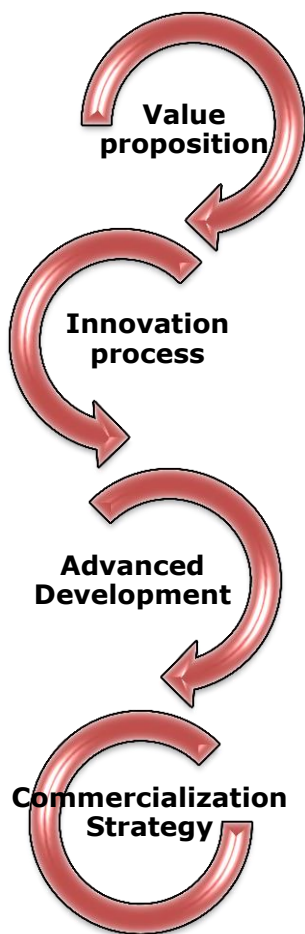
Today ST is looking into the Internet of Things (IoT) and new solutions to data security problems. ST also played an important role in making nano- and microelectronics key enabling technologies. In order to better develop them, ST has recognized the importance of being in the European microelectronics hubs in Grenoble, Eindhoven, and Dresden.

Company Status - The group had 43,600 employees worldwide in 2014. ST's corporate headquarters and the headquarters for Europe, the Middle East and Africa are in Geneva. It also has one headquarters for the Americas, one for Greater China and South Asia, and one for Japan and Korea. Moreover, the company has 11 main manufacturing sites and several offices around the

world. ST also has research and development centres in 10 countries outside the European microelectronics hubs.

Financial results – In 2014, ST’s revenue was US\$7.4 billion. Most of it derives from sensory, power, and automotive products. STMicroelectronics is the tenth largest company in the semiconductor industry. ST spent 21 percent of its revenues on R&D in 2014. It has 15,000 patents and pending applications (9,000 patent families) and it filed 500 new patents in 2014.

Innovation Roadmap



ST produces semiconductor components in the consumer appliances sector and is among the 10 largest semiconductor companies in the world. It controls three percent of the market.

The company implements a strong internal R&D activity and recourse to technology in-licensing. Length of time for solutions development varies according to the type of product and clients.

ST co-develops with clients at different levels. The range varies from customization to co-development of products’ roadmaps. Clients represent a rich source of insights on consumers’ needs.

Development of platforms that integrate ST technologies and whose applications are left to third parties (e.g. universities).

ST components are integrated in customers’ solutions (B2B): since the components developed by ST represent one of the elements assembled in customers’ products, the integration needs a high level of direct coordination between the company and its clients

Innovation Strategy - ST’s innovation process is successful because: (i) ST has strategic partners that are champions in their own market and develops with them its innovations; (ii) ST is both a technology-searcher and a technology-user company, maintaining its leadership in an extremely fast-paced sector; (iii) its components, developed in collaboration with other players in the ecosystem of innovation, are reliable and secure. Through a

collaborative approach, it created connections with companies that understand what customers want and focused on applying integrated solutions designed for industrial partners.

Open Innovation Relevance – Being a large and multi-focused company, the elements of OIS in STM are multi-faceted. As such, the following only summarizes some of its OIS elements:

- *Intellectual Property (IP) management*: IP represents a key factor in the company's strategy. It evolved from a defensive approach in the 1990s to a proactive IP management approach in the last decade. Since ST's knowledge can be easily duplicated, it protects it for future potential applications.
- *Collaborations*: The company's open innovation strategy mainly relies on collaborations. ST collaborates with universities on projects of common interest, in which ST considers the university as a "solution provider", not a partner. It collaborates with clients on one-to-one contracts for product co-development. Levels of co-development have varied throughout ST's life: it went from simple customization to the definition of products' roadmaps. More recently, ST has adopted a "one-to-many" strategy by making some of its products Arduino-compatible to demonstrate its closeness to the makers' community.
- *Innovation System Enabler*: For example in the Etna Valley, the industrial area of Catania (Sicily, Italy) focused on semiconductors, ST often serves as a bridge among multiple stakeholders, creating links and integrating different actors around specific projects to ease collaborations.
- *Initiatives & Investments*: ST implements structured initiatives such as academic incubators or the ST Innovation Cup. In 2011, it created the STMicroelectronics New Ventures, its own corporate venture capital fund, to invest globally in technology, product and service companies. STM New Ventures prefers investing at early stages, in emerging markets where semiconductors play a key role.

Drivers - *Coordination of local resources* (partners, knowledge, people) within an innovation ecosystem.

Leverage international synergies among various international sites where the company is present.

Barriers - *Problems of coordination* among international sites. *Inefficiencies and coordination costs* within local innovation ecosystems. *Hard to adapt OI partnerships to fast-paced developments in semiconductor industry*. Priorities and directions change rapidly and therefore it is difficult to orchestrate alliances and resource allocations. Constant need to renegotiate and short-term objectives does not help execution of OIS.

Interviewees: Cosimo Musca, Italy R&D and Public Programme Director; Pasquale Sanfilippo, Funding Programmes Control Manager & Rome Liaison Officer.

11 BCB Informática y Control



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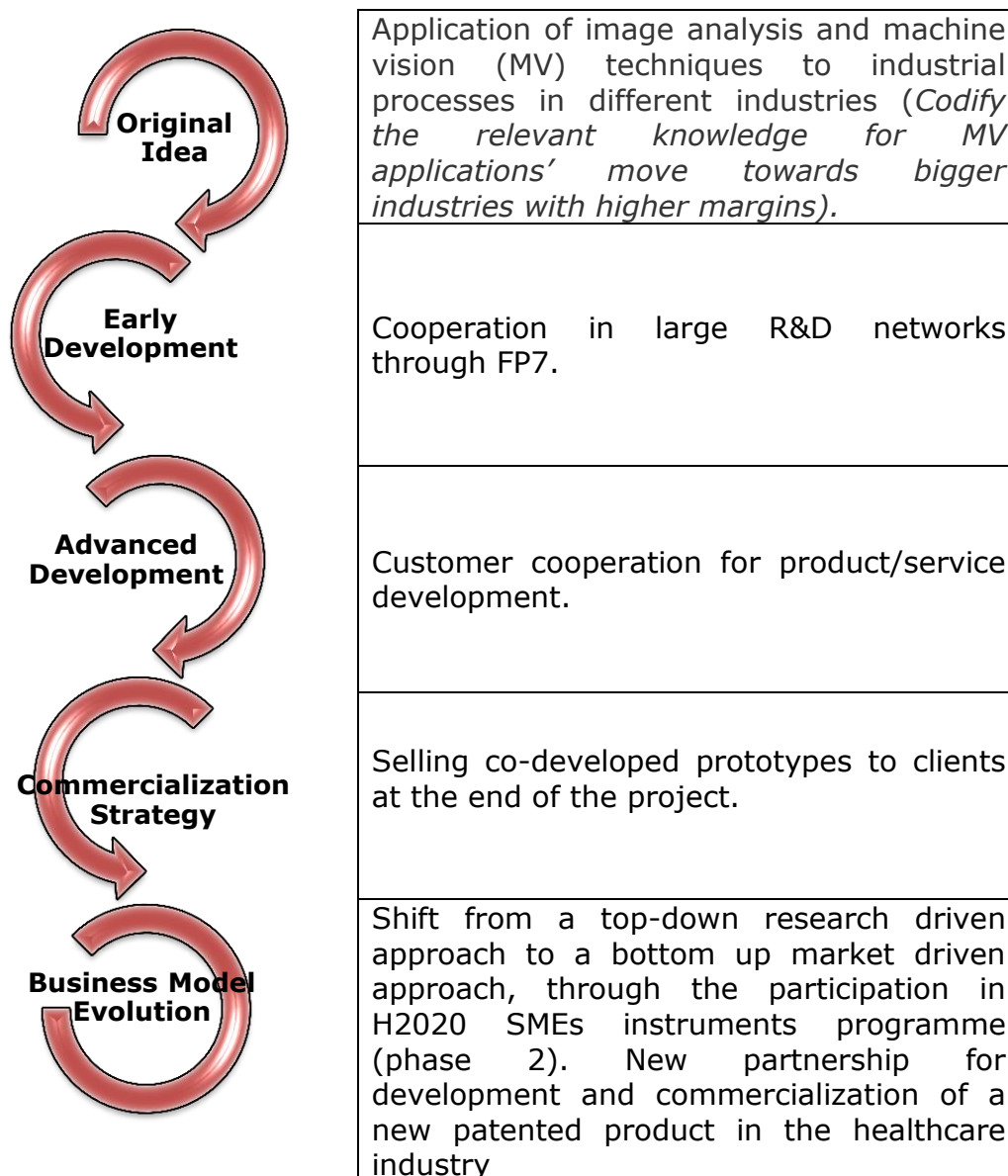
Company description - BCB Informática y Control (hereafter BCB) is a small Spanish ICT engineering company (computer systems design, computer programming and data processing). BCB's core business is based on system integration and quality control services through the development of Machine Vision (MV) applications (imaging-based automatic inspection and analysis enabled by visible and infrared technologies). BCB offers "control and management solutions for clients' industrial processes according to their technical and economical requirements." BCB's solutions are based on hardware integration and software development through cooperative projects with customers in the industrial automation, machine vision, thermo-solar, optical and ICT fields.

BCB usually sells the prototype to the customer at the end of each collaboration project. As a result of these versatile collaborations, BCB co-developed several prototypes of MV industrial applications: 2D measurement equipment, pharma-packaging control system, optical inspection equipment, remote telecontrol, automatic number-plate recognition, and optical devices. A new business opportunity recently came from BCB's participation in H2020 SMEs instrument programme (phase 2). The company is currently developing "Baby Beat", a patented system to measure the fetal heartbeat using a wearable device and laser interferometry techniques, in collaboration with the Polytechnic University of Catalonia (UPC).

Company status - BCB currently employs ten people, mainly telecommunications engineers dedicated to the R&D department in Spain. The company owns one registered US patent, and the rate of intangibles over total assets is about six percent. In 2012, BCB opened a new business unit in Mexico, in order to participate in local R&D projects and explore new business opportunities related to thermography techniques in the mining sector.

Financial results - In 2012, the company's operating revenues were about €408K. A huge increase was observed in the last two years, with revenues reaching €1M in 2014.

Innovation Roadmap



Innovation Strategy: BCB is a specialized supplier focusing on user-producer co-development in order to exploit a transversal knowledge solution (Machine visions technologies for quality control). External networking through research partnerships within the market for technology was the main driver of the evolution of BCB's R&D activity. BCB was able to co-develop and prototype MV applications with clients in several industries (automotive, 3D acoustic measurements, electronics, solar power plants).

Open Innovation Relevance – The main benefits of a demand driven open approach came from the access to product and market knowledge, through proactive technology alliances. The following elements highlight the importance of this partnership in this change:

- *Insourcing through collaboration:* BCB's participation in European Framework Programmes through research consortia with universities, public centres and partner companies was a good opportunity for scientific knowledge insourcing. This strategy played a fundamental role in expanding the company's internal knowledge base and exploiting MV research opportunities in several industries.
- *Private-Public partnership:* The most important milestone in BCB's innovation strategy came with a Horizon 2020 project aimed to develop a market application of sensors integration technologies. BCB developed and patented, in collaboration with the Polytechnic University of Catalonia (UPC), the "Baby Beat" device. The system is based on a new method for continuous, non-invasive measurement of the fetal heartbeat, enabled by the use of a wearable device and by laser interferometry and sensor integration techniques.
- *New opportunities through EU programmes:* The H2020 SME Instrument programme has enabled the company to develop a new open business model based on market implementation of MV technology. This opportunity changed the company's innovation attitude: it shifted from a project sourcing based on collaboration on short-to-medium term collaboration projects to a problem sourcing approach based on involving external partners in product development.

Drivers - *Large EU framework projects* set the right incentives for knowledge sourcing and for the creation of large coalitions focused on research and technology development.

H2020 SME Instrument programme set the right incentives to develop a business model, select application and focus on market implementation

Barriers - *Priority setting for go-to-market.* The case shows that SMEs with a transversal knowledge base being involved in multiple R&D projects may fail to set the market to exploit their core technologies.

Lack of focus: the company risked not finding its way to the market: OIS require the implementation of sustainable business models. The company struggled to find a commercial application in spite of having developed a transversal technology.

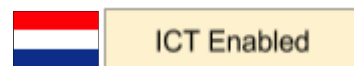
Interviewee: Javier Bezares del Cueto, Chief Executive Officer (CEO)

Javier Bezares del Cueto is a telecommunications engineer and an expert in imaging-based analyses. He worked 4 years as a project engineer in IIC (Ingeniería de Instrumentación y Control) and Isolux Corsan in Madrid; in 1996 he founded BCB Informática y Control, and he is the actual Chief Executive Officer of the company. Javier is a Member of AENOR's AEN/CTN 206/SC Subcommittee for Standardization of Solar Thermal Energy (CSP) Systems. In September 2014 he applied for patenting an innovative and non-invasive method to measure the fetal APW using a low-cost laser: "Method, device and computer programmes for measuring a fetal arterial pulse wave" (Europa 14-7163) (Bezares J., Royo S., Guerrero F.).

12 Philips



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Company description – Founded in 1891 in Eindhoven, NL Koninklijke Philips Electronics N.V. is today a multinational corporation active in many electronics-related business areas. Since January 2008, after a simplification effort of the company's structure, the activities are divided into the following four sectors: (1) healthcare (imaging systems, healthcare informatics, home healthcare solutions); (2) lighting (lamps, luminaires, lighting electronics, automotive and special lighting applications); (3) consumer lifestyle (video and multimedia applications, domestic appliances, peripherals and accessories); (4) innovation and emerging businesses (research, design, applied technologies).

Philips Research Eindhoven, based in the High Tech Campus Eindhoven (HTCE), is one of the largest private research organizations in the world and helps Philips introduce meaningful innovations that improve people's lives. Its activities focus on the three main market sectors of Philips (healthcare, lighting, consumer lifestyle), covering many disciplines, such as physics, chemistry, electronics, mechatronics, embedded software, signal processing, and computer science, in cross-disciplinary fields like biomedical engineering, microbiology, biophysics, system design, psychology, perception, and behavioral sciences. Research activities in all these areas combine to develop new products and advance engineering competencies in a multidisciplinary ecosystem, considering not only the scientific disciplines involved but also the products' potential application.

Company Status - In 2014, Philips employed approximately 120,000 people. It has an IPR portfolio of 80,000 patents and owns manufacturing sites in 28 countries and sales outlets in 150 countries.

Financial Results - In 2013, Philips' operating revenues accounted for €23.452M. Due to its wide patent portfolio, the share of intangibles over total assets is very high (36 percent).

Innovation Roadmap



Phase 1: Characteristics	Phase 2: Joint Research	Phase 3: Transfer of Results
<p>Philips establishes its university partnerships according to specific principles:</p> <ul style="list-style-type: none"> • Criteria of partner choice: proximity, quality, commitment. • One-to-One Agreement on main principles of the Programme, between Philips and University Institutions. 	<p>Once chosen the partner, Philips structures the joint research according to the following elements:</p> <ul style="list-style-type: none"> • 3 Research Areas: represented by Philips core businesses (lighting, healthcare, lifestyle). • 4 research teams per area, each consisting of 4 Ph.D. Students. • Joint governance including 3 subjects: 1) CEO of Philips; 2) delegation from Philips; 3) delegation from Technical University. Combined. These 3 subjects constitute the Joint Steering Committee of the Programme. 	<p>The outputs of Ph.D. Programmes represent a valuable result for Philips: The company puts emphasis on people: at the end of the Programme, Ph.D. graduates own skills and competences needed in Philips. They have a priority in company's hiring procedures.</p>
<p>The PPPs conducted by Philips show the following main characteristics:</p> <ul style="list-style-type: none"> • Cooperation Programmes on peripheral research area. • The core businesses of the company are not involved. 	<p>In conducting joint researches in PPPs, Philips shares facilities, machineries and research activities with its partners to develop new general technologies.</p>	<p>The management of the results obtained from PPPs follows two main rules:</p> <ul style="list-style-type: none"> • No priority on IP appropriation. • Results of the activities shared among partners.



Innovation Strategy - After Henry Chesbrough published his book *Open Innovation: The New Imperative for Creating and Profiting from Technology* (2003), Philips decided to start its own OIS policy trying to apply these principles, which moved the innovation strategy from closed to open.

Open Innovation Relevance – The shift from closed to open innovation strategy was very gradual. The following highlights some of key elements in Philips’ OIS:

- *Opening its Research Campus.* Philips put its Eindhoven Campus research centre at the heart of its OIS: from being a closed lab, it became an open campus.
- *Gradual Changes.* Philips implemented its OIS gradually and customized the strategy to company’s needs and characteristics. Philips is fully aware that OIS must apply following several subsequent phases and experimenting different methods of implementation. Furthermore, actions of OIS must adapt to the single company because a universal recipe for implementing OIS does not exist.
- *Private Collaboration with Different Partners:* In 2012, Philips reconsidered its OI strategy and decided to refocus on three types of partnerships: supplier, general, and strategic partnerships.

Type of Partners	Type of relation	Object of Partnership
Suppliers	Contractual Relations	Non-Core Business
General	Joint Programmes	Non-Core Business
Strategic	Joint Programmes	Core Business

- *Public Private Partnership with Universities:* Philips works intensively with universities around research projects to develop new IP and keeps the project focused on its business.
- *IP Strategy:* The company highlighted the importance of IP issues in cooperation: IP represents Philips’ achievement; cooperating on core business topics might jeopardize IP rights. When core IP is involved, Philips does not have partnerships with complementary companies because business interests overlap and the risk of losing priorities on the IP is too high.

Drivers - *Learning by doing.* The case suggests that a company can build experience and redefine OIS after first initial attempts.

Accountability of OI. Relevance of managerial control for successful implementation of open innovation. Centrality of monitoring and planning for resource allocation.

Appropriation Strategy matters. The case suggests that when partners are involved in co-development clear IP rules need to be established for OI to work.

Barriers - Partnership Management. The case suggests that it is difficult and time intensive to find the right partners, preserve reputation, build trust among partners, and avoid misunderstandings.

Interviewee: Ronald Begeer, Programme Manager Research

Ronald Begeer is Programme Manager Research at Philips since 2006, and Member of the Daily Management Committee of Point-One. In this role, he is responsible for the Eureka ITEA programme and the PDC Point-One programme in Royal Philips Electronics. Ronald previously served as Programme Manager (until 2010). Before starting working in Philips, Ronald was SW Development Manager in NXP Semiconductors (2002-2006) and in Philips Creative Display solution (1996-2000). Begeer graduated in Electrotechnics Engineer at Hogeschool Rotterdam.

In Philips, he is currently Programme Manager Research for PPP and he also runs European Programmes (Horizon 2020). He is Programme Manager for the cooperation with the Technical University Eindhoven. He works within the Campus.

13 Supponor OY



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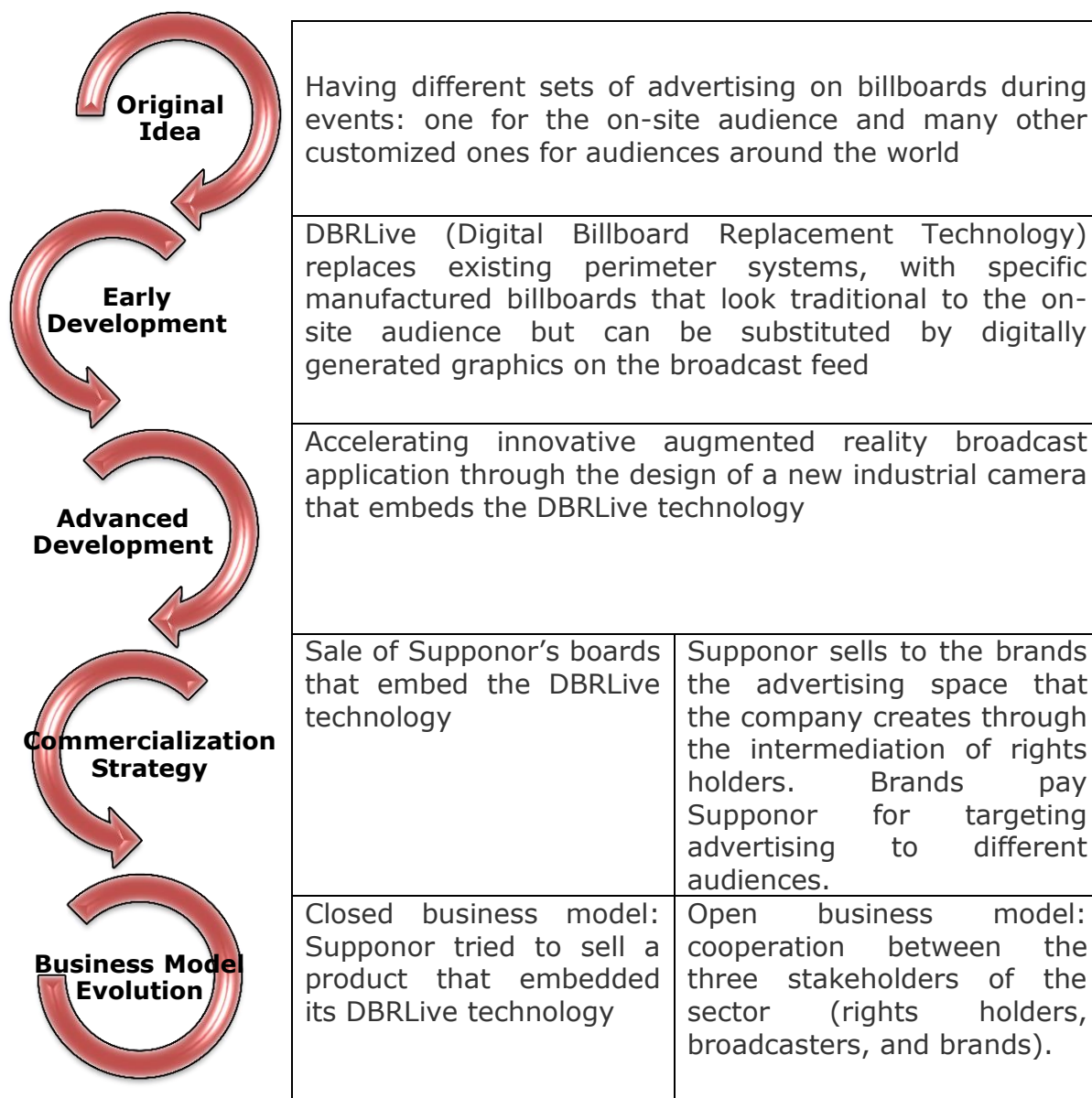
Company description - Supponor OY is a Finnish sports media and technology company whose DBRLive technology replaces traditional perimeter advertising in sports broadcasts with digital content. The company was started in 2000 as Virtual Advertising Systems (VAS) in Finland by Erkki Raintalainen, a physics teacher. In 2006, Conor Venture Partners invested in VAS to start Supponor. In 2008, Northzone, a European technology investment partnership, further invested in Supponor. Today, the company has its headquarters in the United Kingdom, and two branches located in Finland, including a commercial office, an operational centre, and its R&D department. The company's operational teams work with local partners and specialists at live sporting events across the globe.

Supponor's technology is the DBRLive, or Digital Billboard Replacement Technology. The DBRLive replaces existing perimeter systems, such as LED billboards, with their billboards that keep their traditional look for the on-site audience but whose appearance on the broadcast feed can be changed through digitally generated graphics. In other words, people attending the live event see the original billboards while people watching the broadcast see billboards customized with different advertisements.

In 2015, Supponor was awarded an H2020 SME Instrument grant, Phase 2, of €1,207,500. The company will conduct a three-year project on augmented reality cameras enabled with the DBRLive technology. The SME Instrument gives the company an opportunity to develop the business.

Company Status - Supponor is a privately held company owned by management, private investors, and VC funds (i.e. Sports Investment Partners, Northzone, and Conor). In 2013, the company's operating revenue was €1,352K. Supponor employs highly skilled software engineers in the research and development team in Espoo, Finland (19 people). The team constantly refines and develops the technology underpinning DBRLive.

Innovation roadmap



Innovation Strategy: Supponor's business model relies on three elements: i) DBRLive technology, a technically innovative media platform that integrates with live broadcasts; ii) value creation for sports rights holders by enhancing their perimeter billboard; iii) creating and delivering marketing opportunities to brands looking to engage specific sports audiences with relevant marketing.

Open Innovation Relevance – The following elements highlight Supponor's innovation process that shows how open innovation often occurs:

- *Collaboration with active market players:* Supponor made the whole active market converge around its technology through a new business model that enables the other stakeholders of the sector to further profit.
- *IP management strategy:* to openly cooperate with its partners, Supponor first patented its innovation. Patenting allowed Supponor to protect and keep under control the results of its research and to collaborate.

Drivers - *Business model matters.* Orchestration of partnerships aimed at creating win-win conditions by aligning incentives for all partners involved. The company develops a sustainable business model that takes to market a potentially disruptive technology.

Protection of IP. The case emphasized the relevance of strong IP protection in order to develop collaborations downstream with key partners.

H2020 SME instrument gave the company the resources and incentives to anticipate business development projects that otherwise would have been postponed.

Barriers - *Difficulty to establish partnerships.* Being at the forefront of technology is expensive and requires significant investments in in-house R&D. The company claims to be willing to engage in even more OIS for technological development if only capable partners existed.

Interviewee: Charlie Marshall, Chief Product & Strategy Officer

Charlie, working closely with the CEO Roger Hall, develops and drives the overall strategy and roadmap for Supponor's medium and long-term growth. Within the senior management team, Charlie is responsible for steering the execution of the company's strategy through deep analysis of international marketplaces (sports, technology, media, marketing, and communications) and owning the business plan that brings together all elements of Supponor's growth agenda. Charlie also heads up Supponor's Business Development, which involves leading specific new business activities and processes; forming strategic relationships with key partners (particularly broadcasters); and representing Supponor's presence as a growing force in the marketplace. Prior to joining Supponor, Charlie led Accenture's Media and Entertainment Management Consulting practice in Europe, Africa, and Latin America. He has also worked for Spectrum Strategy, Hutchison 3G, and Ingenious Media, and co-founded a successful online venture providing data and ticketing service.

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*Serving society
Stimulating innovation
Supporting legislation*

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