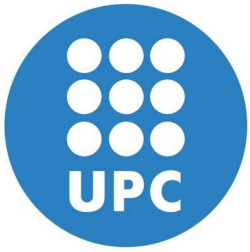

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Programa de Doctorado en Administración y Dirección de Empresas

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Tesis por compendio de publicaciones

COMERCIALIZACIÓN DE INNOVACIONES DISRUPTIVAS. ACTIVIDADES E INDICADORES CLAVE EN LA FASE DE ACELERACIÓN

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Esta tesis se presenta como un compendio de artículos publicados, siguiendo los criterios de la normativa académica de los estudios del Programa de Doctorado en Administración y Dirección de Empresas de la UPC. A continuación, se presentan las referencias y los índices de calidad de cada uno de los artículos que componen la Tesis doctoral, que generan una línea de investigación común:

1. **Commercialization of Disruptive Innovations: Literature Review and Proposal for a Process Framework**, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 5 (3), 2021, 127-144, ISSN 2096-2487, https://doi.org/10.1016/j.ijis.2021.07.001.

   Índice SJR Q2, Factor de impacto: 0.557, 2020, (Business, Management and Accounting: Management of Technology and Innovation), Indice H: 8. Citas: 2. Índice Scopus SNIP 2020: 2.561.

2. **Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison**. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 5 (2), 621-634, 2020, ISSN 2415-6698, https://doi.org/10.25046/aj050278.

   Índice SJR Q4, Factor de impacto: 0.139, 2019, (Business, Management and Accounting: Management of Technology and Innovation), Indice H: 7. Citas: 2. Índice Scopus SNIP 2020: 0.456.

3. **Key Activities for Successful Ventures Scaling Up**, Javier Nieto Cubero, Carolina Consolación Segura, Academy of Entrepreneurship Journal, 2020, 26 (4), 2020, Print ISSN: 1087-9595; Online ISSN: 1528-2686.

   Índice SJR Q3, Factor de impacto: 0.205, 2020, (Business, Management and Accounting: Business and International Management), Indice H: 12. Índice Scopus SNIP 2020: 0.384.

Publicaciones en Actas de Congresos Internacionales:

The Role Teams and Organizational Factors Play in Disruptive Innovations in Ambidextrous Organizations, Javier Nieto Cubero, Carolina Consolación Segura, Proceedings of the 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), 2019, 1-14, doi: 10.1109/ICE.2019.8792627. Libro de Actas publicado por IEEE.

Índice SJR, Factor de impacto: 0.2, (Business, Management and Accounting: Management of Technology and Innovation), 2019, Índice H: 5. Citas: 2.

NOTA: Todos los artículos están indexados en la base de datos Scopus. Los indicadores bibliométricos que se indican corresponden al año de la publicación, o, el año anterior, en el caso de que éste no conste todavía en Scopus.

Participación en Congresos Internacionales como parte del desarrollo de la investigación:

- XXIV Innovation and Product Development Management Conference (IPDMC, Reykjavik, Islandia, Junio, 2017). Título de la ponencia: **Commercilizing Radical Innovations. Review and Analysis of the Literature.**

- XXIX ISPIM Innovation Conference: The Name of The Game (Stockholm, Suecia, Junio, 2018). Título de la ponencia: **Managing integation of disruptive innovations in ambidextrous organizations.**

- XXV IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC, Vallbone, Francia, Junio 2019). Título de la ponencia: **The Role Teams and Organizational Factors Play in Disruptive Innovations in Ambidextrous Organizations**.

Participación en cursos y seminarios:

- IPDMC Doctoral Workshop, (Reykjavik, Islandia, Junio 2017).

- III AEM & TIM PhD Programs: Joint Paper Development Workshop "Entrepreneurship, Innovation, Internationalization: A Multidisciplinary Perspective" (Online, 2020). Título de la ponencia: **Commercialization of Disruptive Innovations: Literature Review and Proposal of Process Framework.**

Para Glòria, David, Ferran y Guillem.

RESUMEN

Contexto. El ecosistema industrial y empresarial actual está fuertemente condicionado por los avances tecnológicos y una competencia globalizada e interconectada, y consecuentemente es altamente dinámico y cambiante, con un alto componente de incertidumbre. La digitalización polariza aun más este contexto y pone de manifiesto la necesidad de desarrollar innovaciones disruptivas para poder mantener la competitividad de las empresas a largo plazo. La viabilidad tecnológica y la comercialización son dos de los retos más relevantes en el proceso de innovaciones disruptivas. Incluso siendo una de las fases más críticas, la comercialización es el área menos estudiada en este tipo de innovaciones (Aarikka-Stenroos y Lehtimaki, 2014; Marx et al., 2014) y autores como Chiesa y Frattini (2011), Datta et al.(2013), Al Natsheh et al. (2015) ó Tiberius et al. (2021) reclaman más investigación en este ámbito con el objetivo de obtener una mejor comprensión de los procesos de comercialización en las innovaciones disruptivas, para aumentar su probabilidad de éxito en el mercado a través de la identificación de los factores clave a considerar y las actividades a llevar a cabo en las diferentes fases del proceso de la innovación. Más particularmente, autores como Ford et al. (2011) afirman que no existe un marco teórico que describa el desarrollo de la fase de aceleración y académicos como van Burg et al. (2012) y Gassman et al. (2012) señalan que es necesaria más investigación sobre las actividades de comercialización a llevar a cabo durante esta fase concreta de la innovación.

Objeto de la investigación. Investigar cómo es el proceso de comercialización asociado a las innovaciones disruptivas, en concreto en la fase de aceleración, con la finalidad de obtener criterios de actuación en esta etapa y mejorar la tasa de éxito en la implantación de los proyectos de innovación en el mercado. Más específicamente, la investigación se centra en dos modelos organizacionales de innovación, las corporate ventures y las spinoffs.

Metodología. La investigación combina la revisión sistemática de literatura existente relativa a la comercialización en el contexto del proceso global de las innovaciones de alta incertidumbre, y más particularmente en la fase concreta de aceleración, con una metodología exploratoria cualitativa basada en estudio de caso múltiple (Yin, 2003). La muestra analizada está compuesta por 20 spinoffs y 15 corporate ventures (provenientes de 8 multinacionales) de diferentes sectores industriales como las tecnologías de la información, las telecomunicaciones, la electrónica, los servicios de ingeniería, los bienes de consumo, la salud y la biotecnología.

Resultados. Los principales resultados de esta investigación son los siguientes:

- Definición del concepto de comercialización en innovaciones disruptivas e identificación de factores de influencia.
- Diseño de un modelo teórico de comercialización de innovaciones disruptivas basado en el modelo DIA (O'Connor y de Martino, 2006).
- Propuesta de un listado de actividades de comercialización en las diferentes etapas de la fase de aceleración para las corporate ventures y las spinoffs, con el objetivo de mejorar la tasa de éxito en esta fase. Identificación y comparativa de los retos que afrontan las corporate ventures y las spinoffs.
- Lista de verificación de actividades e indicadores para evaluar la madurez y el momento adecuado para la transferencia de proyectos disruptivos desde una corporate venture a una unidad de negocio

Finalmente, es preciso señalar que las contribuciones de esta investigación se han plasmado en tres publicaciones que forman el núcleo de esta tesis doctoral por compendio.

ABSTRACT

Context. The current industrial and corporate ecosystem is heavily conditioned both by the technological advances and by the existence of globalized and interconnected markets. Consequently, this makes it highly dynamic and volatile, with a high degree of uncertainty. Further polarization of this context is brought up by digitalization, revealing thus the need to develop disruptive innovations in order to keep long-term corporate competitiveness. Both technological viability and commercialization are the most significant challenges facing the development of disruptive innovations. Although it is one of the most critical phases, commercialization remains greatly understudied in this type of innovations (Aarikka-Stenroos y Lehtimaki, 2014; Marx et al., 2014). Authors such as Chiesa and Frattini (2011), Datta et al.(2013), Al Natsheh et al. (2015), or Tiberius et al. (2021) called for new research to be carried out in this area in order to better understand the processes of commercialization in disruptive innovations. Its potential findings will increase the chances of market success through the identification of the key factors to take into account and the activities to undertake during each of the phases of the innovation process. More specifically, authors such as Ford et al. (2011) claimed that a theoretical framework describing the acceleration phase is missing and academics such as Burg et al. (2012), and Gassman et al. (2012) pointed out that extensive research on the commercialization activities to undertake during this particular phase of the innovation is needed.

Research topic. To investigate how the commercialization process of disruptive innovation works, in particular during the acceleration phase, in order to reveal intervention criteria to be implemented at this stage. Also, to improve the success rate of innovation projects being deployed in the market. The research will specifically focus on two organizational models of innovation: corporate ventures and spinoffs.

Methodology. The research combines a systematic review of existing literature on commercialization within the context of the overall process of high uncertainty innovations, in particular in the acceleration phase, with a qualitative and exploratory methodology based on multiple case study (Yin, 2003). The sample analyzed comprises 20 spinoffs and 15 corporate ventures (derived from 8 multinational companies) belonging to a diversity of industrial sectors such as information technology, telecommunications, electronics, engineering services, consumer goods, health care and biotechnology.

Findings. The main findings of the research are:

- Defining the concept of commercialization in disruptive innovations and identifying influencing factors.
- Designing a theoretical model for the commercialization of disruptive innovations based on the DIA model (O'Connor y de Martino, 2006).
- Propose of a list of commercialization activities during each of the stages of the acceleration phase for corporate ventures and spinoffs, with the goal of improving the success rate during this phase. Identifying and comparing the different challenges facing corporate ventures and spinoffs.
- Provide a list of verification activities and benchmarks to evaluate maturity and determine the right time to transfer disruptive projects from a corporate venture into a business unit.

Lastly, it should be noted that this research's contributions were laid out in three separate publications which together form the nucleus of this PhD thesis by published papers.

RESUM

Context. L'ecosistema industrial i empresarial actual està fortament condicionat pels avanços tecnològics i una competència globalitzada i interconnectada, i conseqüentment és altament dinàmic i canviant, amb un alt component d'incertesa. La digitalització polaritza encara més aquest context i posa de manifest la necessitat de desenvolupar innovacions disruptives per a poder mantenir la competitivitat de les empreses a llarg termini. La viabilitat tecnològica i la comercialització són dos dels reptes més rellevants en el procés d'innovacions disruptives. Fins i tot sent una de les fases més crítiques, la comercialització és l'àrea menys estudiada en aquesta mena d'innovacions (Aarikka-Stenroos i Lehtimaki, 2014; Marx et al., 2014) i autors com Chiesa i Frattini (2011), Datta et al.(2013), Al Natsheh et al. (2015) o Tiberius et al. (2021) reclamen més recerca en aquest àmbit amb l'objectiu d'obtenir una millor comprensió dels processos de comercialització en les innovacions disruptives, per tal d'augmentar la seva probabilitat d'èxit en el mercat a través de la identificació dels factors clau a considerar i les activitats a dur a terme en les diferents fases del procés de la innovació. Més particularment, autors com Ford et al. (2011) afirmen que no existeix un marc teòric que descrigui el desenvolupament de la fase d'acceleració i acadèmics com van Burg et al. (2012) i Gassman et al. (2012) assenyalen que és necessària més recerca sobre les activitats de comercialització que cal dur a terme durant aquesta fase concreta de la innovació.

Objecte de la recerca. Investigar com és el procés de comercialització associat a les innovacions disruptives, en concret en la fase d'acceleració, amb la finalitat d'obtenir criteris d'actuació en aquesta etapa i millorar la taxa d'èxit en la implantació dels projectes d'innovació en el mercat. Més específicament, la recerca se centra en dos models organitzacionals d'innovació, les corporate ventures i les spinoffs.

Metodologia. La recerca combina la revisió sistemàtica de literatura existent relativa a la comercialització en el context del procés global de les innovacions d'alta incertesa, i més particularment en la fase concreta d'acceleració, amb una metodologia exploratòria qualitativa basada en estudi de cas múltiple (Yin, 2003). La mostra analitzada està composta per 20 spinoffs i 15 corporate ventures (provinents de 8 multinacionals) de diferents sectors industrials com les tecnologies de la informació, les telecomunicacions, l'electrònica, els serveis d'enginyeria, els béns de consum, la salut i la biotecnologia.

Resultats. Els principals resultats d'aquesta recerca són els següents:

- Definició del concepte de comercialització en innovacions disruptives i identificació de factors d'influència.
- Disseny d'un model teòric de comercialització d'innovacions disruptives basat en el model DIA (O'Connor i de Martino, 2006).
- Proposta d'un llistat d'activitats de comercialització en les diferents etapes de la fase d'acceleració per a corporate ventures i spinoffs, amb l'objectiu de millorar la taxa d'èxit en aquesta fase. Identificació i comparativa dels reptes que afronten les corporate ventures i les spinoffs.
- Llista de verificació d'activitats i indicadors per a avaluar la maduresa i el moment adequat per a la transferència de projectes disruptius des d'una corporate venture a una unitat de negoci.

Finalment, cal assenyalar que les contribucions d'aquesta recerca s'han plasmat en tres publicacions que formen el nucli d'aquesta tesi doctoral per compendi.

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A mi directora de tesis, la Dra. Carolina Consolación Segura, por su orientación, rigor, espíritu crítico y paciencia como tutora en los años que duró esta investigación, ayudándome desde su experiencia y conocimiento.

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Esta tesis no habría sido posible sin cada una de vosotras y vosotros. Infinitas gracias.

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Capítulo 1

Introducción

1.1 Estructura del documento

El documento se estructura en 5 capítulos. En el capítulo 1 se detalla la justificación, el alcance y el foco de la tesis doctoral. Se enumeran los objetivos y preguntas de investigación. Se describe la relación entre los artículos que componen la tesis y como cada uno de ellos responde a los objetivos de la investigación, generando una unidad temática.

Los capítulos 2, 3 y 4 comparten estructura. En cada uno de ellos se describen los objetivos, contexto, metodología y resultados principales de cada artículo. El capítulo 5 describe los resultados globales de la investigación, detallando los hallazgos de cada uno de los artículos y las conclusiones de la tesis doctoral. El documento concluye enumerando futuras líneas de investigación.

1.2 Terminología, definiciones y conceptos básicos

Esta sección introduce conceptos fundamentales para facilitar la compresión del objeto de la investigación llevada a cabo. En primer lugar, se describen las diferencias clave entre innovaciones incrementales (de baja incertidumbre) y disruptivas (de alta incertidumbre). En segundo lugar, se pone de manifiesto la relevancia de la terminología que ha sido utilizada durante las últimas cuatro décadas en el ámbito de las innovaciones de alta incertidumbre y como ha influido en la falta de consistencia de la investigación en este área de estudio.

1.2.1 Tipos de innovación

Las innovaciones disruptivas o radicales proponen una oferta completamente nueva, basada mayoritariamente en avances tecnológicos, que modifica los hábitos y comportamientos de usuarios y mercados, estableciendo nuevas métricas respecto a los factores que sirven para valorar el producto o servicio (Bower y Christensen, 1995) y que requieren habitualmente nuevos modelos de negocio. Suponen un alto grado de incertidumbre. El grado de novedad no solo afecta a usuarios y mercados sino también a las propias organizaciones que las proponen. Por este motivo, este tipo de innovaciones requiere y genera nuevas competencias en los equipos y compañías que las implementan (Anderson y Tushman, 1990; Bower y Christensen, 1995).

Por otro lado, las innovaciones incrementales proponen adaptaciones o mejoras a productos, procesos o servicios existentes, sin cambiar los hábitos o comportamientos de usuarios o mercados. Las actividades innovadoras de tipo incremental tienden a asumir riesgos bajos, debido al conocimiento previo adquirido sobre los clientes y mercados actuales y están caracterizadas por retornos de la inversión a corto plazo (Chiesa y Frattini, 2011).

Estas son las dos grandes categorías reconocidas por los académicos para definir las tipologías de innovación (Kassicieh et al., 2001), pero pocos autores han enunciado que las organizaciones deben utilizar metodologías diferentes para implementar y comercializar innovaciones incrementales y disruptivas (Tushman et al., 1997; Bower y Christensen, 1995; Veryzer, 1998). Estos autores enuncian también los efectos contraproducentes que puede

tener la aplicación de métodos propios de la innovación incremental en procesos de innovación disruptiva.

1.2.2 Categorización de innovaciones de alta incertidumbre

En la categorización de la innovación con altos grados de incertidumbre se han utilizado terminologías diferentes durante los últimos 40 años, factor que dificulta significativamente la consistencia de la investigación en este ámbito.

García y Calantone (2002) demuestran un cierto consenso en la categorización de la innovación de alta novedad e incertidumbre, bajo la premisa de si están provocando discontinuidades de mercado y/o tecnológicas a nivel macro y /o micro.

Desde una perspectiva macro, estos autores evalúan la innovación en función de la novedad de la innovación a nivel global, en relación con los efectos que causan sobre la industria o el mercado, creando mercados completamente nuevos, modificando sus estructuras y cambiando las métricas de valoración de productos y servicios.

La perspectiva micro define la innovación como algo nuevo para la empresa o nuevo para el cliente. En este caso modifica el comportamiento y los patrones de consumo de los clientes. Por otro lado, provoca que se generen nuevas capacidades y competencias en las empresas que promueven estas innovaciones.

Bajo estos criterios, las innovaciones **radicales** (radical innovations) se definen como procesos que incorporan una nueva tecnología que da como resultado una nueva infraestructura de mercado (García y Calantone, 2002; Song y Montoya, 1998; O'Connor, 1998). Resultan en discontinuidades tanto a nivel macro como micro en el ámbito tecnológico y de mercado.

Por otro lado, Christensen (1997) y Daneels (2004), definen innovación **disruptiva** como aquella basada en una nueva tecnología y que permite desplazar a las empresas establecidas que siguen apoyándose en la tecnología preexistente, que se convertirá en obsoleta. Esto genera a su vez una nueva infraestructura de mercado. La innovación disruptiva cambia las bases de la competencia y modifica los atributos que los usuarios valoran en los productos o servicios. Este tipo de innovación impacta tanto a nivel macro como micro. Bajo esta conceptualización, las innovaciones disruptivas pueden considerarse innovaciones radicales. La diferencia radica en que las disruptivas se generan desde compañías emergentes que desplazan a las empresas establecidas.

Govidaranjan et al. (2006) añaden que las innovaciones radicales se basan en una tecnología sustancialmente nueva y podrían inicialmente estar dirigidas a un mercado emergente pero también a uno existente, a diferencia de las innovaciones disruptivas, que están inicialmente dirigidas a un mercado emergente o no atendido. La voluntad de canibalizar está relacionada con la innovación disruptiva (Christensen, 1997) pero no con la innovación radical. Esta última depende enormemente de las capacidades dinámicas y organizativas de las corporaciones, así como de su capital humano y su cultura de innovación. Aprovechar las competencias básicas y escalar más rápido que la competencia es esencial cuando se enfrentan a nuevos avances tecnológicos.

García y Calantone (2002) definen los **productos realmente novedosos** (really new products) como aquellos que generan una discontinuidad de mercado o una discontinuidad tecnológica pero que no incorporará ambas bajo el enfoque de nivel macro. A nivel micro, podría producirse cualquier combinación de discontinuidad tecnológica y/o de mercado.

La descripción de innovación **discontinua** (discontinuous innovation) engloba el concepto de radical o producto realmente novedoso según el nivel macro o micro de las discontinuidades tecnológicas y de mercado que provoca (Rice et al., 1998).

Por otro lado, O'Connor y Rice (2012), definen innovaciones **revolucionarias** (breakthrough innovations) en función de su impacto en el mercado. Las innovaciones revolucionarias podrían transformar los mercados e industrias existentes o crear otros nuevos, a nivel macro.

Teniendo en consideración las definiciones previas, la presente investigación se focaliza en innovaciones disruptivas, generadas por compañías emergentes (bajo el modelo de corporate ventures y spinoffs) con base tecnológica, y que tienen como resultado un impacto macro a nivel de mercado.

1.3 Contexto y alcance

El ecosistema empresarial actual esta fuertemente condicionado por los avances tecnológicos y una competencia globalizada e interconectada, y consecuentemente es altamente dinámico y cambiante, con un alto componente de incertidumbre. Por estas razones las compañías no pueden basar su estrategia únicamente en innovaciones incrementales. La digitalización polariza aun más este contexto y pone de manifiesto la necesidad de desarrollar innovaciones disruptivas y radicales para poder mantener la competitividad de las empresas a largo plazo (Lettl, 2007; Al Natsheh et al., 2015).

Durante los últimos 30 años, la investigación relacionada con innovaciones disruptivas y radicales ha crecido de manera relevante, generando un ámbito de estudio fragmentado en diferentes áreas de conocimiento (Tiberius et al., 2021). El foco de investigación ha cambiado de la gestión de la tecnología a una serie de áreas como el desarrollo de producto (new product development, NPD), el emprendimiento, la gestión estratégica de la innovación o su comercialización, ámbitos poco relacionados entre sí en la literatura existente.

Diferentes autores como O'Connor et al. (2008) o Chiesa y Frattini (2011) afirman que la viabilidad tecnológica y la comercialización son dos de los retos más relevantes en el proceso de innovaciones disruptivas y radicales. Adicionalmente, Aarikka-Stenroos y Lehtimaki (2014) o Marx et al. (2014) afirman que incluso siendo una de las fases más críticas, la comercialización es el área menos estudiada en este tipo de innovaciones de alto riesgo y complejidad.

La comercialización es clave para entender las interrelaciones entre los procesos de gestión de la innovación y las posibilidades de éxito al implementar nuevos productos o servicios en el mercado, especialmente en condiciones de alta incertidumbre (Aarikka-Stenroos y Lehtimaki, 2014). Además, la comercialización es habitualmente la etapa más costosa de todo el proceso de innovación (Cooper, 1990). Una comercialización efectiva es un factor fundamental para el éxito de la innovación y existe evidencia empírica que respalda esta hipótesis (Calantone y Di Benedetto, 1988)

Sin embargo, la literatura académica no ha desarrollado, hasta ahora, un modelo de comprensión integral de los factores que distinguen una comercialización efectiva de una ineficaz en el ámbito de la innovación disruptiva (Frattini et al., 2012).

La investigación sobre la comercialización de la innovación disruptiva está también fragmentada. Los estudios han abordado la comercialización desde diferentes puntos de vista, y no ofrecen un marco integrador del proceso (Hopp et al., 2018). Por otro lado, existe una inconsistencia entre la teoría e investigación académica y la práctica de los procesos de innovación radical y disruptiva, enunciada por diversos autores como Still (2017), Si y Chen (2020) o Shepperd y Gruber (2020), que reclaman más investigación en este ámbito.

Autores como Chiesa y Frattini (2011), Pellikka et al. (2012), Datta et al. (2013) y más recientemente Al Natsheh et al. (2015) o Tiberius et al. (2021) reclaman más investigación con el objetivo de obtener una mejor comprensión de los procesos de comercialización de las innovaciones disruptivas y radicales, para aumentar su probabilidad de éxito en mercado a través de la identificación de los factores clave a considerar y las actividades a llevar a cabo en las diferentes fases del proceso de la innovación.

Más concretamente, y considerando el modelo de proceso de innovación Descubrimiento-Incubación-Aceleración (O'Connor y de Martino, 2006), autores como Ford et al. (2011) afirman que no existe un marco teórico que describa el desarrollo de la fase de aceleración y académicos como van Burg et al. (2012) o Gassman et al. (2012) indican que es necesaria más investigación sobre las actividades de comercialización a llevar a cabo durante esta fase de la innovación.

1.4 Objetivos y preguntas de investigación

En respuesta a las líneas de investigación previamente citadas, esta tesis doctoral tiene como principal objetivo:

> ***Investigar cómo es el proceso de comercialización asociado a las innovaciones disruptivas, en concreto en la fase de aceleración, con la finalidad de obtener criterios de actuación en esta etapa y mejorar la tasa de éxito en la implantación de los proyectos de innovación en el mercado.***

Para poder lograr este objetivo, se definieron preguntas de investigación. Según Agee (2009), establecer los objetivos adecuados es un requisito previo para desarrollar y abordar preguntas de investigación.

La primera pregunta de investigación surge a partir de la falta de consenso en relación con la definición del concepto de comercialización en el ámbito de la innovación disruptiva. Por otro lado, la definición del concepto de la comercialización en innovación disruptiva sigue estando poco desarrollado. Los conceptos que no han sido suficientemente desarrollados dificultan el uso de los hallazgos de la investigación basados en ellos (Tranfield et al., 2003). Académicos como Frattini et al. (2012) o Datta et al. (2013), reclaman un estudio adicional sobre el concepto de comercialización para obtener una mejor comprensión sobre este.

Para académicos como Cooper (1986) o Veryzer (1998), que proponen modelos lineales o de tipo hitos o puertas (stage-gate), la comercialización es una fase que aparece al final del proceso de innovación y no influye en decisiones de conceptualización y desarrollo del producto o servicio. En cambio, otros autores, en estudios más recientes, como Prebble

et al. (2008), Chiesa and Frattini (2011) o Aarikka-Steenroos y Lehtimäki (2014), consideran el concepto de comercialización como un proceso en el que el desarrollo de producto y las actividades de interacción con el mercado están estrechamente relacionadas, se influyen mutuamente y evolucionan en paralelo.

La falta de consistencia en relación con el concepto de comercialización en innovaciones disruptivas motiva la primera pregunta de investigación del presente estudio.

Pregunta de investigación 1

¿Cuál es el papel de la comercialización en el proceso de innovaciones disruptivas?

La segunda pregunta de investigación surge del trabajo de académicos como O'Connor y de Martino (2006), Slater et al. (2014) o Petzold et al. (2019), que reclaman más investigación sobre la compleja interacción que existe entre el proceso de innovación disruptiva y las actividades específicas de comercialización que se requieren para la implementación de la innovación en sus diferentes fases.

Adicionalmente, esta segunda pregunta de investigación también deriva de los estudios de Slater y Mohr (2006) y Frattini et al. (2012) que recomiendan más investigación sobre los factores que influyen en el proceso de comercialización y de los de Eldred y MacGrath (1997) o Amadi-Echendu y Rasetlola (2011), que solicitan explicitar modelos de comercialización que definan el proceso completo y las actividades a llevar a cabo en cada momento. El objetivo de la pregunta de investigación es diseñar un modelo teórico de comercialización asociado a las diferentes fases de desarrollo de las innovaciones disruptivas.

Pregunta de investigación 2

¿Cuáles son los modelos de comercialización en innovaciones disruptivas y sus actividades vinculadas?

Las dos primeras preguntas de investigación se relacionan directamente con el primer artículo de esta tesis doctoral (aunque cronológicamente haya sido el último en publicarse), que constituye su marco teórico. Adicionalmente, ha servido para definir el foco de la investigación en la fase de aceleración, en la que se profundiza en el segundo y tercer artículo.

La fase de aceleración y escalado es clave en el proceso de innovación. Si una corporación no es capaz de convertir conceptos validados en negocios con impacto, no será capaz de implementar proyectos de innovación de carácter disruptivo (Mattes y Ohr, 2019). Un número muy reducido de compañías tienen definido un proceso efectivo para llevar a cabo la fase de aceleración y escalado (van Burg et al., 2012) y no existe un marco teórico para el desarrollo de esta fase de la innovación (Ford et al., 2011).

Christensen (1997) afirma que las grandes corporaciones presentan grandes dificultades a la hora de implementar innovaciones disruptivas. Escuchan demasiado a sus clientes consolidados y se focalizan en la explotación de productos existentes e innovaciones incrementales y no en la exploración de nuevas oportunidades. Las startups son la tipología de organizaciones más capaces de presentar disrupciones en el mercado, por lo que las corporaciones optan por modelos de innovación como el corporate venturing o el spinoff para poder equilibrar actividades de explotación y exploración. El mecanismo de corporate venturing se basa en unidades de innovación estructuralmente separadas de la compañía matriz con recursos para gestionar proyectos de innovación desde la idea hasta la

comercialización. Uno de los retos clave para este tipo de modelo de innovación es como las organizaciones incorporan las ventures a la corporación en el momento de su aceleración y escalado (Jansen et al., 2009). Por otro lado, el concepto de spinoff se basa en la generación de una estructura completamente nueva creada para desarrollar y explotar el potencial de una innovación.

La investigación se enfoca en las actividades de comercialización de las corporate ventures y las spinoffs en la fase de aceleración. Autores como O'Connor y de Martino (2006), van Burg et al. (2012) o Gassman et al. (2012) afirman que el momento de aceleración, escalado y transición a unidades de negocio no está lo suficientemente estudiado y es necesaria más investigación para definir el proceso de comercialización en esta fase.

Pregunta de investigación 3

> ***¿Cuáles son las actividades de comercialización clave para facilitar la fase de aceleración y escalado de innovaciones disruptivas en las corporate ventures y las spinoffs?***

La tercera pregunta de investigación tiene como objetivo establecer un modelo que describa las actividades clave de comercialización a llevar a cabo durante la fase de aceleración para mejorar la tasa de éxito en la implementación de innovaciones disruptivas.

En el contexto concreto de las corporate ventures, según Andriopoulus y Lewis (2009), la literatura existente identifica ciertas actividades e indicadores para evaluar la madurez de los proyectos de innovación, pero el conocimiento está fragmentado. Paralelamente, el estudio de O'Connor et al. (2002) aborda de manera parcial mecanismos de validación y evaluación de la madurez de las ventures. La cuarta pregunta de investigación surge de la afirmación de van Burg et al. (2012) que afirman que no existe ningún estudio que presente un conjunto completo de actividades clave para determinar si la venture está lista para ser transferida y escalada. Adicionalmente, esta cuarta pregunta de investigación también deriva del estudio de O'Connor y de Martino (2006) en el que afirman que la literatura existente tampoco describe cómo determinar el momento más adecuado para el escalado e integración del proyecto. En consecuencia, se plantea la última pregunta de esta investigación:

Pregunta de investigación 4

> ***¿Cuáles son los factores y actividades clave para determinar la madurez de una corporate venture y determinar el momento de transferencia y escalado?***

El objetivo asociado es establecer criterios para definir si el proyecto de innovación presenta madurez suficiente para su transferencia y cuál es el momento más adecuado para ello.

En resumen, la primera pregunta de investigación busca obtener una mirada global sobre el papel de la comercialización en el proceso de innovaciones disruptivas y la evolución de su conceptualización en el tiempo. A partir de las premisas de estudios más recientes como el de O'Connor y de Martino (2006), Slater et al. (2014), o Petzold et al. (2019), la segunda pregunta pretende identificar como el proceso de comercialización interacciona con las actividades que se desarrollan durante las diferentes fases de desarrollo de la innovación, para definir las actividades y los factores clave en cada etapa. El objetivo es definir un modelo de comercialización aplicable a innovaciones disruptivas.

Dentro del marco de las actividades de comercialización, la tercera pregunta de investigación tiene como objetivo identificar los factores clave para llevar a cabo con éxito la fase de aceleración. Por último, la cuarta pregunta de investigación busca determinar un modelo de evaluación completo del grado de madurez de una venture que permita establecer a su vez el momento más adecuado para su escalado.

1.5 Relación entre los objetivos y los artículos publicados que componen la tesis

En relación con los objetivos de la investigación, cada uno de los artículos presenta resultados complementarios en el ámbito de la comercialización de innovaciones disruptivas.

Objetivo principal	Sub-Objetivos	Preguntas de investigación	Artículo	Capítulo del documento	Inputs	Outputs
Investigar cómo es el proceso de comercialización asociado a las innovaciones disruptivas, en concreto en la fase de aceleración.	Desarrollar el concepto de comercialización en innovaciones disruptivas.	1. ¿Cuál es el papel de la comercialización en el proceso de innovaciones disruptivas?	Commercializ-ation of disruptive innovations: Literature review and proposal for a process framework.	2	Revisión sistemática de literatura. Selección y análisis de 64 artículos con factor de impacto >1 en el ranking JCR.	Definición del concepto de comercialización en innovaciones disruptivas e identificación de factores de influencia.
	Establecer un modelo de comercialización asociado a las diferentes fases de desarrollo de las innovaciones disruptivas.	2. ¿Cuáles son los modelos de comercialización en innovaciones disruptivas y sus actividades vinculadas?				Modelo de comercialización para innovaciones disruptivas a partir del proceso DIA (O'Connor y de Martino, 2006).
	Definir un modelo que describa las actividades clave de comercialización a llevar a cabo durante la fase de aceleración por las corporate ventures y las spinoffs para mejorar la tasa de éxito en innovaciones disruptivas.	3. ¿Cuáles son las actividades de comercialización clave para facilitar la fase de aceleración y escalado de innovaciones disruptivas en las corporate ventures y las spin-offs?	Commercializ-ation Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison.	3	Metodologia cualitativa. Estudio de caso múltiple. Muestra de 12 proyectos (provenientes de 5 multinacionales) de corporate venturing y 20 proyectos de spinoffs (20 spinoffs).	Listado de actividades de comercialización en las diferentes etapas de la fase de aceleración para las corporate ventures y las spinoffs. Retos que afrontan las corporate ventures y las spinoffs en la fase de aceleración.
	Establecer criterios para definir si el proyecto de innovación es suficientemente maduro para su transferencia y cuál es el momento más adecuado para ello, en el contexto de las corporate ventures.	4. ¿Cuáles son los factores y actividades clave para determinar la madurez de una venture y determinar el momento de transferencia y escalado?	Key activities for successful ventures' scaling up.	4	Metodologia cualitativa. Estudio de caso múltiple. Muestra de 15 proyectos de corporate venturing (8 multinacionales)	Listado de un conjunto de actividades e indicadores para evaluar la madurez y el momento adecuado para la transferencia, caracterizadas en relación con las diferentes categorías de incertidumbre.

Tabla 1. Objetivos, preguntas de investigación, inputs y outputs de los artículos que componen la investigación. Elaboración propia

Artículo 1. Commercialization of disruptive innovations: Literature review and proposal for a process framework

El primer artículo, "Commercialization of disruptive innovations: Literature review and proposal for a process framework", ha seleccionado los artículos más relevantes en el ámbito de la comercialización de innovaciones disruptivas desde una perspectiva multidisciplinar. La investigación ha permitido realizar una mirada global sobre la comercialización de innovaciones disruptivas, identificando los marcos teóricos asociados y proponiendo un modelo teórico de comercialización.

Se ha llevado a cabo una revisión sistemática de la literatura existente (Denyer and Tranfield, 2009), mediante un riguroso proceso de ubicación, selección y análisis, revisando las contribuciones de 64 trabajos académicos de alto impacto (con un valor de corte de >1 de Factor de Impacto en el ranking ThomsonReuters, Journal Citation Reports, según las recomendaciones de Tranfield et al. (2003), del ámbito de la comercialización de innovaciones de alta incertidumbre desde 1980 hasta 2020.

La investigación refleja cómo la comercialización ha evolucionado desde una etapa final de la innovación a tener un papel en el que evoluciona en paralelo al desarrollo de producto y que influye en las decisiones de producto/servicio incluso desde las primeras fases de la innovación. La investigación concluye que la comercialización se caracteriza por actividades de exploración, aprendizaje, interacción con usuarios y clientes, y creación de ecosistemas, aparte de las más consolidadas de lanzamiento, introducción al mercado y difusión.

Los hallazgos del artículo se clasifican a través de un análisis descriptivo y un análisis temático. En cuanto al análisis temático, destaca la identificación de los conceptos que influyen sobre la comercialización de innovaciones disruptivas, tales como: el aprendizaje del mercado, la participación del usuario en el proceso de innovación, la orientación de mercado, la configuración y construcción del mercado, el papel de los ecosistemas y las comunidades de adopción y el concepto de transferencia de la innovación.

A partir del análisis de la literatura existente el artículo propone un modelo de comercialización para innovaciones disruptivas. El modelo se basa fundamentalmente en los trabajos de O'Connor y Rice (2013) y Aarikka-Stenroos y Lehtimäki (2014), identificando objetivos y actividades de comercialización concretas, asociadas al proceso de Descubrimiento-Incubación-Aceleración (DIA) enunciado por O'Connor y de Martino (2006). El modelo propone tres fases:

1) Validación de concepto / propuesta de valor,
2) Validación del modelo de negocio y creación de mercado, y
3) Creación de ventas en el mercado mayoritario.

Como se ha apuntado previamente, este modelo integrado ha permitido a su vez identificar y establecer un área más específica de estudio, definiendo preguntas de investigación vinculadas a la etapa de aceleración, que se responden en el segundo y tercer artículo.

Artículo 2. Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison

El segundo artículo, "Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison", tiene como objetivo establecer un modelo que describa las actividades clave de comercialización a llevar a cabo durante la fase de aceleración, para mejorar la tasa de éxito en la implementación de innovaciones disruptivas en el caso de las corporate ventures y las spinoffs.

A nivel metodológico, en primer lugar, se llevó a cabo una revisión del estado del arte sobre el proceso y actividades de comercialización en la fase de aceleración para las corporate ventures y las spinoffs. La revisión de la literatura existente permitió caracterizar los hallazgos previos en cuanto a las actividades de comercialización en tres etapas dentro de la fase de aceleración: pre-transición, transición y post-transición a unidades de negocio en el caso de las corporate ventures y pre-comercialización, comercialización y post-comercialización en el caso de las spinoffs.

A partir del estudio de la literatura existente, se llevó a cabo una investigación basada en una metodología cualitativa de estudio de caso múltiple, a través de una muestra de 12 proyectos de corporate venturing (provenientes de 5 corporaciones) y 20 proyectos de spinoffs, procedentes de diferentes países europeos (España, Reino Unido, Alemania y Finlandia). La muestra elegida estaba formada por empresas de diferentes sectores industriales como la electrónica, las tecnologías de la información, las telecomunicaciones, los servicios de ingeniería, los bienes de consumo, la salud y la biotecnología. La diversidad en la procedencia y la transversalidad sectorial de la muestra tenía como objetivo evitar un sesgo derivado del origen o sector industrial.

Se utilizaron como instrumentos de investigación entrevistas semiestructuradas, cuyo guión esta basado en el trabajo de O'Connor et al. (2002), e información secundaria suministrada por las compañías que participaban en la muestra. El guión de las entrevistas se muestra en los anexos del documento. La información obtenida de las entrevistas fue transcrita y luego analizada mediante codificación abierta (Corbin y Strauss, 2008) para reconocer patrones en respuesta a las preguntas de investigación formuladas. La información que se obtuvo a través de las entrevistas se comparó con la literatura existente conduciendo a hallazgos y conclusiones específicas.

Los hallazgos presentan las actividades clave que las corporate ventures y las spinoffs deben realizar en la fase de aceleración para facilitar el éxito en el escalado, agrupadas en las etapas de pre-transición / pre- comercialización, transición / comercialización y post-transición / post- comercialización respectivamente. El artículo concluye que la formación de equipos, el desarrollo de comunidades y ecosistemas de innovación, así como las relaciones prematuras con comercializadores potenciales y con los diferentes agentes vinculados al proyecto son las actividades de comercialización más relevantes que requieren las innovaciones disruptivas en la fase de aceleración, independientemente del tipo de organización que las afronte. Adicionalmente, el artículo pone de manifiesto las divergencias en el proceso de comercialización entre las corporate ventures y las spinoffs. Estas divergencias incluyen la madurez del proyecto de innovación, la gestión del conocimiento o el enfoque de la fase posterior al escalado.

Artículo 3. Key activities for successful ventures' scaling up

El tercer artículo, "Key activities for successful ventures' scaling up", es una continuación del segundo artículo, profundizando en los indicadores y actividades fundamentales para evaluar la madurez de las corporate ventures antes ser transferidas a las corporaciones. El objetivo de la investigación es establecer criterios para determinar el momento más adecuado para la transferencia.

Se llevó a cabo inicialmente una revisión bibliográfica que permitió clasificar los hallazgos de artículos existentes respecto a los indicadores de madurez de las corporate ventures, en relación con las diferentes categorías de incertidumbre que afectan a los proyectos de innovación disruptiva.

La investigación continuó con una metodología cualitativa de estudio de caso múltiple, mediante de una muestra de 15 proyectos de corporate venturing (de 8 corporaciones diferentes) procedentes de diferentes países europeos (España, Reino Unido y Alemania). La composición de las corporate ventures de la muestra es una ampliación respecto a la del segundo artículo. La investigación se focalizó en las corporate ventures, ya que se estaba evaluando el grado de madurez previo a la transferencia a unidades de negocio corporativas, fenómeno que no se produce en el caso de las spinoffs.

Doce de los proyectos de la muestra se integraron a una unidad de negocio interna de la empresa, uno de ellos se transfirió a una empresa externa y dos proyectos tuvieron un doble destino tanto a una unidad de negocio interna como a una empresa externa. Nueve de los casos fueron proyectos exitosos en el proceso de transferencia. Otros cinco resultaron en fracaso, y el último aún se encuentra en la fase de crecimiento. La definición de éxito de las innovaciones se definió como la consecución de la transferencia y escalado del proyecto, implementado y comercializado en una unidad de negocio.

Se utilizaron como instrumentos de investigación entrevistas semiestructuradas (basadas en el artículo de Rice et al., 2002) e información secundaria facilitada por las empresas de muestra. El guión de las entrevistas se muestra en los anexos del documento. La información obtenida de las entrevistas fue transcrita y luego analizada mediante codificación abierta (Corbin y Strauss, 2008) y se identificaron patrones de respuesta a la pregunta de investigación, identificando las actividades e indicadores para determinar la madurez y el momento para la escalado.

El análisis de los casos en comparación con la revisión bibliográfica permitió integrar los hallazgos del estudio empírico con el conocimiento existente, resultando en un conjunto de actividades e indicadores para evaluar la madurez y el momento adecuado para la transferencia. El artículo describe este conjunto de actividades concretas caracterizadas en relación con las diferentes categorías de incertidumbre (técnica, de mercado, organizacional y de recursos).

Capítulo 2

Comercialización de innovaciones disruptivas: Estado del arte y propuesta de un modelo de proceso

2.1 Introducción y objetivos

El primer artículo, **Commercialization of disruptive innovations: Literature review and proposal for a process framework,** responde a las dos primeras preguntas de la investigación de la tesis doctoral.

La primera surge a partir de la falta de consenso en relación con la definición del concepto de comercialización en el ámbito de la innovación disruptiva. Autores como Datta et al. (2013) o Frattini et al. (2012), reclaman más investigación en este ámbito.

¿Cuál es el papel de la comercialización en el proceso de innovaciones disruptivas?

El objetivo principal asociado a esta pregunta es desarrollar la definición de comercialización en innovación disruptiva para facilitar la interpretación de los hallazgos relacionados con este concepto.

La segunda pregunta de investigación surge del trabajo de académicos como O'Connor y de Martino (2006), Pellikka et al. (2012), Slater et al. (2014) o Petzold et al. (2019), que destacan la necesidad de más investigación para obtener una mayor comprensión de los procesos de comercialización de las innovaciones disruptivas, para aumentar la probabilidad de éxito en mercado a través de la identificación de los factores clave a considerar y las actividades a llevar a cabo en las diferentes fases de la innovación.

¿Cuáles son los modelos de comercialización en innovaciones disruptivas y sus actividades vinculadas?

El objetivo de la pregunta de investigación es establecer un modelo de comercialización asociado a las diferentes fases de desarrollo de las innovaciones disruptivas.

2.2 Marco teórico

2.2.1 Modelos de proceso de innovación disruptiva

Los enfoques del proceso de innovación podrían agruparse en dos categorías: lineales y no lineales. Una visión lineal muestra el proceso de innovación disruptiva iniciando con una idea, siguiendo con el desarrollo del producto y terminando cuando el producto crea riqueza a través de la comercialización. Este enfoque muestra un paralelismo con el marco teórico de desarrollo de productos basado en hitos o puertas (Cooper, 1990).

Por otro lado, un enfoque no lineal enfatiza el proceso de desarrollo de productos, pero también la interacción con todos los actores del proyecto, así como en las actividades de marketing y comercialización. En este enfoque, tanto las actividades de desarrollo como las de comercialización actúan en paralelo y están interrelacionadas.

2.2.1.1 Modelos de proceso de innovación lineales

Los modelos presentados por Veryzer (1998) y Markham (2002), presentan un marco lineal donde el enfoque está en la construcción de conceptos, la búsqueda de la viabilidad técnica, la demostración interna para obtener la aprobación y el apoyo necesarios de la alta dirección de la empresa y la obtención de los recursos críticos para desarrollar y lanzar un nuevo producto. La comercialización es una fase final que aparece una vez se valida el prototipo de producto o servicio. Los procesos citados se basan fundamentalmente en el marco teórico de desarrollo de productos (New Product Development, NPD).

Entre los modelos de NPD, el más referenciado es el propuesto por Cooper (1990), basado principalmente en el establecimiento de un sistema de puertas (stage-gate), que se articula mediante la consecución de hitos durante el proceso de desarrollo, que transcurre por diferentes etapas. Las puertas están destinadas a la detección de puntos débiles en el proyecto, al control de viabilidad de la propuesta y a la toma de decisiones. Este marco teórico detalla el proceso NPD en varias fases como: 1) idea, 2) evaluación preliminar de concepto, 3) desarrollo, pruebas y validación, 4) producción y 5) comercialización.

Según este modelo, la fase de comercialización es una tarea que se realiza al final del proceso y no modifica las decisiones tomadas en las puertas precedentes. En su trabajo más reciente, Cooper (2017) ha incorporado actualizaciones del modelo, basadas en una visión más flexible y adaptable a los cambios del mercado actual, acercándose más a modelos como Lean Startup (Ries, 2011).

2.2.1.2 Modelos de proceso de innovación no lineales

Los trabajos de O'Connor y de Martino (2006), O'Connor (2008) y Story et al. (2009), identifican un proceso basado en tres fases para la innovación disruptiva: descubrimiento, incubación, aceleración, conocido como el modelo DIA (Discovery-Incubation-Aceleration, enunciado por O'Connor y de Martino, 2006). Cada una de las fases requiere distintos tipos de experiencia, conocimientos y habilidades en el equipo de innovación.

La fase de **descubrimiento** involucra actividades que buscan la identificación, creación, elaboración y articulación de oportunidades de innovación disruptiva.

La fase de **incubación** implica actividades que convierten oportunidades disruptivas en propuestas comercializables. La incubación no estará completa hasta que esa propuesta haya sido probada en el mercado, con un prototipo funcional. Las habilidades necesarias para la incubación son fundamentalmente de experimentación. Los experimentos se llevan a cabo para reducir no solo la incertidumbre técnica sino también la del mercado, para iniciar la creación de clientes y para probar el encaje de la propuesta comercial con los usuarios y el mercado.

Como señalan O'Connor et al. (2008) y Slater et al. (2014) esta fase implica sondear a posibles clientes reales, desarrollar versiones comerciales tempranas y testearlas, identificar tecnologías o productos complementarios y explorar posibles oportunidades de asociación con otros actores de la cadena de valor. El objetivo es maximizar el aprendizaje sobre usuarios, clientes y mercados.

La fase de **aceleración** se enfoca en construir un negocio que permita una estabilidad en términos de ventas y operaciones. Se basa en preparar la innovación para su

implementación y escalado. Esta etapa también se caracteriza por una continua exploración y experimentación del mercado, trabajando con clientes reales para refinar el producto y los modelos de negocio (Rice et al., 2002). La fase de aceleración busca madurar el proyecto hasta un punto en el que puede evolucionar por sí solo antes de transferirlo a la unidad de negocio correspondiente. El último paso será la comercialización masiva a todos perfiles de adopción de la innovación. Esta fase implica el lanzamiento y el crecimiento de las redes de distribución.

O'Reilly y Binns (2019), más recientemente, presentan una variante del proceso descrito anteriormente y lo dividen en tres fases principales: 1) generación de ideas o **descubrimiento**, donde se desarrollan ideas para nuevos negocios potenciales; 2) **incubación**, donde las nuevas ideas se validan en un mercado preliminar; y 3) **escalado**, donde los activos y capacidades existentes en las compañías se redistribuyen para ayudar a que la nueva empresa crezca. Para tener éxito en el escalado, una nueva empresa necesita agregar clientes, y una capacidad operativa lo suficientemente rápida para maximizar el valor de la oportunidad en el mercado.

Comparando los enfoques lineales y no lineales. se puede concluir que el proceso de innovación disruptiva ha mutado con el paso del tiempo de un enfoque basado en marcos más rígidos, del tipo hitos o puertas (Cooper, 1990), a un proceso donde el desarrollo de producto y la comercialización están íntimamente relacionados, evolucionando en paralelo (Prebble et al., 2008; Aarikka-Steenroos y Lehtimäki, 2014).

2.2.2 Modelos de difusión de la innovación

La teoría de la difusión de la innovación, desde su obra de referencia "Diffusion of Innovations" (Rogers, 1963), clasifica a los usuarios en una serie de perfiles en función de una variable principal: su respuesta a la disrupción y su propensión a adoptar la innovación.

Según Rogers (1963) no todo el mercado adoptará inmediatamente una idea disruptiva a pesar de los beneficios ofrecidos, sino que lo harán gradualmente pudiéndolos agrupar en categorías o perfiles. Rogers (1963) asignó a estas categorías de usuarios las siguientes denominaciones, ordenados a continuación en relación con la disposición a aceptar la innovación:

- Tecnófilos (Innovators),
- Visionarios (Early Adopters),
- Pragmáticos (Early Majority),
- Conservadores (Late Majority) y
- Escépticos (Laggards)

Más recientemente, Moore (2002) refina y construye un concepto a partir del trabajo de Everett M. Rogers. Moore (2002) afirma que cada perfil de adopción requiere un enfoque diferente de comercialización. El autor afirma que la diferencia entre visionarios y pragmáticos es tan importante que se produce un abismo (chasm) entre ambas categorías de consumidores, siendo este momento el más crítico en la adopción de las innovaciones, particularmente las que conllevan cambios importantes en mercados o en comportamiento del consumidor. Este abismo se produce durante la fase de aceleración del proyecto de innovación.

Este abismo se traduce en una caída severa de las ventas a nuevos clientes: no hay más visionarios a quien vender y los pragmáticos no han empezado todavía a adoptar la

innovación. Moore (2002) enuncia que para cruzar este abismo la compañía debe encontrar un primer segmento de pragmáticos que sirva como vehículo para trasladar y difundir los beneficios de la innovación al resto. Para ello, Moore (2002) afirma que la innovación debe ofrecer un "producto completo", que incluya también servicios complementarios y una distribución fiable para garantizar credibilidad a este primer nicho de pragmáticos y facilitar el uso y la adopción de la innovación.

A partir de este primer segmento y con la credibilidad adquirida, el proceso de difusión continua a segmentos similares y adyacentes, modificándose la oferta si fuera necesario para adaptarse a ellos. Este proceso conlleva habitualmente una optimización del producto y del modelo de negocio asociado a la innovación; busca generar un efecto de adopción en cadena por parte de todo el segmento de pragmáticos, que progresivamente dispondrá de una oferta ampliamente conocida y disponible.

2.3 Metodología

2.3.1 Justificación de la metodología

Durante las últimas cuatro décadas, la investigación académica ha explorado la comercialización de la innovación disruptiva desde múltiples perspectivas y ámbitos de conocimiento. Actualmente, el conocimiento está mayoritariamente fragmentado y los estudios ofrecen un análisis incompleto sobre el proceso completo de comercialización y su relación con el desarrollo de la innovación.

Es necesaria una revisión sistemática de la literatura (Systematic Literature Review, SLR) para poder realizar un análisis sólido sobre el marco teórico de un ámbito de investigación, más aún si cabe cuando se afronta desde una aproximación multidisciplinar. Adicionalmente, se requiere rigor metodológico para consolidar el estado del arte en un dominio de conocimiento determinado (Thorpe et al., 2005). El objetivo es llegar a una conclusión sobre "lo que se conoce y lo que no se conoce" (Denyer y Tranfield, 2009). Los autores Petticrew y Roberts (2006), añaden que una revisión sistemática de la literatura es un método adecuado para grandes volúmenes de información y también un método para definir áreas de estudio que requieren investigación adicional.

2.3.2 Procedimiento

Se realizó un proceso de ubicación, selección y análisis, para revisar las contribuciones de los trabajos académicos de alto impacto desde 1980 hasta 2020 en el ámbito de la comercialización de innovaciones disruptivas. Para ello, se siguió un enfoque en cinco pasos (basado en el propuesto por Denyer y Tranfield, 2009):

1. Formulación de las preguntas de investigación
2. Búsqueda y localización de los estudios (mediante palabras clave y búsqueda en base de datos)
3. Selección de los estudios relevantes
4. Análisis descriptivo, temático y síntesis
5. Redacción y exposición de los resultados

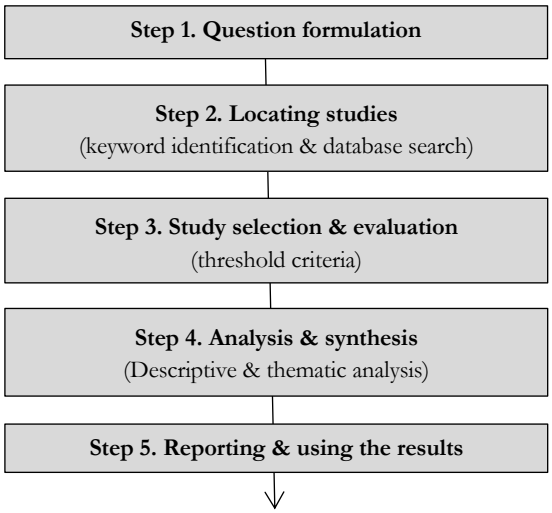

Figura 1. Proceso seguido en la revisión sistemática de la literatura. Fuente: Commercialization of disruptive innovations: Literature review and proposal for a process framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación Segura, International Journal of Innovation Studies, 2021, 5(3), páginas 127-144.

Para la fase de localización, se utilizó la base de datos Web of Science (WoS) para la búsqueda de publicaciones de alto impacto en revistas académicas indexadas del ámbito de la tecnología y la administración de empresas. Esta base de datos fue seleccionada por su credibilidad entre las organizaciones académicas y debido a la naturaleza multidisciplinaria de la innovación disruptiva, ya que focalizarse en revistas de una temática especifica podía proporcionar información incompleta. WoS cubre una amplia gama de revistas en el campo de la innovación, el desarrollo de productos, el marketing, la gestión estratégica y la gestión de tecnología con procedencias de ámbito mundial.

Respecto al uso de palabras clave, la falta de consistencia mostrada en la literatura existente respecto a la categorización de la innovación disruptiva fue determinante en esta fase. Esta falta de consistencia ha derivado en una intercambiabilidad de conceptos que provoca confusión sobre los hallazgos que generan las investigaciones, que pueden estar estudiando el mismo tema desde denominaciones diferentes, dificultando la investigación en este ámbito de estudio. Debido a la intercambiabilidad de definiciones al estudiar innovaciones disruptivas, se utilizaron para esta investigación cadenas de búsqueda con las palabras "disruptive", "radical", "discontinu *" y "break *", en combinación con "innovation *", y "process*", "commercializ*", "market*", "transfer*", "adoption*", "difusión", para recoger y segmentar la información en función de las distintas definiciones empleadas.

Filters	**Search strings**		**Results**
Search on the article title, abstract and keywords 1980-2020	"radical innovation" AND	process* OR commercializ* OR market* OR transfer* OR adoption OR diffusion	735
	"disruptive innovation" AND		321
	"discontinu* innovation" AND		110
	"breakt* innovation" AND		86
	Combined search strings		1180

Tabla 2. Palabras clave para el proceso de búsqueda y localización de artículos. Base de datos: Web of Science. Fuente: Commercialization of disruptive innovations: Literature review and proposal for a process framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 2021, 5(3), pág. 127-144.

2.3.3 Muestra

Para la selección de la muestra, se aplicó un umbral de calidad respecto a la muestra inicial de 1180 artículos obtenida a partir de la búsqueda mediante palabras clave. Este umbral permitió una selección de artículos de alto impacto, de manera transparente y replicable, como sugiere Tranfield et al. (2003). Se definió un umbral de corte, basado en un Factor de Impacto>1, bajo la clasificación ThomsonReuters, Journal Citation Reports (JCR). La aplicación de este filtro resultó en una selección de 192 artículos.

Se realizó una segunda delimitación al examinar el abstract de los artículos de la muestra, seleccionando los potencialmente relevantes para un análisis adicional, y eliminando aquellos donde el foco del estudio no estaba alineado con las preguntas de investigación. La muestra resultante final fue de 64 artículos. Esta muestra se expone en el punto I de los anexos del documento, mediante una tabla que caracteriza cada uno de los artículos seleccionados para el análisis.

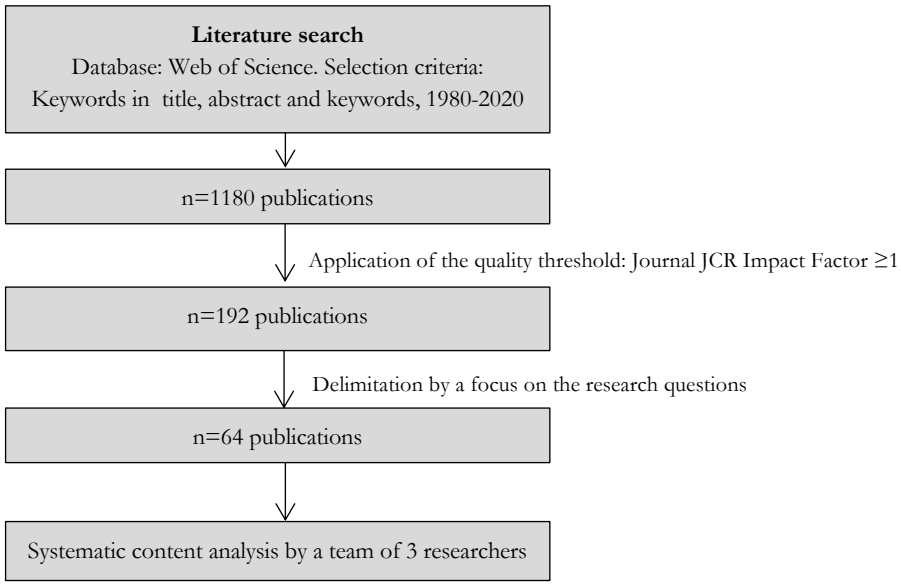

Figura 2. Proceso de selección para la determinación de la muestra. Fuente: Commercialization of disruptive innovations: Literature review and proposal for a process framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 2021, 5(3), páginas 127-144.

2.3.4 Análisis

Para esta fase se utilizó un método de análisis de contenido sistemático para la evaluación de los materiales seleccionados, como sugiere Krippendorff (1980). Se realizó primero una lectura de los artículos para adquirir una perspectiva general sobre el tema de investigación y posteriormente se llevó a cabo una comparativa, categorizando y codificando el contenido de los artículos en relación con estos tres temas:

1. Rol de la comercialización en el proceso global de innovación disruptiva
2. Conceptos que influyen en la comercialización de innovaciones disruptivas
3. Modelos de proceso de comercialización de innovaciones disruptivas

Se analizó la muestra de manera reiterada y se identificaron de manera iterativa patrones de temas recurrentes. Posteriormente se llevó a cabo la interpretación de los datos. Se empleó la tabulación de excel para establecer categorizaciones y facilitar la interpretación de los resultados de la investigación.

2.3.5 Limitaciones

Aunque la revisión sistemática de la literatura es un enfoque de investigación consolidado y riguroso, es necesario reconocer algunas de las limitaciones de la metodología utilizada en este artículo.

En primer lugar, aunque la metodología llevada a cabo es transparente y replicable, puede ser criticada por no incluir trabajos relevantes en el campo de la comercialización de las innovaciones disruptivas, debido a los criterios de búsqueda utilizados o el sistema de delimitación elegido, vinculado al factor de impacto o la selección final de los artículos de la muestra.

El enfoque en cuanto a la metodología utilizada y la interpretación de los resultados fue revisado iterativamente gracias a la participación en la vigésimo cuarta edición de la conferencia internacional *XXIV Innovation and Product Development Management Conference* (IPDMC, Reykjvik, Islandia, 2017), en el III *AEM & TIM PhD Programs Joint Paper Development Workshop "Entrepreneurship, Innovation, Internationalization: A Multidisciplinary Perspective"* (Online, 2020) y a las sucesivas observaciones y comentarios realizados por parte de los revisores de la revista International Journal of Innovation Studies, previos a la publicación del artículo.

2.4 Resultados

2.4.1 Rol y definición de comercialización en innovaciones disruptivas

El primer hallazgo de la presente tesis doctoral proviene del análisis cronológico de la revisión bibliográfica desarrollada en el primer artículo y responde a la primera pregunta de investigación de la tesis doctoral vinculada al papel de la comercialización en los procesos de innovación disruptiva.

Tras comparar los diferentes enfoques lineales y no lineales vinculados al proceso de innovación disruptiva, se puede concluir que éste ha evolucionado desde un modelo más tradicional y rígido basado en el desarrollo de productos con una fase de comercialización final, a un proceso en el que el desarrollo de productos y las actividades de comercialización y de interacción con el mercado están estrechamente relacionadas. Estas afirmaciones son reconocidas por Prebble et al. (2008) y Aarikka-Steenroos y Lehtimäki (2014) quienes enfatizan que muchas decisiones y actividades relacionadas con el desarrollo técnico y la comercialización interactúan y evolucionan en paralelo a lo largo del proceso de innovación disruptiva y, por lo tanto, están mutuamente vinculadas.

En consecuencia, la definición del concepto de comercialización pasa de una actividad finalista sólo basada en la explotación y difusión de la innovación, a una competencia que deberá desarrollarse desde etapas tempranas del proceso de innovación, y que se basa principalmente en la exploración y experimentación, la interacción con usuarios y clientes y la creación de ecosistemas para la implantación de la innovación. El

reconocimiento de la oportunidad de negocio o innovación no solo se produce al inicio del proceso sino también durante su desarrollo.

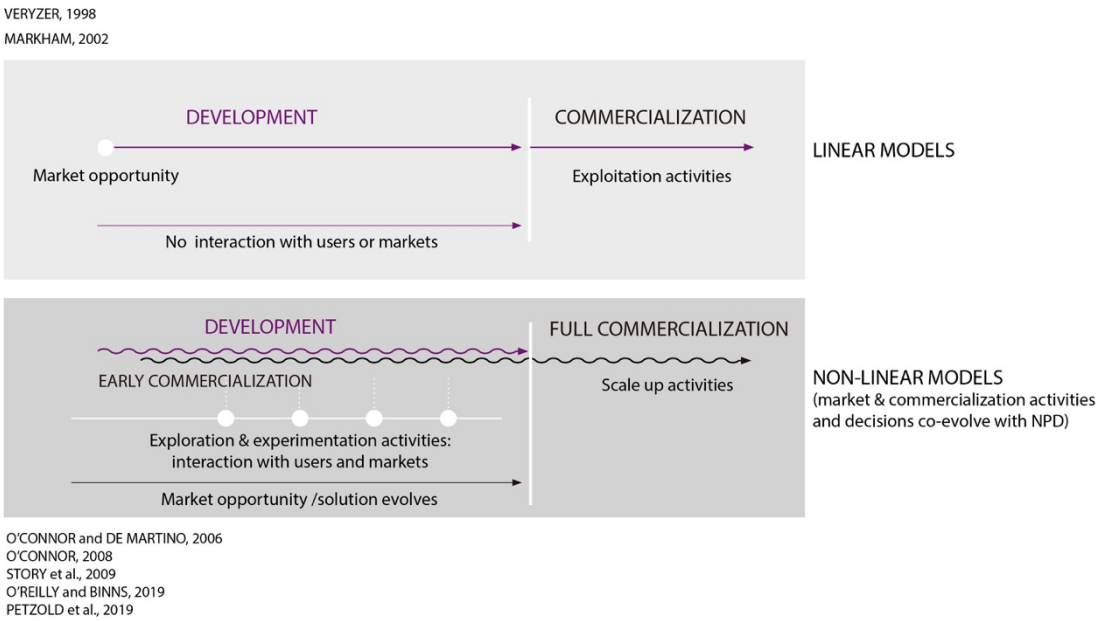

Figura 3. Comparación entre modelos de innovación Lineales y No-Lineales. Papel de la comercialización en el proceso de innovación disruptiva. Fuente: Commercialization of disruptive innovations: Literature review and proposal for a process framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 2021, 5(3), páginas 127-144.

Relacionado con este primer hallazgo y también bajo el enfoque cronológico, el análisis sistemático de la literatura ha permitido detectar como el foco de la investigación en el ámbito de la innovación disruptiva ha ido cambiado con el transcurso del tiempo. Durante el periodo de 1990 a los 2000, el foco estaba principalmente en actividades de interacción y aprendizaje de mercados, estableciéndose una base teórica al respecto, a través del trabajo de autores como Dougherty (1990), Hamel y Prahalad (1991), Lynn et al. (1996) u O'Connor (1998), virando hacia el concepto de orientación a mercados a finales de los años 90 e inicios de los 2000, con estudios destacados como los de McGrath, (2001) ó Slater y Narver (1998). Este último enfoque fue mutando hacia la idea de configuración o construcción de nuevos mercados, con ejemplos relevantes en las investigaciones y aportaciones de Sarasvasthy (2001), Jaworski et al. (2000), Easingwood y Harrington (2002) ó Sandberg (2002). En la segunda mitad de la primera década de los 2000 se observa un interés hacia el papel que juegan los ecosistemas y redes de innovación, especialmente en el contexto de los proyectos más disruptivos. Autores como Chacravorti (2004), Chiesa y Frattini (2011) ó Aarikka-Stenroos y Sandberg (2012) ponen en relevancia esta nueva corriente que ha seguido siendo investigada desde 2010 a 2020. Durante este último periodo, el foco de los estudios sobre innovaciones disruptivas también se ha centrado en como consolidar procesos y competencias de innovación en las compañías y en cómo consolidar estrategias organizacionales para favorecer la cultura y la implementación de la innovación disruptiva, como lo corroboran los trabajos de Story et al. (2009), Gassman et al. (2012), Slater and Mohr (2014), Aarikka-Stenroos y Lehtimäki (2014) ó Hansen et al. (2019).

Estas corrientes de investigación han permitido identificar los conceptos que influyen sobre la comercialización de innovaciones disruptivas, tales como: 1) el aprendizaje del mercado, 2) la participación del usuario en el proceso de innovación, 3) la orientación de mercado, la configuración y construcción del mercado, 4) el papel de los ecosistemas y las comunidades de adopción y 5) el concepto de transferencia de innovación.

2.4.2 Propuesta de modelo de proceso de comercialización

El artículo propone un modelo integrado de comercialización de innovaciones disruptivas, que proviene del análisis y comparación de los procesos de comercialización seleccionados en la revisión bibliográfica realizada, con base en los trabajos de O'Connor y Rice (2012) y Aarikka-Stenroos y Lehtimäki (2014). Este modelo integrado de comercialización presenta los objetivos a considerar y actividades especificas a desarrollar en cada una de las etapas del marco de proceso de innovación DIA (Descubrimiento, Incubación, Aceleración) propuesto por O'Connor y de Martino (2006) y corroborado por Story et al. (2009) y O'Reilly y Binns, (2019).

La primera etapa, **Validación de Concepto y Propuesta de Valor** se centra en determinar si el concepto de innovación puede ser interesante para un usuario potencial. Busca verificar las hipótesis del concepto inicial e identificar el mercado al que se enfocará y la dirección en la que diseñar productos o servicios que se ajusten a las necesidades del usuario o cliente. Las actividades de comercialización van más allá de las tareas tradicionales de investigación de mercado, y se enfocan a experimentos preliminares, rápidos y con mínimo coste, con los primeros usuarios y actores interesados, para conocer las preferencias del cliente, los beneficios percibidos o los contextos de uso potencial, y también como un primer indicador para comenzar a definir los segmentos a los que apuntar. Este paso tiene lugar durante la etapa de **Descubrimiento.**

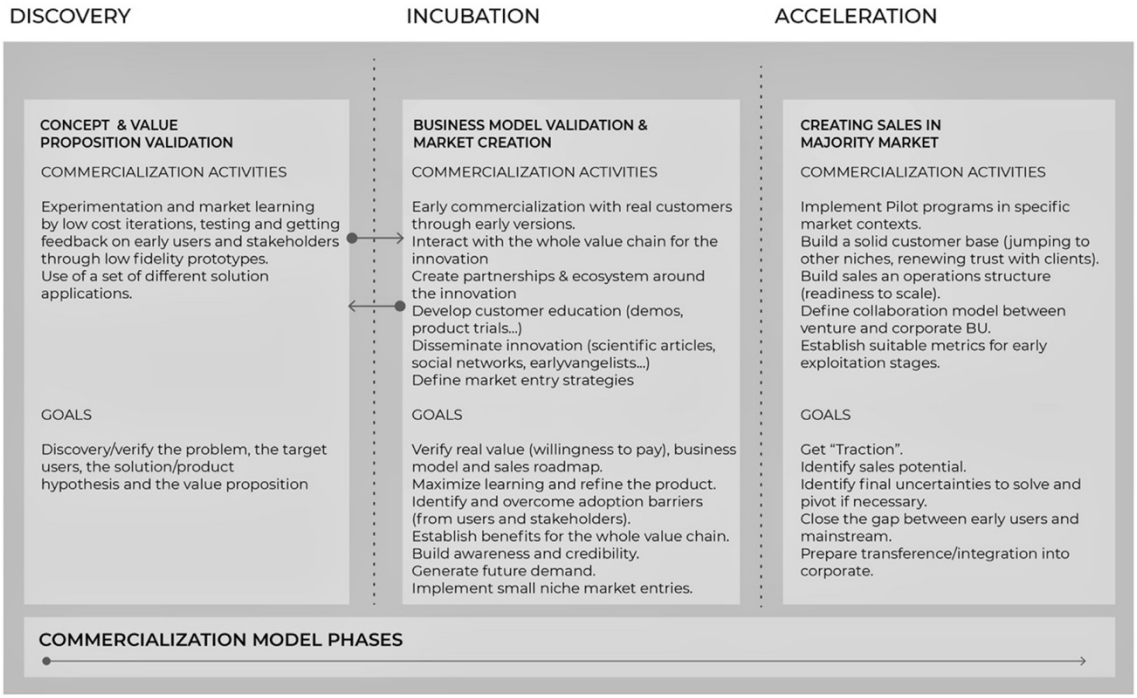

Figura 4. Modelo integrado de comercialización vinculado al proceso de innovación Descubrimiento- Incubación-Aceleración. Fuente: Commercialization of disruptive innovations: Literature review and proposal for a process framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 2021, 5(3), páginas 127-144.

La segunda etapa, denominada **Validación de modelo de negocio y creación de mercado**, tiene como objetivo difundir gradualmente la innovación e identificar las barreras de adopción. A medida que la innovación se introduce en el mercado a través de versiones preliminares, el producto o servicio también se modifica de manera iterativa en términos de concepto de innovación, segmentos objetivos, propuestas de valor y modelo de negocio. Testear lo antes posible la validez del modelo de negocio y el plan de crecimiento comercial

a través de primeras ventas a clientes reales es crucial, y revela la predisposición a pagar por la innovación. Esta estrategia permite evaluar diferentes vías de entrada al mercado. Por otro lado, la difusión de la innovación es crucial para superar las barreras de adopción y cambiar la mentalidad del cliente hacia la innovación. Los conceptos de configuración y creación de mercados y el papel del ecosistema de innovación son muy relevantes en este momento. Esta etapa tiene lugar durante la fase de **Incubación.**

La fase final de **Creación de ventas en el mercado masivo** aparece en la fase de **Aceleración**. Se caracteriza por la capacidad de capturar el potencial de ventas del mercado mayoritario y por la optimización de ventas y operaciones. Requiere gestionar el proceso de transferencia e integración en las corporaciones matriz y equilibrar las actividades de exploración y explotación.

En esta etapa es vital no solo lograr las primeras ventas con clientes en nichos iniciales específicos, sino también fidelizarlos y obtener nuevas ventas con clientes similares. Esto terminará de confirmar el potencial de la innovación mediante el establecimiento de una base de clientes más amplia y estable, para poder saltar a nichos paralelos. Gestionar las expectativas de la innovación y establecer métricas de rendimiento adecuadas también es una actividad relevante para implementar el proyecto correctamente.

El modelo de comercialización propuesto presenta grandes similitudes con los 5 pilares fundamentales del marco de proceso propuesto por Ries (2011) en su trabajo Lean Startup. Este modelo es una de las contribuciones más extendidas en la literatura sobre emprendimiento orientada al ámbito profesional, y puede afirmarse que es uno de los marcos más utilizados por los emprendedores e incluso por algunas corporaciones, aunque carece de evidencias provenientes de la investigación académica. En consecuencia, el proceso de comercialización propuesto en el primer artículo también proporciona una base que permite acercar la brecha entre investigación académica y práctica profesional, estableciendo un marco teórico para las diferentes contribuciones del modelo Lean Startup.

Como resumen, el primer artículo proporciona a la tesis doctoral un marco teórico, una mirada global sobre los mecanismos de comercialización dentro de las diferentes etapas de la innovación disruptiva y también proporciona una línea de estudio más concreta centrada en la fase de aceleración, permitiendo formular dos preguntas de investigación especificas relativas a esta parte del proceso de innovación con el objetivo principal de ampliar las competencias de las compañías en esta fase para mejorar la tasa de éxito en la implantación de innovaciones disruptivas.

2.5 Artículo publicado en su formato original

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Commercialization of disruptive innovations: Literature review and proposal for a process framework

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ABSTRACT

The challenges of disruptive innovations have gained significant attention from both academics and practitioners, commercialization being one of the most critical phases. At the same time, however, it is the less studied area of disruptive innovation. Therefore, this article examined scholarly papers on the commercialization of disruptive innovations through a multidisciplinary systematic literature review. It resulted in the analysis of 64 high-quality peer-reviewed academic articles. The analysis highlighted the commercialization models and main constructs that are affecting the commercialization process: market orientation, market learning, user's involvement, market configuration, adoption networks and stakeholders, and innovation transference. The study evidences how commercialization has evolved from a later stage in innovation to influence even the early phases of innovation, characterized in turn by exploration, learning and ecosystem creation activities. Additionally, the analysis led to a proposition that established an integrated commercialization model for high uncertainty innovations. The model has three phases: 1) Concept/value proposition validation, 2) Business model validation & Market creation, and 3) Creating sales in the majority market. Lastly, the article contributes to a better understanding of commercialization processes in high uncertainty innovations, bridging also the academic-practitioner divide.

1. Introduction

The current business environment is technologically oriented and highly dynamic. Hence, firms cannot only rely on incremental innovations. Especially, due to current digitization trends, radical innovations will still become more relevant (Kraus et al., 2019).

Even if management principles of operational excellence, customer satisfaction and incremental innovation continue to dominate large mature companies (O'Connor and Rice, 2013) focusing only on incremental innovations has negative consequences on the firms (Christensen, 1997; Christensen et al., 2015). Firms need to generate disruptive innovations to sustain their long-term competitiveness (Lettl, 2007; Al Natsheh et al., 2015; Helm et al., 2018).

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There is a broad consensus in both academia and industry that disruptive innovations have a critical value to the firms (Chandy and Tellis, 2000; McDermott and O'Connor, 2002). Different scholars have acknowledged and demonstrated by means of deep literature reviews the relevance and increasing interest on radical and disruptive innovation during the last decades (Li et al., 2017; Hopp et al., 2018a; Si and Chen, 2020; and Tiberius et al., 2021).

Over the years, the research landscape concerned with disruptive innovations has grown fast, leading to a fragmented research field which is difficult to overlook (Tiberius et al., 2021). The locus of disruption research has shifted from technology management to a broad set of loosely coupled disciplines including, among others, entrepreneurship, commercialization and strategic management.

Firms engaged in disruptive innovations face challenges managing them (O'Connor et al., 2008), especially technology development and commercialization (Chiesa and Frattini, 2011; Slater et al., 2014; Tiberius et al., 2021). Some scholars, such as Chiesa and Frattini (2011); Alberti-Alhtaybat et al. (2019); Cozzolino et al. (2018); or Snihur et al. (2018) buttress that commercialization is one of the most critical phases and also the less studied area of disruptive innovation (Aarikka and Lehtimaki, 2014a; Marx et al., 2014). Commercialization is key to understanding the relationships between innovation management processes and success in bringing new products to market. Additionally, commercialization is particularly challenging in tech transfer and the most important drive for change (Still, 2017). More research identifying and describing key factors to market commercialization is still needed (Al Natsheh, 2015), as well as on how to actively foster commercialization processes and increase the likelihood of a radical innovation's market success (Tiberius et al., 2021).

Research on the commercialization of disruptive innovation is also fragmented. Studies have approached the commercialization from different points of view, and they did not offer an integrative framework of the process, leaving the true potential of multidisciplinary research unexploited (Hopp et al., 2018b).

Furthermore, there is a lack of a unified definition of "disruptive innovation" (Si and Chen, 2020). For example, Lynn et al. (1996); and Veryzer (1998a, b), used "discontinuous innovation," Christensen (1997), employed "disruptive innovation," Coviello and Joseph (2012), used "major innovation" and O'Connor and Rice (2001), called it "breakthrough innovation". Each author uses different terminology, even when studying similar issues, which makes research inconsistent. Consequently, it can be established that disruptive innovation commercialization needs research on its process in order to establish a grounded theoretical framework.

Finally, inconsistency between theory and real business practice on disruptive innovation has been detected (Still, 2017; Si and Chen 2020; Shepherd and Gruber 2020), claiming for further research on this area.

This article aims to identify the main stages of the commercialization of disruptive innovation through these research questions:

1. What is the role of commercialization in the process of disruptive innovation?
2. How can the commercialization process framework be defined?

Answers to the above questions will enhance understanding of disruptive innovations, its commercialization process, and the challenges of the phenomenon. Having such knowledge is essential to provide direction for future research and insights for business enterprises. This article is structured as follows: definition of disruptive innovation, methodology, findings, discussion, contributions, limitations, and suggestions for future research.

2. Definitions of disruptive innovation

The phenomenon of disruptive innovation has been categorized differently, resulting in a myriad of definitions. The study from Garcia and Calantone (2002), reveals a consensus in categorizing innovativeness considering if they are causing marketing or/and technological discontinuities on macro or/and micro level. From a macro perspective, innovativeness is evaluated based on the newness of the innovation to the world, to the industry or to the market, creating thus new markets, modifying market structures, or changing performance metrics. The micro perspective defines innovativeness as new to the firm or new to the customer. In this case, it adds values or benefits as well as changes behavior and consumption patterns for the customers, whereas, for the company, it also serves as new capabilities and new knowledge.

Radical innovations could be defined as innovations that embody a new technology that results in new market infrastructure, Garcia and Calantone (2002); Song and Montoya (1998); and O'Connor (1998). They result in discontinuities on both a macro and micro level.

Garcia and Calantone (2002), define a really new product as the one that generates a market discontinuity or a technological discontinuity but will not incorporate both under the macro-level approach. On a micro level, any combination of marketing and/or technological discontinuity could occur.

A discontinuous innovation could be considered either radical or really new innovation depending on the level (macro/micro) and the discontinuities it causes (market/technological/both) when the innovation is introduced to the market. The majority of examples of discontinuous innovations found in the literature could be categorized as really new innovations since only one of the S-curves is affected.

O'Connor (2008), defines breakthrough innovations depending on its impact on the market. Breakthrough innovations could transform existing markets and industries or create new ones, on the macro level. Innovations that are only new to the firm but not to the market do not, in this conceptualization, constitute breakthrough innovations.

On Christensen (1997), and Danneels (2004), a disruptive innovation is represented by a new technology displacing incumbent firms that support the prior technology becoming obsolete. This generates in turn a new market infrastructure or creates new ones. Disruptive technology changes the bases of competition, and modifies the attributes that users value, as well as the performance metrics along which firms compete. A mismatching then occurs between current customer requirements. This kind of innovation impacts on both macro and micro level. Under this conceptualization, disruptive innovations may indeed be considered radical innovations.

Govindarajan et al. (2011) posit that radical product innovations draw on substantially new technology and could initially be targeted at an existing or an emerging market. Differently, disruptive innovations are initially targeted at an emerging or not-served market, and may not involve the newest technology. Under this perspective, disruptive innovation could be categorized also as radical, although not all radical innovations could be defined as disruptive. The willingness to cannibalize is related to disruptive innovation (Christensen, 1997) but not to radical innovation, supporting the idea that radical innovation does not require cannibalization of existing investments. Radical innovation is reliant on dynamic and organizational capabilities as well as on individual and organizational human capital. Leveraging core competencies or scaling faster than competitors is essential when faced with new technological breakthroughs.

We will define innovations throughout this article depending on whether they occur at both macro and micro levels, and on whether they generate marketing and/or technology discontinuities.

3. Research methodology

A systematic literature review (SLR) is needed for multidisciplinary studies to perform a robust analysis of the theories. As well as to reach a definitive conclusion on 'what is and is not known' (Denyer and Tranfield, 2009). Similarly, a methodological rigor with regards to management literature reviews is needed to consolidate the literature across a domain (Thorpe et al., 2005). Petticrew and Roberts (2006), add that a systematic literature review is a method that makes sense for large bodies of information and also a method for mapping out areas of uncertainty where new studies are needed. Consequently, a SLR was conducted for this article. A five-step approach, proposed by Denyer and Tranfield (2009), was followed. This approach has been combined with the application of a quality threshold that allows for a comprehensive, transparent, and replicable selection, such as suggested by Tranfield et al. (2003). Fig. 1 shows the five-steps methodology approach used to conduct this research.

3.1. Locating studies

An electronic database, specifically Web of Science (WoS), was scanned for publications on peer-reviewed academic business and management journals. This database was selected because of its renown among scholarly organizations.

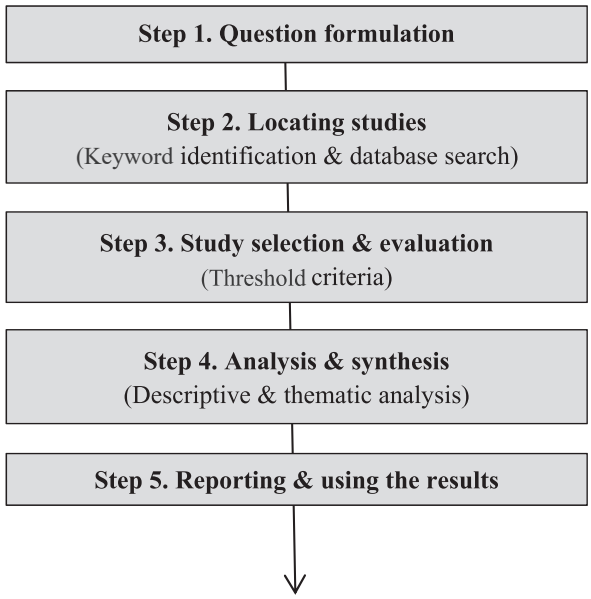

Fig. 1. Methodology approach adapted from Denyer and Tranfield (2009).

Similarly, the database was selected due to the multidisciplinary nature of disruptive innovation, making specific journals not enough to provide comprehensive information. Additionally, the database was used because it covers a wide range of journals in the field of innovation, product development, marketing, strategic management, and technology management from worldwide geographical locations.

The extensive review from Christensen et al. (2018), of research relevant to the theory of disruptive innovation shows that foundational works relating to discontinuities on technology and market appeared at the beginning of the 1980s. Therefore, the publication period researched in this study was defined as 1980–2020. However, despite the depth of the literature review from Christensen et al. (2018), these authors hardly address the strategic role that commercialization activities play in disruptive innovation.

The lack of consistency in operationalizing "disruptiveness" has resulted in the interchangeable use of constructs. This leads in turn to confusion concerning what studies are reporting. Due to the interchangeability of definitions when studying "disruptive innovations", we used for this study the search strings "disruptive" as well as "radical", "discontinu*", and "breakthrough", in combination with "innovation*", in order to understand and compare what is known and what is agreed, depending on the different perspectives and definitions employed. This will reveal where the potential gaps in knowledge are.

The keywords employed in combination with the terms mentioned above were "process*", "commercializ*", "market*", "transfer*", "adoption", and "diffusion" (Table 1). These terms were selected from 20 key terms related to the research questions according to the experience of the researchers on the field. The initial search combining the different search strings resulted in the identification of 1180 scholarly papers for further evaluation.

3.2. Study selection

Due to the extensive number of results, a threshold quality criterion (Tranfield et al., 2003) was introduced in order to identify the highest-standard academics papers. The sample does not include books or conference papers. This quality threshold correlates to the quality of the sources, only keeping articles that were published in academic journals ranked by the Thomson Reuters "Journal Citation Reports (JCR) Impact Factor" with the cut-off factor of ≥ 1. As a result of this limitation, we obtained a sample of $n = 192$ high-quality scholarly articles for further evaluation.

The researchers performed a second delimitation by examining the abstract of the 192 studies, and only potentially relevant articles were chosen for further analysis. The process followed to make that delimitation was to eliminate studies in which the focal phenomenon did not sufficiently represent our focus (research questions). First, we read the abstract, and if it was still not clear whether the article focused on our theme, we skimmed through the article. We eliminated papers in which the focusing phenomenon was only mentioned in passing. Articles concerning the different dimensions of disruptive innovation were excluded if they were not linked to disruptive innovation's commercialization. This resulted in a final sample of 64 articles (Fig. 2).

3.3. Analysis

A systematic content analysis method was used to synthesize screened materials. Content analysis is an established method that enables minimal interference by the researcher on the phenomenon studied and enables large volumes of data to be handled (Krippendorff, 1980). The method enables the employment of both quantitative and qualitative textual analysis. We first read through the articles to acquire a general perspective on the focal research. Then, we compared, categorized, and coded the contents of the articles in terms of the following:

1. Identification of the role that commercialization plays in the process of disruptive innovation.
2. Categorization of the most relevant constructs affecting the commercialization of disruptive innovations.
3. Elaboration of a theoretical model for the process of commercialization of disruptive innovations.

Three researchers participated in data interpretation and categorization. To identify the main topics in our systematic sample, we scanned the sample multiple times and iteratively developed patterns of recurrent themes. Coding procedures

Table 1
Search filters and results, Web of Science database.

Filters	Search strings		Results
Search on the article title, abstract and keywords 1980–2020	"Radical innovation" AND	Process* OR Commercializ* OR	735
	"Disruptive innovation" AND	Market* OR Transfer* OR	321
	"Discontinu* innovation" AND	Adoption OR	110
	"Breakthrough innovation" AND	Diffusion	86
	Combined search strings		1180

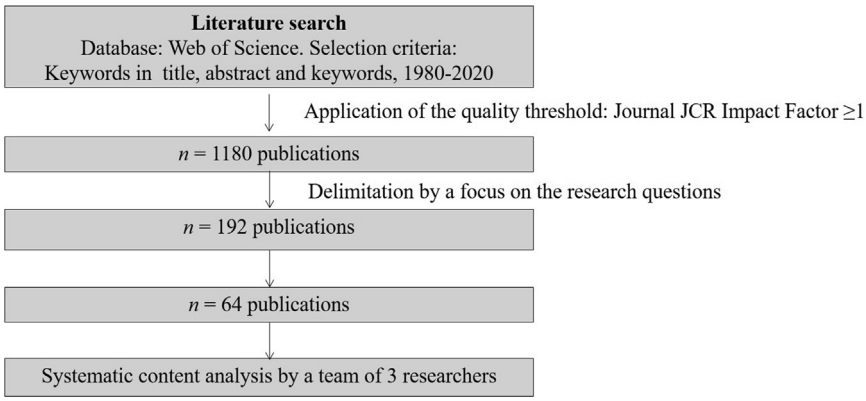

Fig. 2. Systematic research approach.

and categories were assessed in detail by the researchers collectively and compiled accurately. Excel tabling was employed to ensure a consistent, detailed categorization and interpretation of the research findings. As a result, researchers' triangulation increased the trustworthiness of the findings, and provided the opportunity to establish a theoretical model for the commercialization process of disruptive innovations as the main output of this SLR.

4. Findings

This section of the paper presents the findings of the descriptive and thematic analysis. Additionally, it assembles an integrative commercialization model developed from the main findings of the study.

4.1. Descriptive analysis

The of the existing literature reveals three types of studies, with different contributions to the research.

1. Global process models of high uncertainty innovations. They offer us a general framework to develop a better understanding on the role of commercialization activities in the different phases of innovation.
2. Studies that address activities and constructs that affect the commercialization innovation process at specific moments and circumstances. They offer us very focused approaches which require contextualization and positioning within the global commercialization process.
3. Studies that offer complete commercialization models, which will help us to establish an integrative framework for the commercialization phenomenon in high uncertainty innovations.

The researchers scanned the sample multiple times, identifying the main topics and iteratively developing patterns. This was the main approach of the studies (summarized in Table 2). This categorization allowed to better understand the contributions of each study in relation to the commercialization activities proposed. It also helped to identify when they happen during the whole innovation process and their influence. The definition of the type of innovation in the sample's studies (also showed in Table 2) is categorized in relation to the impact of the innovation at macro and/or micro levels, which then generates marketing and/or technology discontinuities. This codification also helps to understand under which perspective the phenomenon has been studied and it also verifies how authors use different innovation categorization when studying the same topics (such as O'Connor and de Martino, 2006; O'Connor, 2008; or O'Connor and Rice, 2013, using breakthrough, radical or discontinuous).

The analysis of the selected materials evidences how commercialization activities have been mainly approached through a Radical Innovation categorization (31 of the articles, almost fifty percent of the sample). They were addressed as Disruptive innovations in only 13 articles (20% of the sample). The Discontinuous approach also appeared in 11 articles, 5 of them using the term "high-tech" innovation or products. A little portion of the sample has been studied through the Breakthrough categorization, with 5 articles present. Finally, other articles have also used terms as "really new" or "major innovation".

These categorizations also revealed different trends. First, most of the articles during the 1990s discussed new technologies under a perspective of traditional New Product Development. However, during the last 20 years, the approach has changed to an exploratory and learning process. The challenge of how to manage user's involvement has been a topic of interest during the whole period of the research sample.

Chronologically we can observe that during the decade of 1990–2000 a grounded theory about market learning was consolidated by scholars such as Dougherty (1990); Hamel and Prahalad (1991); Lynn et al. (1996); or O'Connor (1998), as well as on market orientation, through the studies of McGrath (2001); or Slater and Narver (1998). From 2000 onwards, the

Table 2
Analysis of papers according to ABS Journal type ($n = 64$).

Journal type	No of publications	Author	Type of innovation	Main approach
Innovation	24			
Journal of Product Innovation Management	15	O'Connor, (1998)	Radical	Market Learning
		Song and Montoya, (1998)	Really new	Success Factors
		Veryzer, (1998a)	Discontinuous	Disruptive Innovation Process
		Veryzer, (1998b)	Discontinuous	User Involvement
		O'Connor and Veryzer, (2001)	Radical	Market Visioning
		McDermott and O'Connor, (2002)	Radical	Strategic Issues
		O'Connor and de Martino, (2006)	Radical	Organization
		Govindarajan and Kopalle, (2006)	Disruptive	Performance Metrics
		Markides, (2006)	Disruptive	Business Model Innovation
		O'Connor, (2008)	Major innovation	Disruptive Innovation Process
		Govindarajan et al., (2011)	Radical/ Disruptive	Market Orientation
		Chiesa and Frattini, (2011)	High technology	Adoption and Networks
		O'Connor and Rice, (2013)	Breakthrough	Commercialization Process
		O'Connor, (2013)	Radical	Uncertainty Management
		Slater et al. (2014)	Radical	Organization
R&D Management	3	Lettl et al., (2006)	Radical	User's Involvement
		Gassmann et al. (2012)	Radical	Transition
		Hansen et al., (2019)	High technology	Transition
Technovation	2	Easingwood and Harrington, (2002)	High technology	Market Configuration
		Bessant et al., (2006)	Discontinuous	Networks
Research Policy	1	Gans and Stern, (2003)	High technology	Market Orientation
Journal of Engineering and Technology Management	1	Lettl, (2007)	Radical	User's Involvement
Journal of High Technology Management Research	1	O'Connor, (2008)	Radical/Really new	Market Learning
Creativity and Innovation Management	1	Petzold et al., (2019)	Disruptive	Disruptive Innovation Process
General management	**15**			
California Management Review	5	Lynn et al. (1996)	Discontinuous	Market Learning
		Stringer, (2000)	Radical	Market Learning
		Birkinshaw et al., 2007	Discontinuous	Networks
		O'Connor and Rice, (2001)	Breakthrough	Market Visioning
		O'Reilly and Binns, (2019)	Disruptive	Disruptive Innovation Process
Harvard Business Review	4	Hamel and Prahalad, (1991)	Disruptive	Market Learning
		Von Hippel and Thomke, (1999)	High technology	User's Involvement
		Chakravorti (2004)	Radical	Networks
		Garvin and Levesque, (2006)	Radical/ disruptive	Organization
Academy of Management Journal	2	McGrath (2001)	Radical	Market Learning
		Sarasvathy, (2001)	Radical	Market Configuration
MIT Sloan Management Review	1	Rice et al., (2008)	Breakthrough	Uncertainties Management
Management Science	2	Von Hippel, (1986)	High technology	User's Involvement
		Marx et al. (2014)	Disruptive	Networks
Journal of Business Review	1	Aarijja and Lehtimaki, (2014)	Radical	Commercialization Process
Marketing	**11**			
Industrial Marketing Management	5	Story et al., (2009)	Radical	Competences/DI Process
		Möller, (2010)	Radical	Networks
		Aarikkaa and Lehtimaki, (2014)	Radical	Commercialization Process
		Story et al., (2014)	Radical	Barriers
		Aarikka and Sandberg, (2014)	Radical	Barriers
Journal of Marketing	3	Chandy and Tellis, (2000)	Radical	Success Factors
		Zhou et al., (2005)	Breakthrough	Market Orientation
		Coviello and Joseph, (2012)	Major innovations	User's Involvement
J. Targeting, Measurement & Analysis for Marketing	1	Sandberg, (2002)	Radical	Market Configuration
Journal of Marketing Research	1	Chandy and Tellis, (2000)	Radical	Organization
Journal of the Academy of Marketing Science	1	Jaworski et al., (2000)	Disruptive	Market Configuration
Operation and Tech.	**7**			
Research Technology Management	4	O'Connor et al., (2002)	Radical	Transition
		Markham, (2002)	Radical	Disruptive Innovation Process

Table 2 (*continued*)

Journal type	No of publications	Author	Type of innovation	Main approach
		Paap and Katz, (2004)	Disruptive	User's Involvement
		O'Connor and Ayers, (2005)	Radical	Competences
IEEE Transactions on Engineering Management	3	Rice et al., (2002)	Discontinuous	Commercialization Process
		Walsh et al., (2002)	Disruptive	Market orientation
		O'Reilly and Tushman, (2004)	Radical/ disruptive	Organization
Strategy	**4**			
Strategic Management Journal	4	Dougherty, (1990)	Radical	Market Learning
		Slater and Narver, (1998)	Disruptive	Market Orientation
		Ahuja, (2001)	Breakthrough	Barriers
		Ansari et al., (2016)	Disruptive	Networks and ecosystems
Organization studies	**2**			
Organization Science	2	Day, (1994)	Radical	Championship
		Andriopoulos and Lewis, (2009)	Radical	Organization
Entrepreneurship	**1**	Shepherd and Gruber, (2020)	Radical	Market learning

approach turned to a market configuration perspective, as enunciated by Jaworski et al. (2000); Sarasvathy (2001); Easingwood and Harrington (2002); or Sandberg (2002). The papers published between 2004 and the beginning of the 2010s represented an early stage in investigating the influence of networks in the commercialization of innovations, as pointed out by Chakravorti (2004) and Bessant et al. (2006); with further in-depth studies about ecosystem creation in the works of Chiesa and Frattini (2011); Aarikka-Stenroos and Sandberg (2012); Marx et al. (2014); or Ansari et al. (2016) during the last decade (summarized in Fig. 3).

The scholar studies during the last years have also focused on competencies and organization for radical innovation: O'Connor and de Martino (2006); Slater et al. (2014); and Story, O'Malley and Hart (2009), as well as in commercialization transition activities in the scale-up stage, as shown by the works of Gassmann et al. (2012); or Hansen et al. (2019). Furthermore, during the last decade the research has also been focused on how to overcome barriers to this kind of innovations, as the work from Aarikka-Stenroos and Sandberg (2014b) shows. Still, recent studies such as the one carried out by Shepherd and Gruber (2020), evidence the controversial relationship between widely extended methods used by practitioners (Osterwalder and Pigneur, 2010; Ries, 2011; or Blank, 2013) and academic research. Scholars have barely taken into account these practitioner's methodologies and rarely appear as academic research. Table 2 shows the categorization by journal type according to the Association of Business Schools' (ABS) ranking. The 64 papers were published in 23 different journals, showing the diversity of research on the commercialization of high uncertainty innovations, and further explaining the phenomenon from different perspectives. More than forty percent of the publications are in the Innovation category, with 24 articles. The General Management and the Marketing categories contribute with 15 and 11 articles, respectively. Within this category, the Journal of Product Innovation Management published the majority of papers (15). The other journals publishing articles on this topic are the California Management Review, with 5 articles (General Management category), the Industrial Marketing Management, with 5 (Marketing category), and finally the Research technology Management

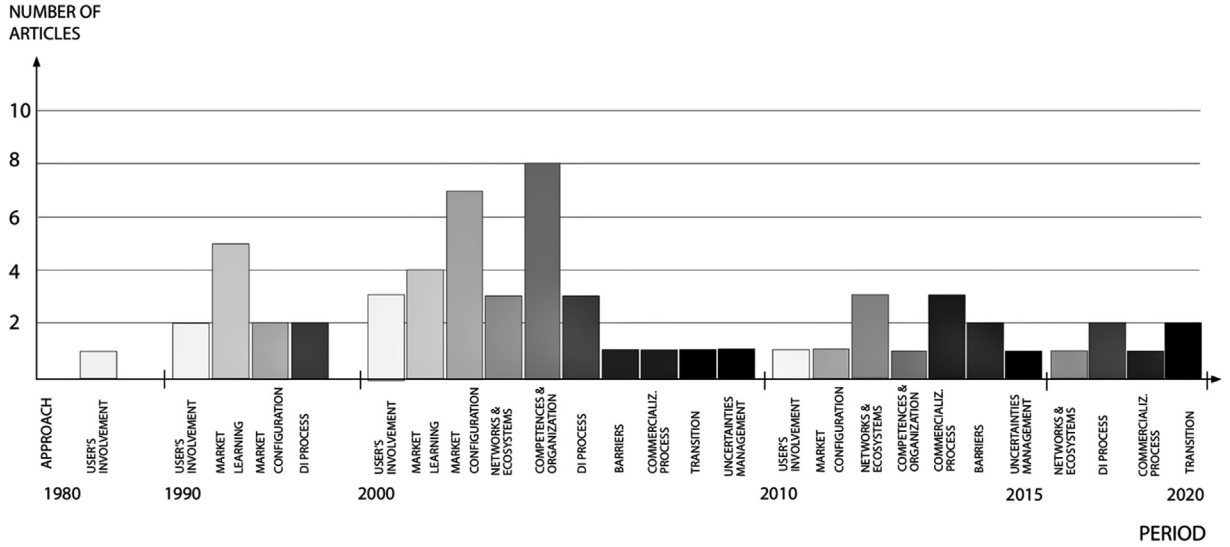

Fig. 3. Approach evolution on Disruptive Commercialization Research (1980–2020).

(Operations and Technology Management category) and the Harvard Business Review (General Management category), with four papers (Table 2).

The category type of the articles seemed to influence the different approaches to the phenomenon. The more prolific authors are O'Connor, with thirteen articles, followed by Rice, with five articles. O'Connor covers several research fields through different terminologies over time, such as Major, Breakthrough, Radical or Discontinuous innovations. Veryzer published three articles at the end of the 1990s. During the last decade, Aarikka-Stenroos (three articles), Sandberg (two articles), and Story (two articles) are the more prolific scholars.

4.2. Thematic analysis

Based on a systematic literature review of 64 scientific articles from 1980 to 2020, this study provides a thorough picture of the current state of affairs in the commercialization of disruptive innovations. As a result, in this chapter, we will describe the information gathered to advance the research field.

4.2.1. Approaches to the commercialization of disruptive innovation

The analysis showed that the number of scholarly articles dedicated to the disruptive innovation process is limited. Only seven articles seem to deal with the complete process, understood as a succession of interrelated phases and activities, and all of these articles employ different approaches. They are as follows: Veryzer (1998a, b); Markham (2002); O'Connor and de Martino (2006); O'Connor (2008); Story et al. (2009); Petzold et al. (2019) (only under the perspective of incumbent failure); and O'Reilly and Binns (2019).

The approaches could be grouped into two categories: linear and nonlinear. A linear view shows that the disruptive innovation process begins with an idea, follows with product development, and ends when the product creates wealth through commercialization. On the other hand, a nonlinear approach emphasizes product development but also interaction with partners during product development, as well as marketing and commercialization activities. In this approach, both development and marketing activities overlap.

Linear Process models: The models from Veryzer (1998a, b), and Markham (2002), present a linear framework where the focus is on concept building, technical feasibility, internal demonstration for obtaining the required approval and support from top company's management, and getting critical resources to develop and launch a new product. The work from Veryzer (1998b) also stresses that the "commercialization phase" is what happens after the innovation project has moved beyond the prototype testing phase. These examples follow a product development-based model (Cooper, 1986). Despite the high rates of technical and market uncertainty, interaction with customers or markets only appears after the prototype phase, in the final stages of the innovation process, and never before. They share a common approach in that commercialization is a separate and later stage of the innovation process that takes place after the front-end and technical development stages.

Nonlinear Process models: From a competences-based approach, the works from O'Connor and de Martino (2006); O'Connor (2008); and Story et al. (2009), identify four phases for disruptive innovation: discovery, incubation, acceleration and full commercialization, each of which requires distinctive types of expertise and processes.

A discovery capability involves activities that create, recognize, elaborate, and articulate disruptive innovation opportunities. Whereas discovery competencies generate or recognize disruptive innovation opportunities, the incubation competency involves an activity that matures radical opportunities into business proposals.

Incubation is not complete until that proposal has been tested in the market, with a working prototype. The skills needed for incubation are also experimentation skills. Experiments are conducted to reduce not only technical but also market uncertainty, to initiate market creation, and to test the business proposal's match with the market and even with the company's strategic roadmap. As O'Connor (2008), stated, this phase involves probing real prospective customers, developing early commercial versions, testing them, identifying complementary technologies or products, and exploring potential partnership opportunities, as also recognized by Slater et al. (2014). The aim is to maximize learning about customers and markets.

Acceleration focuses on building a business to a level of some predictability in terms of sales and operations and trying to make the innovation ready for the market. This stage is also characterized by market exploration and experimentation, working with real customers to refine the product, the target users and the business models through early commercialization, as also recognized by Rice et al. (2002). Furthermore, O'Connor and de Martino (2006); O'Connor (2008); and Story et al. (2009), agreed that the difficulties of transmitting the R&D project to an operating unit would be eliminated if early commercialization is considered. These assertions have also been confirmed in the work of Gbadegeshin (2019). Acceleration competency ramps up the new business to a point where it can stand on its own before transferring to the corresponding receiving unit. Full commercialization entails launching and scaling up activities and distribution networks in the context of mainstream market creation.

O'Reilly and Binns (2019), presented a variation from the previously described process, and divided it into three main phases: idea generation, or the discovery and development of ideas for potential new businesses; incubation, where the new ideas are validated in a preliminary market; and scaling, where existing assets and capabilities are reallocated to help the new venture grow. To be successful at scaling, a new venture needs to add customers, capacity, and capability fast enough to maximize the market opportunity.

Table 3
Phase comparison between linear and nonlinear models.

Author	Process evolution				
Veryzer, (1998a)	Discovery or convergence phase	Incubating, concept building or preliminary formulation	Formal evaluation	Formative prototype phase	Commercialization phase
Markham, (2002)	Driven by a visionary. Match of an invention with a possible market application	Translating technical capabilities into product attributes or features	Obtaining the critical resources to support the innovation	Technical validation. First testing with customers about needs/ attributes	Launch and scale-up activities
O'Connor and de Martino, (2006)	Discovery	Incubation	Acceleration	Full commercialization	
O'Connor, (2008)	Sense making, finding the potential	Activities aimed at maturing the	Make the innovation ready for	Launch and scale-up activities and distribution	
Story et al., (2009)	offered by the idea	articulated radical opportunity and transforming it into a business proposal, and also at generating a tech platform and new market specifications that will evolve into a concept and a prototype	the market. Market exploration: working with customers to refine the product iteratively before full commercialization	networks on the context of market creation	
O'Reilly and Binns, (2019)	Ideation or iniciation	Incubation	Scaling/mainstream market pahse		
Petzold et al., (2019)	Discovery and development of ideas/tech for potential new businesses	Validation of innovation and business model in a niche market	Reallocate assets and capabilities to help the venture grow		

Commercialization activities carried out during phases of disruptive innovation are colored in this grey tonality.

Petzold et al. (2019), describe the process as having an initiation phase, in which a disruptive technology emerges and is incorporated into a business model; a niche market phase, in which the business model is refined, grows and develops; and a final mainstream market phase, which describes the innovation's disruptive effect in an established market. The fundamental approach is to analyze the process via the underlying dynamics within each phase. These authors identified events and actions as a dynamic progression: the perception and expectations of the opportunity and the entrant's innovation, the entrant's strategy, and finally the utilization of enabling technologies and factor markets that shape the dynamics characterizing each phase and provoking a proliferation of multiple paths when the innovation is introduced.

The most recent sources from the sample corroborate the consolidation of the DIA (Discovery, Incubation and Acceleration) approach to face disruptive innovations. Table 3 compares the different stages and the evolution of the disruptive innovation, highlighting when commercializing activities appear in the process.

In relation with the commercialization phenomenon, after comparing the previous linear and nonlinear approaches it was learned that the approach to the disruptive innovation process evolved from a more traditional and rigid stage-gate and product development-based model (more commonly applied to incremental innovations) to a process where product development and market and commercialization activities are closely interrelated. These assertions are also recognized by Prebble et al. (2008), and Aarikka-Steenroos and Lehtimäki (2014a), who stress that many decisions and activities relative to technical development and marketing do interact and evolve in parallel throughout the disruptive innovation process and are therefore mutually linked.

Consequently, the commercialization definition changes from a final stage activity that is only based on exploitation to a competence that will have to be developed from early stages of the innovation process, and that is mainly based on exploration and experimentation (Fig. 4).

This school of thought is consistent with the works of Blank (2013), and Ries (2011), where the authors explain that the process of “customer development” should be made in parallel with the “product development” process. This remains especially important in disruptive innovations entering a new market.

Even if it could be affirmed that the approach to disruptive innovation has evolved from linear to non-linear models, as the aforementioned distinctly shows, scholars should seek to advance the state of knowledge on the complex interplay that exists between the disruptive innovation process and the specific commercialization activities that are required for the innovation implementation, as recognized by Slater et al. (2014), or Petzold et al. (2019).

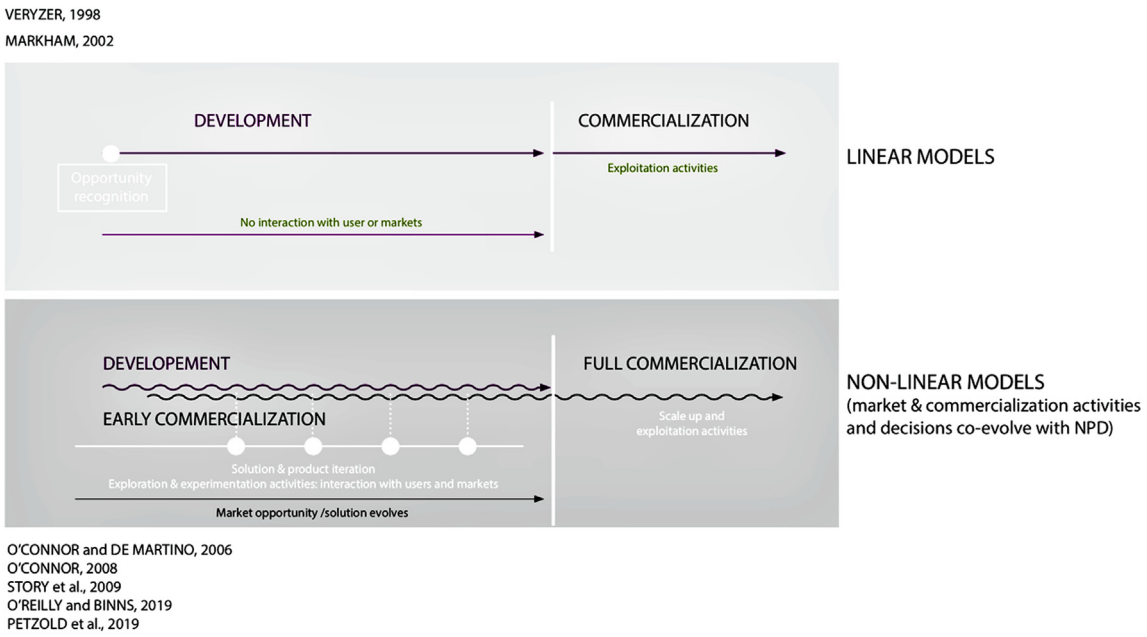

Fig. 4. Comparison between linear and non-linear disruptive innovation models.

4.2.2. The constructs that affect the commercialization of disruptive innovations

Despite the fragmented nature of the sample, which studies the phenomenon under different points of view, this section summarizes the main constructs affecting the commercialization process. This helps to identify the main activities and market strategies to be performed during the different stages of the innovation. This will allow us to correlate them with the integrative commercialization model proposed in the last section of the article.

Market orientation. This area has been mainly studied through the disruptive innovation terminology. It also appears under the breakthrough and radical innovation approach (confirming the interchangeability of terms on these kinds of innovations). Several scholars stressed that innovative companies launch a new product for a specific market when incumbent companies do not usually consider that the new product could be a competitor and such products are not addressed to their customer base. Under this perspective, disruptive innovations often underperform established products in the mainstream markets and offer benefits to emerging customers. Christensen (1997), supports this notion by stating that leading suppliers do not launch disruptive innovations. The main reason is that incumbents are embedded in an existing value network that constrains their ability to introduce disruptive products or business models. They listen too carefully to their current customers. Other authors also know this as the "path dependence" (e.g., McGrath, 2001).

Additionally, Govindarajan and Kopalle (2006), stated that firms capable of developing truly disruptive innovations have a customer orientation focused on emerging customer segments and unfamiliar markets rather than on mainstream customer segments. Similarly, Day (1994); Chandy and Tellis (2000); and Slater and Narver (1998), state that a customer-oriented firm can serve current customers and remain vigilant for *unserved* emerging markets. Christensen (1997), defined an "Over-served" market as one where standard products based on the dominant technology platform are not needed, and a "non-customers" market one where needs are not met with standard products. Dougherty's work (Dougherty, 1990) pointed out that new product development in unfamiliar markets should be done outside the firm's strategy (consistent with Burgelman, 1983).

Market learning. This area has been studied through the radical and discontinuous innovation approach. In these scenarios it is crucial to prioritize uncertainties that must be solved, define alternative approaches to explore them, and continually assess the value of cumulative learning. This iterative learning loop allows managers to adopt decisions according to the learning obtained and to warrant the continuation of the project. Exploring as much of the entire landscape as possible before committing to any single direction is regarded as key to advancing organic growth options through innovation (McGrath, 2001). Exploratory learning has focused on identifying appropriate processes to enhance the effectiveness and efficiency of learning. Lynn et al. (1996), enunciated the importance of and organization's ability to learn about new markets beyond the conventional market techniques. This should be done by probing potential markets with early versions of the concept or the product through successive approximation. Each step creates a more significant understanding and acceptance of the product idea in relation to the markets and customers. The higher the environmental uncertainty, the better those the organizations proving to have superior abilities to manage exploration will be able to adapt to changing circumstances, as stressed by McGrath (2001).

Hamel and Prahalad (1991), used the term "expeditionary marketing" as the way to maximize learning and determine the precise direction in which to design products or services that will fit with the customer needs and drivers, as well as with the market to target. This should be done through market experimentation and learning through low cost, fast-paced market incursions, enabling successive approximations, and minimizing the time and cost relative to product iteration.

Market knowledge and strategy should be redefined iteratively to build on each other. This is why creating effective knowledge on new markets and customers becomes crucial, as recognized by O'Connor (1998), who enunciated several market-related questions and learning mechanisms during the feasibility and prototype phases in disruptive innovation projects.

Furthermore, O'Connor et al. (2008), recognized that *experimental learning* and *early harvesting strategies* through interaction with markets lead to quick learning and can be used to compensate limited understanding of high uncertainty contexts and unfamiliar markets. This also contributes to decision making in the management of disruptive innovation processes.

User involvement. This area has been studied through the different terminologies of "innovativeness", but mainly under the radical innovation approach. Scholars noted that in these innovations, customers are often unaware of their need until they purchase, test, touch, feel or use a product or service that satisfies their different needs. Scholars advanced different recommendations for managing this issue. For instance, Slater and Narver (1998), stated that it is necessary to systematically understand both the expressed and latent needs, and to proactively create customer value by listening to customers' existing needs, as well as by proactive research of unarticulated needs from potential customers. Paap and Katz (2004), advised that it is crucial to focus on understanding the levels of needs and drivers users have for the new technology. Veryzer (1998b), also stated that customers could not express their latent or future needs, because of a cognitive limitation; they tend only to think about issues relevant to them at that time, concerning their current life or business situation or context, and they are conditioned by what they have learned to do or by their daily behavior. Chiesa and Frattini (2011), added that until customers see new opportunities for improved services or characteristics, these unarticulated needs are not often mentioned. These scholars also added that customers perceive uncertainty about their benefits and the need to alter their behavior in order to realize the potential benefits of the new product. Sandberg (2002), noted that explaining disruptive innovation's benefits to potential customers could be very difficult because the product is still non-existent, and customers would have to visualize functionalities and benefits based on concept descriptions.

Customer and stakeholder involvement should appear from the early stages of innovation. An immediate identification of customers and their involvement in each of the phases of the innovation project becomes crucial, generating a portfolio with tight or loose relations (Coviello and Joseph, 2012). According to Athaide and Klink (2009), ineffective relationship management with potential buyers during New Product Development (NPD) can be a major contribution for new product failure in technology-based industries' markets. Therefore, scholars concluded that testing disruptive innovations with customers to detect latent needs is essential, and they also noted that such testing is very challenging, even with lead users.

Market configuration. This area has been studied through the disruptive innovation approach, mainly because the new entrant's need of reconfiguring the status quo. Scholars as Jaworski et al. (2000); Sandberg (2002); and Easingwood and Harrington (2002), discussed that disruptive innovation usually needs to influence the structure of the market and/or the behaviors of market players in a direction that enhances the competitive position of the new business. More recently, Sandberg (2002) uses the term *Proactiveness*, that could be seen as a firm's tendency to influence the environment and initiate change by anticipating the coming circumstances, and also by showing the opportunities and risks of markets, which are presumably not served by the firm. According to Easingwood and Harrington (2002), persuading a market to adopt new technology is generally comprised of four stages: market preparation, targeting, positioning, and execution. These authors argue that market preparation aims to ready customers and other companies for the innovation stage that usually occurs while the product is still in development. Market preparation includes building relationships and awareness as main strategies. The *Effectuation theory* by Sarasvathy (2001), states that shaping a new market depends on building relationships to create a future (as a result of the interaction between actors) rather than analyzing the competitive landscape. Furthermore, the *Opportunity Creation theory* from Baker and Nelson (2005), and Alvarez and Barney (2007), recognizes that opportunities are not always created by the change in a market but rather they may be endogenously created by the actions of people seeking ways to develop new offerings.

Network and stakeholders. The first decade of 2000 represented an early stage in investigating the influence of networks in the commercialization phase, mainly studied under the radical innovation approach. Chakravorti (2004); Chiesa and Frattini (2011); Möller (2010); and Aarikka-Stenroos and Lehtimäki (2014a), emphasized that networks and collaboration with different stakeholders play essential roles in the commercialization of innovations within interconnected markets. Ansari et al. (2016); and Marx et al. (2014), provided examples of moving from a disruptive to a cooperative strategy with incumbents in order to gain the support of the market actors. Chakravorti (2004); argued that interconnection between market players has an effect on the adoption of innovations and that networked markets can allow a rapid diffusion. Innovators should create a new status quo where the different players (partners, suppliers, distributors, policymakers and regulators, retailers, or consumers) could find an interesting choice. As innovation could change several players' behavior, the innovator should define benefits and incentives for them to guide the adoption network to choose their new product. According to Chiesa and Frattini (2011), in a fully interconnected market, customer acceptance is influenced not only by the commercializing firm but also by the decisions of the members of the adoption network. Thus, it is critical to orchestrate the actions that will influence the key members of this network in order to persuade them to support the innovation and sustain diffusion of the new product or service. Easinwood and Harrington (2002), argued that building relationships is not an option

but rather necessary to obtain extensive support from the adoption network. Aarikka-Stenroos and Sandberg (2014b), developed in an in-depth study an integrative framework explaining the network actors and their main contribution to commercialization. The resources in the network should be focused on creating trust and credibility, awareness-building, developing customer education, making visible the benefits and how can users and opinion leaders use the innovation, generating trial opportunities, defining complementary offerings in interconnected markets, or mobilizing user communities to ensure market pull effects.

Transference activities (scale-up phase). This issue has been approached under the radical innovation perspective. The ambidexterity literature introduces the concept of separated units for exploration and exploitation activities, coordinated at the top management level. This structural detachment guarantees that the exploration activities are preserved from the bureaucracies, managerial routines, and the culture of exploitation (Tushman and Anderson, 1990).

Nevertheless, the detachment of these units from the corporate parent is a necessary yet insufficient condition for success. The work from Andriopoulos and Lewis (2009), argues that ambidextrous organizations require methodologies to activate, organize, and incorporate separated exploration and exploitation units in organizations. This topic should be an area for further research in order to better manage the integration mechanisms that guarantee the transition process to mainstream commercialization.

4.2.3. Commercialization processes

This study provides a thorough picture of the current state of affairs in the commercialization of disruptive innovations through a multifaceted approach. Two papers have been identified in the analyzed sample presenting a framework that describes the process of commercialization of disruptive innovation (activities to perform during the different phases of the innovation and also before full commercialization).

The first, from O'Connor and Rice (2013), is a qualitative prospective cross-case comparison of breakthrough projects in large established companies, mainly focused on market creation. In this, the processes and challenges associated with creating new markets for disruptive innovations are explored. A framework is presented for enabling and constraining mechanisms that teams and organizations impose through the processes and decisions they take in the course of the project's development. A series of propositions regarding the dynamics of successful new market creations for disruptive innovations were enunciated. The results of the study show again that business model development and market creation are nonlinear. Still, they are exploratory processes due to high market and organizational uncertainty and require an exploratory and experimental approach (as enunciated by McGrath, 2001). Opportunities arise and are perceived and elaborated via interactions between firms and potential customers, but also through dynamic intra-organizationally activities. Furthermore, market creation in non-familiar markets may require as much time and investment as their technical development.

O'Connor and Rice (2013), argue that new market creation is the result of managing a set of events and challenges, and identify six market creation activities to implement:

1. Generation and choice of applications
2. Discovering the business model
3. Stimulating the value chain
4. Developing market priming activities
5. Initial market entry
6. Managing market evolution.

Each one may involve constructionist, deconstructionist, and/or modification activities to shape markets and customers or stakeholders' behavior, as also described by Jaworski et al. (2000). These scholars described that the *generation and choice of applications* takes place when the company selects various areas of application for disruptive innovation. They note that the bigger the number of early application ideas, the higher chance of success for the innovation. Also, if the choice of the initial application is based on the firm's past experience with users and markets, it is quite possible to sub-optimize the innovation's market impact, as recognized by Gruber et al. (2008). Furthermore, O'Connor and Rice (2013), described *discovering the business model* as a stage in which the company co-evolves its revenue model of innovation. They advised that the process should be explorative and iterative. Still, the authors explained the importance of *stimulating the value chain* when the company conceptualizes and builds a supply chain for its innovation that involves the whole set of stakeholders. This explanation is consistent with the target endgame concept from Chakravorti (2004). The scholars also added that the *market priming activities* are an early interaction with the market, which can affect the success of disruptive innovations. They stated that articles' publication, advertising in technical journals, product trials, and small market entries are good examples of market priming activities. The final stages, according to these authors, are initial *market-entry* and *market evolution activities*.

The second model, from Aarikka-Stenroos and Lehtimäki (2014a), is focused on business-to-business firms (offering radical products and services). This qualitative cross-case comparison also presents an approach where commercialization activities interact with the ideation and R&D phases. The commercialization processes are complicated by technological uncertainties, but especially by customer and marketing ones. Customer discontinuities mean newness of the customer's needs and customer's behavior. Market discontinuities appear as new products are needed to create new markets that generate in turn new value chain ecosystems and new stakeholder's behaviors.

This work identified six main challenges to overcome: choosing a feasible market strategy under uncertainty conditions, understanding the customer perspective, creating credibility for the innovation and the firm, acquiring support from stakeholders, overcoming adoption barriers, facilitating diffusion, and finally creating sales in the early majority market.

Their results also revealed key constituents of the commercialization process, based on the identified challenges. This results in a straightforward nonlinear process where the disruptive innovation evolves, moving back and forth across three significant zones:

1. Defining market strategy includes developing knowledge on the market, customers, and stakeholders and results in modifying the innovation concept, the targeted segments, the value propositions, and the business model, which in turn refine the innovation strategy.
2. Creating and preparing the market, including building awareness, educating the market, demonstrating benefits, credibility building, and activating and gaining support from stakeholders. These activities will facilitate overcoming adoption barriers from markets and customers.
3. Creating and developing sales in the mainstream market reveals that a different approach should be taken to capture the sales potential of the majority in comparison with early adopters (consistent with the “chasm” concept enunciated by Moore, 2002, and acknowledged by Goldenberg et al., 2002). This mainly occurs because of the different needs between the two segments and because of the difficulty of getting cross-market communication among visionaries and pragmatists, causing a slower adoption from the latter group.

Scholars assumed that moving across these zones would make the commercialization of disruptive innovation effective and efficient. All activities to develop during the different phases are characterized by interaction with relevant stakeholders, customers and users (from the early beginning). This involves continuous experimenting and probing with prototypes and early versions in order to trigger learning about customers and markets, as well as about benefits of the innovation or the potential adoption barriers. All this results in a continuously refined project. According to these authors, neglecting the market preparation and creation stage seems to be a major reason for disruptive innovation failures.

When the above two models are juxtaposed, several common elements can be identified. The two models share patterns in the case of dealing with unfamiliar markets through new categories of products, which are also new for the companies. They suggested not concentrating on targeting familiar markets to avoid underperforming the innovation potential. Furthermore, they both described that market development and innovation development in uncertainty contexts are mutually linked. As the project team explores applications, the market learns about innovation. They evolve in a tandem, and each affects the other. Also, the two models are characterized by an iterative and nonlinear straightforward process. They both put the focus on uncertainty management, itself based on early exploration and discovery, to maximize learning about customers and markets. These learnings affect not only the innovation concept and its value proposition but also the targeted segments and the business model, co-evolving as the market responds.

However, the model from O'Connor and Rice (2013), explains the commercialization challenges mainly as a process of market creation through different key activities to be implemented during the Incubation and Acceleration phases. Aarikka-Stenroos and Lehtimäki, 2014a, differentiate three main phases in which to develop commercialization activities in order to overcome the innovation uncertainties, from the stage of Discovery.

4.2.4. Proposal for an integrative commercialization framework

This article puts forward an integrative theoretical model after examining, comparing, and synthesizing the aforementioned disruptive commercialization frameworks' main characteristics. It puts together the key constructs affecting commercialization and the related activities to be performed, and also establishes when and how to implement them along the whole innovation process.

First, the model completely distances itself from those commonly used in incremental innovation (Stage-gate and variants) in which the newness is minimal. In disruptive innovation, the commercialization activities should be implemented mainly to manage uncertainty (Lynn and Akgün, 1998; and Rice et al., 2002). This is a model characterized by iteration, market experimentation, continuous discovery and learning, and validation (Dougherty, 1990; Hamel and Prahalad, 1991; Lynn et al. 1996; O'Connor, 1998; and McGrath, 2001) and particularly influenced by the need to create new contexts, markets and balances between the whole set of agents involved. Final scaling also poses completely different challenges from incremental innovation, such as moving between different adoption segments or transferring the innovation cell to the corporate ecosystem. Commercialization activities have evolved from exploitation activities to become discovery, learning and validation competences. The model is divided into three main phases, summarized in Fig. 5.

The first stage, *Concept and Value proposition Validation* is focused on determining if the innovation concept could be interesting for a potential user (Fig. 5). It verifies the initial concept hypotheses and identifies the market to target and the precise direction in which to design products or services fitting with the customer needs and drivers. Commercialization activities go beyond traditional market research tasks. They should be carried out through first experiments with early users and stakeholders in order to learn about customer's preferences, perceived benefits, or potential use contexts, and also as a driver to begin finding the segments to target. This step takes place during the Discovery stage. Successive fast and low-cost iterations should be done in different fidelity prototype levels until arriving to first commercial versions of the product or

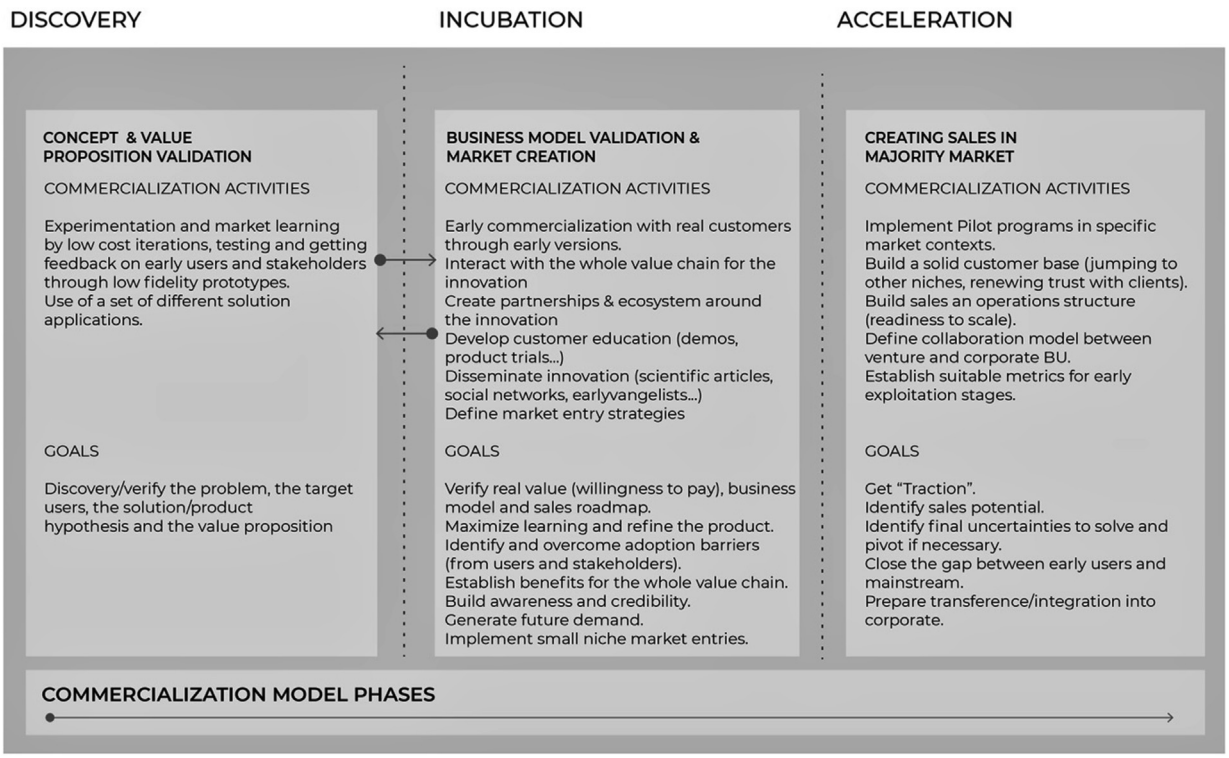

Fig. 5. Integrative framework for the commercialization of disruptive innovations.

service. The market orientation strategy adopted by the firm, focused on unfamiliar or emerging markets (Slater and Narver, 1998; Chandy and Tellis, 2000; and Govindarajan and Kopalle, 2006) is crucial in this phase, in which users and stakeholders should be involved from the very beginning (Veryzer, 1998b; Slater and Mohr, 1998; and Paap and Katz, 2004).

A second main stage, named *Business validation and Market Creation,* aims to gradually disseminate the innovation and to identify and overcome adoption and market barriers. As the innovation is introduced into the market through early versions, the product or service is also modified in an iterative way in terms of the innovation concept, the targeted segments, the value propositions, and finally refining the business model. It is suggested that a wide range of early application ideas that can improve the innovation's chance of success are developed (also corroborated by Gruber et al., 2008). Testing as soon as possible the validity of the business model and the sales roadmap through first sales to real customers is crucial, and reveals a certain willingness to pay for the innovation in the early stages of commercialization that allows evaluating different market entry strategies. This dissemination of the innovation is crucial for overcoming adoption barriers and changing customer's mindset towards innovation. It could also generate the creation of future demand for innovation. This stage takes place during the Incubation phase.

Market configuration activities play an essential role in this stage. Scholars as Jaworski et al. (2000); Sandberg (2002); Easingwood and Harrington (2002); Alvarez and Barney (2007); or Sarasvathy (2001), discussed that disruptive innovation needs to influence the structure of the market and the behaviors of market players in a direction that enhances the competitive position of the new business. The value chain should be stimulated (defining and building it, generating rewards of innovation for all players) through partnerships, and should also offer complete solutions, complementary offerings, share technology platforms or licensing, and create new distribution channels. Furthermore, market priming activities such as articles' publication, advertising in technical journals, developing customer education, product trials, and small market entries are good examples of how to positively affect the success of disruptive innovations. Still, the need of an ecosystem around the innovation integrated by other than members of the company is crucial. Network building enables interconnection between market players and helps towards the adoption of innovations. This garners in turn support from stakeholders, and allows a rapid diffusion (Chakravorti, 2004; Chiesa and Frattini, 2011; and Aarikka-Stenroos and Lehtimäki, 2014a).

The final phase *Creating Sales in Majority Market* appears in more advanced stages of the Acceleration phase. It is characterized by capturing the sales potential of the majority market and by the optimization of operations. This is because some organizational uncertainties usually remain unsolved, and require transition management to integrate the innovation project into the exploitatory business units (Rice et al., 2002; and Gassmann et al., 2012). Managing the integration process and balancing exploratory and exploitatory market activities is a crucial step under an organizational perspective.

It is vital during this stage not only to achieve first sales with a customer in specific initial niches but also to build customer loyalty and obtain new sales with similar clients. This will confirm the potential of the innovation through establishing a broader and more stable customer base, which can jump to parallel niches (Cubero and Segura, 2020). It is also crucial not to approach the market via a unique killer application, but instead through a series of smaller, niche applications implemented through pilot projects. These early sales favor continuous market learning and enable testing the hypotheses related to the projects and linked to the particularities of the target market. This helps gathering new knowledge in order to refine or pivot the innovation product. Managing the expectations for the innovation and establishing suitable performance metrics is also a crucial activity in order to implement the project properly.

5. Contributions and discussion

Research related to the commercialization of disruptive innovations is quite fragmented and, in addition, the sample here studied reveals that there are partial views from very diverse fields of knowledge. Through a rigorous process of location, selection and analysis, this article presents an integrated model for the commercialization process of high uncertainty innovations and joins together the contributions of the highest-standard academic papers from 1980 to 2020.

The study corroborates the use of the DIA (Discovery, Incubation, Acceleration) model and delves into the interplay of the model with the different commercialization activities to be carried out in each of its phases.

The paper shows the evolution of the definition of commercialization, from a purely exploitative concept, present only in the final phase of the innovation process, to an approach where commercialization activities are mutually linked with those of product development and those based on the experimentation, discovery and validation, which appear from the first stages of innovation. Under this approach, opportunity recognition could appear not only at the beginning of the process but in parallel with the development process, due to a continuous iteration with customers, networks, and markets. This will serve to validate hypothesis about the target users, their problems and the proposed solutions. These innovations impacting at the macro level, defining new markets, modifying market structures, or changing user's drivers, require processes of a mainly explorative nature, far from traditional models of innovation and commercialization. Here, the concepts of market creation and network building take on a crucial relevance in these types of innovations. Targeting emerging customers also requires special attention to the strategies to be implemented in order to create and promote sales in the majority market. The article also provides important challenges to consider before the scaling up, proposing an iterative approximation to the majority sales potential.

The proposed model sets out key activities to be carried out and the time and manner of implementing them within the global innovation process, with the main objective of reducing the uncertainties related to the project. The model is divided into three main phases that coexist within the innovation process and enunciates the key challenges to overcome and the activities to carry out in each moment.

The results show that the mindset of the model as well as the activities described present high similarities (Fig. 6) to the five primary building blocks from the Lean Startup framework (Blank, 2005; Osterwalder and Pigneur, 2010; Ries, 2011): (a)

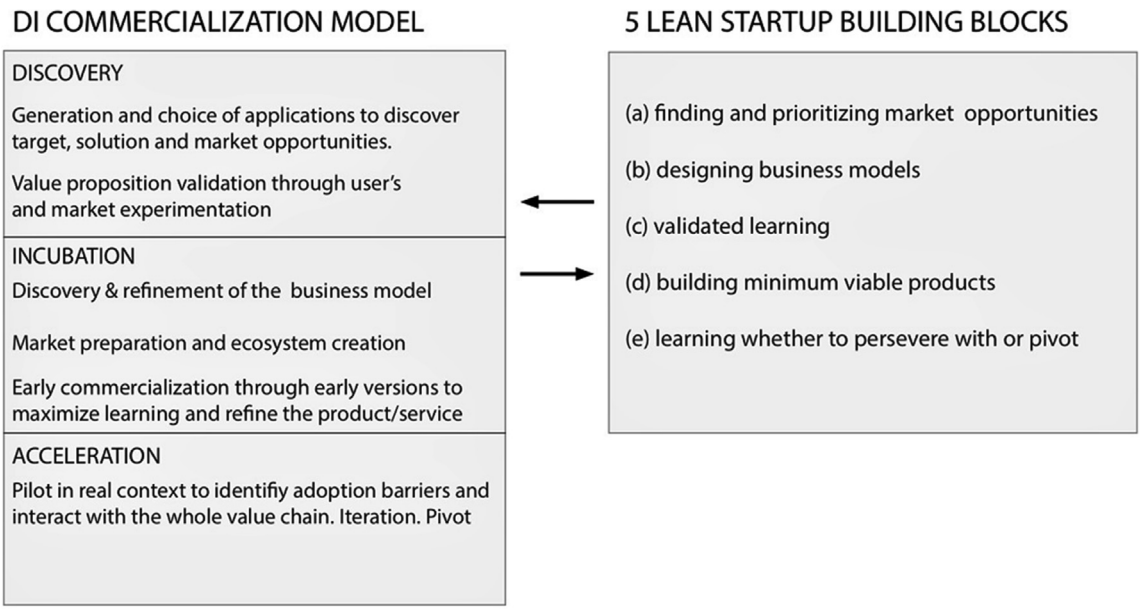

Fig. 6. Key activities comparison between the Disruption Commercialization Model and the Lean Start-up Framework.

finding and prioritizing market opportunities in startups, (b) designing business models, (c) validated learning (including customer development), (d) building minimum viable products (MVPs), (e) learning whether to persevere with or pivot from the current course of action (Gruber et al., 2008). Lean Startup is one of the most popular contributions in the practitioner-oriented entrepreneurship literature from the recent past, and it is surely the framework most widely used by entrepreneurs and practitioners, although it lacks evidence from academic research.

Consequently, the commercialization model resulting from this SLR also provides an academic grounded framework that allows bridging the research–practice gap and establishes a theoretical basis for the different contributions of the Lean Start-up framework. This will help academics by offering insights that can guide them towards questions of interest to both academics and practitioners, thus coupling research in both fields.

6. Conclusions and future research

During the past four decades, academic research has explored the commercialization of disruptive innovation from multiple perspectives. Nowadays, the knowledge is mostly still fragmented, and the studies offer little understanding about the whole process of commercialization and its relation to innovation development. At this point, research was needed to develop a comprehensive approach to the disruptive commercialization process and to evaluate what has been studied in this field and what has been left out. This study has taken a broad look at current academic research in the role of commercialization within disruptive innovations.

To examine the field's current state, we conducted a systematic literature review that was based on a multidisciplinary SLR resulting in a sample of 64 high-quality peer-reviewed scholarly articles across 23 journals obtained through a rigorous data collection and analysis process. This article updated theoretical knowledge about the commercialization of disruptive innovations. Six main constructs related to the commercialization of disruptive innovations were identified: market orientation, user's involvement, market learning, market configuration, adoption networks and stakeholders and organization culture.

The paper proposes a commercialization model that results from the examination, comparison, and synthetization of the main characteristics of the disruptive commercialization frameworks that exist in current literature. They describe the commercialization activities to perform according to three main phases: 1) Concept and Value proposition Validation, 2) Business model validation and Market Creation and 3) Creating Sales in a Majority Market. This conceptualization stresses the relationship between the constructs mentioned above and the commercialization model, pointing out when and how each of them interacts during the process. The study also presents a reviewed definition of the concept of commercialization in high uncertainty innovations.

Although the SLR is a rigorous and well-established research approach, this paper has some limitations that need to be acknowledged. First of all, although it is comprehensive in its kind, the systematic literature review could be criticized for not including all relevant work on commercialization disruptive innovations, hence taking a slim selection of publications as a starting point for the analysis. However, through the rigorous procedure of our systematic data collection, we developed a literature base representing as ultimately as possible the relevant thoughts within current research. In addition, we recognize the limitations concerning the objectivity of the analyses' results. The choice of data, the allocation of the main themes, and the interpretation of the results are subjective. To minimize this issue of subjectivity, the multiple researchers' method was applied. The individual assessments were discussed until agreement was reached, and the present analysis and interpretation represent the point of view of all researchers.

Through the comprehensive approach carried out in this systematic literature research, we reveal potential research gaps that can be used as input for forthcoming projects. First, the hypothetical model for commercialization developed here requires empirical validation, generating avenues for future works. Still, more research could be carried out to close the practitioner–academic gap on the explorative manner of approaching high uncertainty innovations. This will help establishing a more consolidated approach that will inspire academics and practitioners, particularly concerning the issues related to scaling. To develop a more mature acceleration and commercialization competency, more research should be done on how to manage leaders' expectations with regards to the sales development in disruptive innovations. Consequently, also on how to develop appropriate performance metrics for the people responsible for market creation that go beyond technical discovery and engineering development. Future research could also be directed toward performance metrics to better measure the success of innovation transition, to balance the activity in exploration-exploitation teams and to overcome the natural tendency to prioritize sustaining innovations.

Additionally, as market preparation and creation seem to be crucial for innovation success, more research in this area is needed. For instance, the manner of mobilizing and committing potential actors. Furthermore, Alvarez and Barney (2007), recognizes that opportunities are not always created by the change in a market but rather that they may be endogenously created by the actions of people seeking ways to develop new offerings. More research is needed to further explore how the activities shaping a new market could be created and leveraged and how they interact with the dynamic commercialization process.

Finally, O'Connor et al. (2008), recognized that experimental learning and early harvesting strategies through interaction with markets lead to quick learning. This can be used to compensate limited understanding of high uncertainty contexts and unfamiliar markets, therefore contributing with decision making in the management of disruptive innovation processes. More research on this area should be carried out to answer how market learning can be implemented across the different

phases of the innovation project. With special attention to how customer participation and their perceptions could be managed and how to accurately define the boundaries of their capabilities for effective customer involvement.

Declaration of competing interest

The authors declare no conflicts of interest.

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Capítulo 3

Actividades de comercialización en la fase de aceleración y escalado en las corporate ventures y las spinoffs

3.1 Introducción y objetivos

El proceso de aceleración de una innovación disruptiva es muy complejo. Es una fase en la que se requiere terminar de resolver posibles incertidumbres remanentes de carácter tecnológico, de mercado, organizacionales y de recursos. En cuanto a las incertidumbres de mercado, las actividades a llevar a cabo en la fase de aceleración se centran en:

1) ganar tracción entre los segmentos iniciales (Maurya, 2012; Leveland, 2019),
2) identificar posibles barreras de adopción e implementar el proyecto en condiciones reales de mercado mediante pilotos (Nieto y Consolación, 2019),
3) consolidar el ecosistema entorno a la innovación (Aarikka-Stenroos y Lehtimäki, 2014),
4) preparar el equipo para su escalado a nivel de estrategia de ventas y operaciones (Rice et al., 2002),
5) saltar de manera eficiente a un mercado amplio, superando el abismo definido por Moore (2002), también descrito como el valle de la muerte por Markham (2002).

La fase de aceleración es clave en el proceso de innovación. Si una corporación no es capaz de convertir conceptos validados en negocios con impacto, no será capaz de generar crecimiento, adaptar el negocio actual para el futuro o generar nuevas tipologías de negocio (Mattes y Ohr, 2019).

Sin embargo, muy pocas compañías tienen definido un proceso efectivo para llevar a cabo la fase de aceleración (van Burg et al., 2012) y no existe una metodología o un marco teórico para el desarrollo de esta fase de la innovación (Ford et al., 2011). Autores como O'Connor y de Martino (2006), van Burg et al. (2012) o Gassman et al. (2012) solicitan más investigación sobre la fase de aceleración y transición a unidades de negocio y sobre el proceso de comercialización vinculado a esta etapa. Más concretamente, la tesis doctoral centra esta investigación en dos modelos organizacionales de innovación basados en el concepto de organización ambidiestra, el corporate venturing y las spinoffs.

A partir de estas premisas, se formula la tercera pregunta de investigación, que tiene como objetivo establecer un modelo que describa las actividades de comercialización a llevar a cabo durante la fase de aceleración para mejorar la tasa de éxito en la implementación de innovaciones disruptivas.

> ***¿Cuáles son las actividades de comercialización clave para facilitar la fase de aceleración y escalado de innovaciones disruptivas en las corporate ventures y las spinoffs?***

3.2 Marco teórico

3.2.1 La organización ambidiestra

Una de las premisas principales de Christensen (1997) es que las grandes corporaciones presentan grandes dificultades a la hora de implementar innovaciones disruptivas, debido a que sus organizaciones están enfocadas a proyectos de explotación y optimización y su orientación a mercado se centra en la base de clientes consolidados, dejando sin atender posibles mercados emergentes, con necesidades no satisfechas. Esta inercia estructural dificulta enormemente el desarrollo de innovaciones disruptivas.

Por ello, un factor clave para el éxito de las compañías que trabajan en mercados de alta incertidumbre es adoptar una estructura de organización ambidiestra. Ésta se define como aquella que tiene la capacidad de capitalizar un conjunto existente de activos y competencias y, al mismo tiempo, desarrollar nuevas combinaciones de recursos para satisfacer las necesidades futuras del mercado (Hill y Birkinshaw, 2014; Tushman y O'Reilly, 1996).

El concepto de organización ambidiestra se define en términos de exploración y explotación. La exploración implica experimentación con nuevas propuestas de carácter disruptivo, con retornos que son inciertos, no convergentes y a menudo negativos, y la explotación es la optimización y extensión de las competencias, tecnologías y paradigmas existentes en la organización con retornos que son positivos, próximos y predecibles (Raisch y Birkinshaw, 2008).

Estudios como el de Gibson y Birkinshaw (2004) afirman que las organizaciones que buscan simultáneamente exploración y explotación obtienen un desempeño innovador superior. La combinación de exploración y explotación no solo ayuda a las organizaciones a superar la inercia estructural que proviene de centrarse en actividades de explotación, sino que también les ayuda a obtener mejores resultados en iniciativas de exploración (Levinthal y March, 1993).

Adicionalmente, Tushman y O'Reilly (1997), argumentan que las organizaciones necesitan desarrollar innovaciones incrementales y disruptivas simultáneamente, a través de una estrategia ambidiestra, con unidades separadas para exploración y explotación, definiendo modelos de negocio y procesos diferentes para cada una de ellas.

Aunque ambos tipos de actividades son importantes para la supervivencia organizacional, crean desafíos completamente diferentes (Jansen et al., 2009). Mientras que la exploración es el resultado de la experimentación, la flexibilidad y el pensamiento divergente, la explotación se asocia con la eficiencia, la optimización y el enfoque.

Por este motivo, el concepto de organización ambidiestra no solo implica equipos estructurales separados para la exploración y explotación, sino también diferentes competencias, sistemas, incentivos, procesos y culturas para cada uno de ellos. Estas unidades separadas se mantienen unidas por una visión estratégica común, un conjunto general de valores y mecanismos de vinculación estructural específicos para aprovechar los activos compartidos. Esta visión estratégica asociada debe estar orquestada por el equipo de dirección, mediante sistemas de incentivos adaptados y procesos de equipo capaces de manejar las divergencias entre los hábitos y cultura de trabajo de cada unidad, articulando una visión y apoyo estratégico (O'Reilly y Tushman, 2004). Para optimizar este sistema organizacional, se requiere un conjunto común de valores compartidos que brinden una identidad común, aun bajo normas operativas diversas en las diferentes unidades y equipos de las empresas (O'Reilly y Tushman, 2004).

La separación estructural entre equipos de exploración y explotación es una condición necesaria, pero insuficiente, para el éxito de la organización ambidiestra (Kaaupila, 2010). van Burg et al. (2012), afirman que las organizaciones ambidiestras necesitan rutinas

y procesos para movilizar, coordinar e integrar actividades de exploración y explotación estructuralmente separadas.

Adicionalmente, Raisch y Tushman (2016) afirman que los estudios del ámbito de la organización ambidiestra no han analizado formalmente el proceso de aceleración y transición a unidades de negocio de la corporación.

3.2.2 Corporate ventures

Bajo un contexto de mercados interconectados, con alta incertidumbre y máxima competitividad, la innovación puede generarse tanto dentro como fuera de los límites de las compañías (Chesbrough, 2003). El concepto de innovación abierta está muy vinculado con la idea de organización ambidiestra que se ha descrito previamente, que busca el equilibrio entre iniciativas de carácter más exploratorio y de explotación, desde dentro o fuera de la corporación (Miles y Covin, 2002).

Uno de los mecanismos para facilitar que grandes corporaciones puedan desarrollar innovaciones disruptivas es el corporate venturing, que se define como la exploración de nuevas tecnologías o productos, mediante equipos separados de la estructura de la corporación y de sus actividades de explotación y optimización. Estos equipos actuarán con libertad en relación con la rigidez organizativa de la corporación y de sus objetivos de retorno inmediatos, pero aprovechando los activos de la organización como la financiación, los contactos con clientes o los conocimientos adquiridos.

Habitualmente, el objetivo es integrar de nuevo la célula independiente en una unidad de negocio de la corporación cuando el proyecto de innovación está lo suficientemente maduro y preparado para generar beneficios. Sin embargo, una integración forzada en una unidad de negocio por falta de alineamiento puede ser contraproducente tanto para la corporate venture como para la unidad de negocio y la compañía, resultando en múltiples ocasiones en un fracaso del proyecto innovador (McGrath, 2001; Rice et al., 2002). La corporate venture también puede convertirse en una escisión independiente o spinoff y atraer financiación externa, o bien venderse a otra empresa, si no encuentra un destino coherente dentro de la corporación.

El concepto de corporate venture es diferente al del intraemprendimiento. Este último se define como la competencia de infundir la mentalidad de emprendimiento dentro del equipo de la empresa y generar así una atmósfera innovadora dentro de la organización (Thornberry, 2001).

3.2.3 Spinoffs

Una spinoff se define como la generación de un nuevo negocio para obtener beneficios comerciales a partir del desarrollo y explotación de una nueva tecnología o innovación (Zahra, 1996; Carayannis et al., 1998). La spinoff utiliza activos, propiedad intelectual, conocimientos, tecnología y / o productos existentes de la organización matriz (Zahra, 1996).

La organización de origen pueden ser empresas privadas, universidades o institutos de investigación (Pirnay et al., 2003). Por este motivo, el concepto de spinoff también se refiere a una nueva empresa que se establece para comercializar oportunidades comerciales de una nueva tecnología que ha se ha incubado en institutos de investigación o para explotar una propiedad intelectual desarrollada por una universidad (Shane, 2004).

3.2.4 Etapas de comercialización en la fase de aceleración para las corporate ventures y las spinoffs

Para poder comparar el proceso de comercialización entre las corporate ventures y las spinoffs, se ha tomado como referencia el modelo de Frattini et al. (2012), basado en los segmentos de adopción (Rogers, 1963; Moore, 2002) y también corroborado por Maine y Garnsey (2007) y Amadi-Echendu y Rasetlola (2011). Estos autores caracterizan la fase de aceleración de innovaciones disruptivas en tres etapas de comercialización:

1) la etapa de **pre-comercialización**, como el período donde se desarrollan actividades enfocadas tanto a la difusión, venta y adopción del producto/servicio por parte de los visionarios (early adopters) y a la configuración y creación del ecosistema de innovación entorno al proyecto.
2) la etapa de **comercialización**, caracterizado por actividades enfocadas a pasar de los nichos iniciales a un mercado masivo (early majority).
3) la etapa de **post-comercialización**, cuando el proyecto de innovación se consolida y se centra en actividades de explotación.

Paralelamente, van Burg et al. (2012) caracterizan las siguientes etapas en la fase de aceleración, dentro del contexto concreto de las corporate ventures, considerando también el proceso de transferencia de éstas a la unidad de negocio:

1) la etapa de **pre-transición**, como el periodo dedicado a la difusión y adopción del producto o servicio por parte de los visionarios (early adopters). Es una etapa que también tiene como objetivo la obtención de indicadores de credibilidad de negocio de cara a la corporación matriz y a la creación del ecosistema de innovación externo e interno a la compañía.
2) el momento de **transición** del proyecto de innovación a la unidad de negocio que coincide con el inicio de su comercialización a un mercado masivo (early majority).
3) la consolidación del proyecto dentro de la unidad de negocio, a nivel de estructura operativa y ventas, o **post-transición.**

Las actividades de comercialización recopiladas en la bibliografía existente para los modelos de innovación de las corporate ventures y las spinoffs se agrupan en relación con las etapas citadas (como se muestra en el punto IV de los anexos, Tablas 10 y 11). El paralelismo entre las etapas previamente descritas para ambos modelos nos ha permitido comparar el proceso seguido por las corporate ventures y las spinoffs, detectando retos compartidos y divergentes.

3.3 Metodología

3.3.1 Explicación y justificación del método

Para este artículo, se empleó un método basado en estudio de caso para obtener un conocimiento profundo sobre el proceso de comercialización en la fase de aceleración, como sugieren Walsh (2012) o Ellis y Levy (2009).

El método de estudio de caso es adecuado para estudios empíricos (Eriksson y Kovalainen, 2008), así como cuando es necesario examinar un problema específico y explorar y describir un fenómeno (Yin, 2003).

Este método es recomendable para ámbitos de conocimiento incipiente, con investigaciones cuya pregunta comienza con *cómo* (Yin, 2003) y donde el tema de estudio se basa en la experiencia o la práctica (Shank, 2002). El método permite la interpretación crítica y la replicabilidad de estudios (Yin, 2003; Eriksson y Kovalainen 2008). Por estas razones, se empleó este método para la investigación.

Adicionalmente, de entre los diferentes tipos de estudios de caso, uno de ellos es el estudio de caso múltiple. Según Yin (2003), el estudio de caso múltiple permite a los investigadores tener conocimiento sobre las diferencias y similitudes de un fenómeno y facilita las comparaciones para que se pueda generar un conocimiento en profundidad, especialmente cuando los casos provienen de diferentes industrias y tecnologías (Pellikka, 2014). A partir de estas premisas, se empleó el estudio de caso múltiple para este artículo.

Finalmente, el estudio de caso puede ser longitudinal (Yin, 2003; Eriksson y Kovalainen, 2008), llevado a cabo durante un período mantenido de tiempo. Este tipo de procedimiento también fue recomendado para el proceso de comercialización de innovaciones por académicos como Datta et al. (2013), que afirman que un estudio de caso longitudinal proporcionaría una visión profunda del proceso.

3.3.2 Procedimiento

Como se ha descrito previamente, el método de estudio de caso es relevante para este tipo de investigaciones, pero es crucial llevar a cabo el método de manera sistemática. Un procedimiento sistemático asegura y promueve la credibilidad del método (Yin 2003; Creswell, 2009). Consecuentemente, se siguieron los siguientes pasos para la aplicación del método de estudio de caso múltiple:

1. En primer lugar, se realizó un análisis de la literatura. La revisión de estudios previos es recomendada por Ellis y Levy (2009) para comprender el fenómeno a estudiar y sus teorías relacionadas, así como para familiarizarse con enfoques similares.
2. En segundo lugar, se planteó la pregunta de investigación.
3. En tercer lugar, se desarrollaron criterios de selección para la muestra de la investigación. Los criterios son los siguientes:

    a) Los participantes estaban desarrollando una innovación de carácter disruptivo.
    b) Los participantes formaban parte de una corporate venture o una spinoff.
    c) Los participantes serían elegidos para obtener una muestra final de compañías de diferentes sectores.
4. Cuarto, se procedió a identificar a los posibles participantes del estudio. La muestra se configuró influida por los contactos de los autores del artículo. La participación del investigador Saheed Adebayo Gbadegeshin permitió ampliar la muestra con compañías de Finlandia.
5. En quinto lugar, se desarrollaron las preguntas de las entrevistas semiestructuradas. El guión de las entrevistas se basa en el artículo de O'Connor et al. (2002) y se muestra en los anexos del documento.
6. En sexto lugar, se contactó y reclutó a los participantes. A partir de los criterios de selección de la muestra, se esbozó una lista de los posibles participantes y se les contactó explicando brevemente los objetivos del estudio. El siguiente paso consistió en agendar entrevistas con aquellos que respondieron positivamente al primer paso.
7. En séptimo lugar, se llevaron a cabo las entrevistas (en las Tablas 3 y 4 se especifican los períodos de realización para las corporate ventures y las spinoffs). Algunos de los

participantes de la muestra no permitieron la grabación de las entrevistas. En estos casos se procedió a transcribir la información clave de las entrevistas, que se realizaron presencialmente o mediante videoconferencia.

8. Por último, se analizó el material obtenido a partir de las entrevistas y la información secundaria aportada por algunos de los participantes de la muestra. Se presentaron los resultados, a partir de la comparación de los resultados de la investigación con la literatura existente conduciendo conclusiones específicas

3.3.3 Muestra

La muestra final está formada por 5 multinacionales con origen en España, Reino Unido y Alemania (en las que se investigaron 12 corporate ventures) y por 20 spinoffs originarias de Finlandia. Con todos los participantes se acordó tratar la información referente a la empresa, producto o proyecto de forma anónima.

Consecuentemente, en el caso de las Corporate Ventures, la muestra se denominó de la siguiente manera: TELCO CO (Alpha project, Beta project, Gamma project, Delta project, Epsilon project, Omega project), FMCG CO (Digital project), APPLIANCES CO (Material 1 project y Material 2 project), FINANCIAL CO (Kelvin project) y ENGINEERING CO (Medical project y Train security project).

Para el caso de las spinoffs, éstas se denominaron respectivamente con los nombres de Coy 1 hasta Coy 20. En las siguientes tablas se muestra en detalle cada uno de los participantes de la muestra de las corporate ventures y las spinoffs, el sector industrial al que pertenecen y los perfiles entrevistados en cada caso.

Parent company	Industry	Corporate venture	Interviewed profiles
TELCO CO	Telecommunications	Corporate organization	Product innovation director Design Research Lead
		Alpha project	Head of product/project Head of Innovation Portfolio Innovation Business Development Manager
		Beta project	Corporate Venture Leader Head of Innovation Portfolio
		Gamma project	Senior Technical Expert Head of Innovation Portfolio
		Delta project	Service innovation Lead Head of Innovation Portfolio
		Epsilon project	Head of commercial innovation Head of Innovation Portfolio Innovation Business Development Manager
		Omega project	Corporate Venture Leader Head of Innovation Portfolio
FMCG CO	Laundry & Home Care	Digital project	Innovation Manager - IoT Corporate Venture Leader
APPLIANCES CO	Home appliances	Materials project 1	Innovation Transference Director Corporate Venture Leader
		Materials project 2	Innovation Transference Director Corporate Venture Leader
FINANCIAL CO	Financial	Kelvin project	Service Design Lead Product Innovation Director
ENGINNERING CO	Engineering	Medical project Train security project	Division Manager Division Manager

Tabla 3. Muestra de las corporate ventures: corporación matriz, sector industrial y perfiles entrevistados. Las entrevistas se llevaron a cabo en el periodo de Noviembre de 2016 - Noviembre de 2018. Fuente: Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 2020, 5(2), página 625.

Companies	Industry	Interviewed profiles
Coy 1	Electronics	CEO Chief Engineer
Coy 2	Environment Tech	CEO Chief Engineer
Coy 3	Healthcare Equipment	CEO Head of Venture Capital IPR Manager
Coy 4	Research Equipment	CEO Business developer Head of Venture Capital
Coy 5	Research Equipment	CEO
Coy 6	Electronics	CEO Chief Engineer
Coy 7	Research Instrument	CEO Business developer
Coy 8	Information Technology	Head of Venture Capital IPR Manager
Coy 9	Research Instrument	Principal lecturer
Coy 10	Optics	Head of Venture Capital
Coy 11	Biotechnology	Head of Venture Capital
Coy 12	Biotechnology	Head of Venture Capital
Coy 13	Electronics	Head of Venture Capital IPR Manager
Coy 14	Chemical Production	CEO
Coy 15	Information Technology	Head of Venture Capital IPR Manager
Coy 16	Electronics	Head of Venture Capital IPR Manager
Coy 17	Research Instrument	Head of Venture Capital IPR Manager
Coy 18	Information Technology	CEO Head of Venture Capital IPR Manager
Coy 19	Information Technology	Head of Venture Capital IPR Manager
Coy 20	Paper Production	Head of Venture Capital IPR Manager

Tabla 4. Muestra de las spinoff: sector industrial y perfiles entrevistados. Las entrevistas se llevaron a cabo en el periodo de Enero 2016 - Noviembre de 2016. Fuente: Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 2020, 5(2), página 625.

3.3.4 Análisis

La información obtenida de las entrevistas fue analizada mediante codificación abierta para reconocer patrones (Corbin y Strauss, 2008). El siguiente paso fue la codificación para identificar relaciones entre patrones, categorizarlos y organizarlos. La información que se obtuvo a través de las entrevistas y documentación complementaria se comparó con la

literatura existente conduciendo conclusiones específicas. Las similitudes halladas en relación con los estudios previos obtenidos en la revisión bibliográfica aumentan la validez de los hallazgos, permiten vincular teorías previas y determinar nuevas aportaciones. Las diferencias emergentes muestran a su vez oportunidades para la investigación futura.

3.3.5 Validación

La evaluación de la metodología de investigación es esencial para garantizar su fiabilidad (Eriksson y Kovalainen, 2008). A pesar de la importancia de la validación y la fiabilidad de una investigación, es difícil de obtener en estudios cualitativos debido a los grandes volúmenes de datos a analizar y al sesgo de los investigadores en su interpretación (Golafshani, 2003). El propósito principal de la fiabilidad es asegurar la reproducibilidad de una investigación. Last (2001) propone la triangulación y revisión entre investigadores como estrategia de fiabilidad.

Para el análisis y confección de resultados, se llevó a cabo la triangulación entre los tres autores del artículo. Por otro lado, se empleó la revisión por otros investigadores, solicitada a compañeros de mayor experiencia para que examinaran el artículo. En esta tarea participaron supervisores de tesis, y compañeros y colegas de otras instituciones. Los comentarios obtenidos de las revisiones han permitido retroalimentar tanto el análisis de la información como la interpretación de los resultados, promoviendo que se mostrase una mayor transparencia en el proceso de investigación. Un paso fundamental en el proceso de revisión de la investigación fue la participación en el Congreso de 2019 *IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC,* Junio 2019, Vallbone, Francia), a través del cual se generó un primer resultado preliminar de la investigación recogido en los Proceedings del 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC 2019), publicados por el Institute of Electrical and Electronics Engineers (IEEE), indexado SJR Q3, con factor de impacto: 0.2, 2019, Índice H: 5.

3.3.6 Limitaciones

La investigación presenta diferentes limitaciones. En primer lugar, desde el punto de vista de la generalización de los resultados y si estos dependen de la naturaleza de cada sector analizado o de las especificidades de cada país de origen. Adicionalmente, en el caso de la muestra de las corporate ventures, la investigación carece del punto de vista de perfiles provenientes de las unidades de negocio.

Por último, los resultados empíricos de la investigación requieren ser confirmados. Un estudio de carácter cuantitativo sería muy útil para corroborar la influencia de cada una de las actividades identificadas en el éxito del proceso de aceleración de las corporate ventures y las spinoffs.

3.4 Resultados

3.4.1 Actividades de comercialización en las diferentes etapas de aceleración para las corporate ventures y las spinoffs

Corporate ventures

En el caso de la muestra de las corporate centures, los resultados obtenidos presentan los hallazgos que se enuncian a continuación.

Durante la etapa de Pre-transición, los participantes de la muestra destacan **la definición y formación del equipo** que explotará el proyecto de innovación como una actividad fundamental. Identificar y captar perfiles adecuados entre los miembros de la unidad de negocio y también de la estructura interna de la corporación, será un factor crucial en la aceleración del proyecto. Esta investigación también destaca también el **papel de las estructuras más horizontales** como puerta de entrada básica a la adopción y difusión del proyecto de innovación en las unidades de negocio. Adicionalmente identifica la **labor de soporte de directivos en capas intermedias** como actores clave en la mediación entre alta dirección y unidades de negocio, poniendo en relevancia la necesidad de potenciar relaciones dentro del ecosistema interno de la corporación para obtener estos apoyos. Por último, otra actividad detectada que tiene efectos positivos en el proceso de aceleración y transferencia es promover **movimientos cruzados** entre equipos de innovación y unidades de negocio, dotando a los perfiles de los primeros de visiones más enfocadas al desarrollo de negocio, facilitando el encaje del proyecto innovador en la hoja de ruta de las corporaciones.

En lo relativo a la fase de Transición, la muestra analizada puso en evidencia la importancia **de transferir parte del equipo de innovación** a la unidad de negocio, para asegurar una transmisión de conocimiento completa respecto al proyecto.

Spinoffs

En el caso de la muestra de spinoffs, la investigación evidencia dos actividades que tienen lugar durante la fase de comercialización. En primer lugar, las spinoff de la muestra llevan a cabo actividades para evaluar y desarrollar **potenciales modelos de negocio alternativos** al propuesto inicialmente durante la fase de comercialización. Adicionalmente, la realización de **primeras ventas** en estas fases iniciales de comercialización sirve como referencia e indicador de credibilidad para poder acceder a una base de clientes más amplia que facilite el proceso de escalado.

3.4.2 Comparativa entre retos y actividades que afrontan las corporate ventures y las spinoffs en la fase de aceleración

A partir del análisis de los resultados obtenidos, esta investigación propone una comparación de las actividades de comercialización que llevan a cabo las corporate ventures y las spinoff durante la fase de aceleración.

SPINOFF			CORPORATE VENTURE		
PHASE	PROBLEMS TO OVERCOME	ACTIVITIES	ACTIVITES	PROBLEMS TO OVERCOME	PHASE
PRE-COMMERCIALIZATION	GETTING COMMITMENT FROM STAKEHOLDERS	Identification of technological opportunity Application. Technical and economic viability	Early relations with potential business units Personnal exchange and training Cross-functional interfaces	COMMITMENT FROM BU. SEARCH FOR CHAMPIONS	PRE-TRANSITION
	ASCERTAINING INNOVATION VALUE AND BUSINESS POTENTIAL	Targetting markets Formulate different business models Gathering enough market information	Achieving first sales and running pilot programs	VALIDATION AND DEMONSTRATE REAL TRACTION	
			Reduce all remaining uncertainties	INNOVATION PROJECT READINESS	
	TEAM LACK OF RESOURCES AND SKILLS	Formation of the commercialization team	Definition and formation of the right team	TEAM LACK OF RESOURCES AND SKILLS	
	PROTECTION OF INNOVATION	IP protection			
ON-COMMERCIALIZATION	CONDITIONS FOR COMMERCIALIZATION	Reference sales Product simplification. Ready or existing technology platform Testing business models Prototype and testing with end users. Final validation	Renew sales and open new niches Clear operating model and technology platform technology platform. Complementary services Ready business model	CONDITIONS FOR TRANSITION TIMING	TRANSITION
	LACK OF RESOURCES	Subcontracting	Search for right personal resources	RESOURCES LEVERAGING	
	AWARENESS AND SALES NETWORK	Participation in business events Internationalization Creation of potential alliances Searching for distribution channels	Synergies with corporate parent	AWARENESS AND SALES NETWORK	
			Team transference for knowledge transferences	KNOWLEDGE MANAGEMENT	
POST-COMMERCIALIZ.	PROMOTING SPINOFF	Product launching and post launching. Market assesment			POST-TRANSITION
	REFINING INNOVATION PROJECT	Getting back from initial buyers			
	OPTIMIZATION VALUE CHAIN	Managing supply chain			
			Defining specific performance metrics	BALANCE EXPLORATION & EXPLOITATION PROJECTS	
			Searching for partial autonomy	KEEPING CV MINDSET	

Tabla 5. Comparación entre actividades de las corporate ventures y las spinoff en las diferentes etapas de comercialización de la fase de aceleración. Fuente: Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 2020, 5(2), página 631.

Las actividades de comercialización para cada uno de los dos contextos de innovación se agrupan en relación con las etapas citadas en el punto 3.2.4, como se muestra en la tabla. El paralelismo entre las etapas descritas para ambos modelos ha permitido comparar el proceso seguido por las corporate ventures y las spinoff, detectando retos

compartidos y divergentes, producto de los contextos diferenciados de cada uno de los dos modelos organizacionales de innovación.

Etapa de pre-comercialización/pre-transición

Tanto las corporate ventures como las spinoffs llevan a cabo actividades para desarrollar un **ecosistema** entorno al proyecto de innovación, para involucrar a los actores y colaboradores adecuados y buscar su compromiso con el proyecto.

Otro de los retos identificados es cómo determinar la **madurez** del proyecto de innovación. Las actividades registradas a través de la investigación indican un nivel de madurez superior en el caso de las corporate ventures, especialmente en lo relativo a la validación de la innovación por el mercado. Esta diferencia puede estar motivada por una mentalidad mucho más centrada en el desarrollo de negocio y en la búsqueda de retorno en el caso de las corporate ventures.

La **falta de recursos personales** y **competenciales** es una barrera común que afrontan ambos tipos de organización. La planificación y búsqueda de perfiles con las habilidades, experiencia y conocimientos adecuados para **formar un equipo** capaz de llevar a cabo la transición desde la exploración a la explotación es fundamental.

En el contexto concreto de las spinoff, siempre basadas en nuevos hallazgos científicos, la muestra enfatiza la relevancia de la **protección intelectual** en el proceso de desarrollo y comercialización, a diferencia de las corporate ventures, que no citan este reto como relevante.

Etapa de comercialización/transición

La fase de comercialización es la etapa enfocada a pasar de las ventas a los nichos iniciales (early adopters) a un mercado masivo (early majority). En el caso de las corporate ventures coincide también con el momento de la transferencia del proyecto del equipo de innovación a una unidad de negocio de la corporación.

En los casos de las corporate ventures es muy común que ningún perfil del equipo de innovación continúe en la unidad de negocio receptora que explotará el proyecto. Esta investigación destaca la importancia crítica de la **transmisión de los conocimientos** adquiridos durante las fases más exploratorias de descubrimiento e incubación, en términos no sólo de conocimientos técnicos o de producto sino también de toda la información respecto a la base de clientes, las necesidades reales detectadas en usuarios finales o la opinión obtenida de consumidores y de otros agentes relevantes dentro de la cadena de suministro y distribución. Toda esta información es clave en el proceso de comercialización a gran escala y la transferencia de miembros del equipo de innovación a la unidad de negocio facilita este proceso.

La **madurez** con la que las corporate ventures y las spinoff afrontan esta etapa es diferente. Las primeras presentan unas condiciones más adecuadas para abordar un mercado más amplio, con una base sólida de clientes y una viabilidad tecnológica, organizacional y de modelo de negocio más contrastada. En cambio, las actividades de las spinoff en esta etapa todavía están enfocadas a la simplificación y ajuste del producto, su encaje a plataformas existentes para facilitar su venta y distribución, a la validación del modelo de negocio o la obtención de indicadores de credibilidad para el proyecto de innovación a través de primeras ventas.

La **escasez de recursos** que presentan las spinoff obliga a estas organizaciones a centrar sus esfuerzos en sus competencias diferenciales, y consecuentemente subcontratar la fabricación y aprovechar plataformas existentes para facilitar el escalado del proyecto. En el caso de las corporate ventures, el esfuerzo se enfoca más en la capacidad de aprovechar los recursos que ofrece la corporación madre, siendo clave la promoción interna en la compañía del valor potencial de la innovación.

Otro de los retos fundamentales para las spinoff en esta etapa es generar **visibilidad del proyecto en el mercado y consolidar una red de ventas.** Algunas de las actividades que deben realizarse en esta fase están orientadas a maximizar la visibilidad y a construir la red comercial mediante la participación en eventos empresariales, la creación de alianzas potenciales y la definición y búsqueda de los canales de distribución adecuados. Las sinergias con los activos previos de la corporación madre en el caso de las corporate ventures ayudan significativamente a la hora de afrontar estos desafíos.

Etapa de post-comercialización/post-transición

Es durante esta etapa cuando el enfoque de los dos modelos de innovación es más divergente. Los resultados obtenidos de la muestra analizada revelan que, para las spinoff, el proceso de **optimización del producto** es crucial en esta fase de post-comercialización y requiere la retroalimentación de los compradores iniciales. Incluso si la iteración continua también está presente en la mentalidad de las corporate ventures, las actividades de optimización de producto que realizan las spinoff en esta fase ya han sido realizadas en la etapa previa a la transición por las primeras, para poder ofrecer un negocio creíble y viable a la unidad de negocio receptora.

La pequeña escala y la falta de recursos que presentan las spinoffs impulsan a este tipo de organizaciones a centrar parte de sus actividades específicas de esta fase para **definir y desarrollar la cadena de suministro y distribución**, y a refinar la planificación del proceso de lanzamiento que ayudará escalar la innovación.

Adicionalmente, el estudio muestra que en los casos de las corporate ventures transferidas a una unidad de negocio, éstas se centran en disponer de cierta **autonomía en la toma de decisiones** y en mantener la cultura innovadora del equipo (proveniente de la unidad de innovación) para optimizar el escalado del proyecto en la corporación matriz. Además, los participantes de la muestra destacaron la importancia de definir métricas para el equipo de comercialización que permitan equilibrar la exploración y los proyectos de explotación.

Como resumen, el segundo artículo ha permitido identificar nuevas actividades de comercialización relevantes en el proceso de aceleración para las corporate ventures como para las spinoffs, respondiendo a la tercera pregunta de investigación. Por otro lado, a través del análisis de los resultados con la bibliografía existente, el artículo también presenta una comparativa que muestra los retos que ambos modelos organizacionales de innovación afrontan durante esta etapa.

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Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison

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ABSTRACT

One of the most critical challenges that large companies, small enterprises and research institutes face, when commercializing their innovations, is the transfer process at the moment of scaling up. These organizations often transfer their innovation to either existing business units or create a new business entirely. The process of transferring innovations to an existing unit is known as corporate venture, while creating a new business is called spinoff. Both processes have been studied separately, but not yet together and from different business sectors and countries. In order to understand both processes, this article compares the commercialization of disruptive innovations from these sectors: electronics, information technology, telecommunications, engineering, healthcare, biotechnology or research equipment. The article used multiple case study methodology from commercialization projects carried out in large, small and medium-sized companies and research institutes based in Spain, Germany, UK and Finland. The findings showed that certain activities needed to be done at pre-transition /commercialization, transition/commercialization, and post-transition/commercialization phases to reach a successful transition. Furthermore, the study provides similarities between the corporate venture and spinoff approaches that include team formation, network development and getting the commitment from the company and stakeholders. Additionally, the article outlines divergences between the approaches which consist of innovation readiness, knowledge management or the activities of the post-transition phase. The article also provides insight for innovation scholars, commercialization practitioners, and business enterprises. Therefore, the article contributes to the commercialization of disruptive innovations.

1. Introduction

In today's fast-paced technologically based environments, to keep long-term competitiveness, companies need to introduce disruptive and incremental innovations to markets [1,2]. The disruptive innovations need to be commercialized as it is argued by the scholars [3]. Unfortunately, the commercialization of these innovations has not been thoroughly studied [4], despite its importance within the innovation process [5]. Disruptive innovations are challenging to commercialize by both established enterprises and new businesses (specifically spinoffs). One of the most critical challenges that mature corporations face at the commercialization phase is the transition of an innovation project to their business units for scaling up the project. Similarly, spinoff companies meet obstacles related to organizational factors when commercializing their disruptive innovation [6].

Thus, the corporate venture could be described as the exploration and exploitation of new technologies or products. It is detached from the corporate parent to avoid organizational inelasticity. Additionally, the term "corporate venture" could refer to "spin-in" according to [7]-[9]. Moreover, the commercialization of innovations by establishing a new enterprise is known as spinoff. Spinoff is defined as the creation of a new company to

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commercialize the business potential of a technology or innovation.

Currently, literature has explained the corporate venture process from many different perspectives, such as the corporate parent [10] or the corporate venture [11]. However, it is noted in the literature that there is a limited discussion on the venture transition at the moment of scaling up the innovation. Specifically, there is a limited scholarly discussion on how to design the transition process. Similarly, there is not yet a model that discusses activities needed for the successful transition of the corporate venture into the established company businesses [12] to reach the full commercialization of the innovation.

The existing literature also has explained the spinoff process from the parent organization and the academic entrepreneur's perspective. Nevertheless, few studies have focused on the commercialization process of the spinoff and how the innovation is transformed into a marketable product or service via the spinoff. Therefore, there is a need for in-depth knowledge of the commercialization process of spinoff [6].

Furthermore, ambidextrous literature has not yet provided a better explanation for the transferring of disruptive innovations in corporate entrepreneurship environments, by spin-in (corporate venture) or spinoff. Lastly, the current literature does not either provide a comparison among corporate ventures and spinoffs in their process of commercialization.

Therefore, the purpose of this article is to provide a better understanding of the commercialization process of disruptive innovations in the context of corporate venture and spinoff. It aims to provide critical factors and activities to perform in order to reach a successful scaling up innovation in these environments. To achieve these goals, it employed a qualitative research method.

The article also provides a comparison of the process of commercialization between corporate ventures and spinoffs in order to learn about the challenges they face in the commercialization process. The article offers both theoretical and practical knowledge to discourse on the commercialization process.

The rest of the article is organized as follows; Section 2 presents the theoretical background about the commercialization process in the corporate venture and spinoff, section 3 details the employed research method, section 4 presents the results obtained from the empirical studies, and section 5 presents discussion and conclusions. The last section presents contributions and limitations of the article as well as provides avenues to future research.

2. Theoretical Background

Disruptive innovations are new technologies, techniques or knowledge that generate market and technological breakthroughs on macro and micro levels. These innovations embody new technology that causes a new market environment or generates different customer behaviors. These innovations are affected by S-curve(s): market, technology, or both, during their introduction to the marketplace [13,14]. More specifically, disruptive innovations are radical, and they distort existing ecosystems [15]. Thus, the disruptive innovation changes the relations among firms and customers, modifies marketplace, overtakes current products and reconfigures the innovator's resources [16,17].

The corporate venture is often used to improve competitive positioning and transform corporations, their markets, and industries. It can also be used as opportunities to exploit value-creating innovations. The corporate ventures are startup-like structures that are idea-wise rooted in an established company. They are commonly used in exploration processes of disruptive innovations.

Thus, the corporate venture is, at this moment, described as the exploration and exploitation of new technologies or products, detached from the company's exploitation activities in an "incubation" cell structure that avoids organizational inelasticity and provokes resources and organizational renewal [18]-[20]. The corporate is notably essential when the innovation is still in an early phase, characterized by high uncertainties. Typically, the venture should be transferred to an existing business unit from the corporate parent creating profits within the firm. Meanwhile, the relationships between new corporate ventures and existing business units generate conflicts [21,22]. If this conflict is escalated, the incorporation of corporate venture into an existing corporate unit could be harmful to the development of the innovation and could also find hostility in the receiving team [23].

Notably, the corporate venture is different from intrapreneurship, which is described as infusing the mindset of entrepreneurs in the company's team and thus generating an innovative atmosphere within the company, as enunciated by [24]. Similarly, the corporate venture is different from the spinoff. While the corporate venture is a structurally separated unit with resources to manage innovation projects from idea to commercialization, the spinoff is an entirely new business created to develop and exploit the potential of the innovation.

The spinoff is defined as the generation of a new business to reach profits of new technology or innovation. This new business formation is attained by transferring innovation and other resources (e.g., intellectual property and human) from the originating organization. The originating organization consists of companies, universities or tertiary institutions and research institutes [25]. The spinoff also refers to a new firm that is established to commercialize business opportunities for a new technology that is developed by the research organizations [26]. Additionally, it could be a new company founded fundamentally to exploit an intellectual property that is developed by a university [27]. The spinoff is otherwise known as an academic spinoff, research-based spinoff or new technology-based firm.

2.1. Corporate Venture (CV)

This article focuses on the transition phase of disruptive innovations, and particularly on the transference of innovations to a receiving business unit of the corporate parent.

Usually, a split exists among innovation teams and existing business units, as stated by [13]. Supported by research from [19], these scholars point out that there is not a defined process or methodology to guarantee the delivery of the innovation projects from research and development (R&D) at an acceptable level to the business unit before reaching the scaling-up phase. It has been

studied in literature through different perspectives, and it is described in the following paragraphs.

Uncertainties perspective: the scholars [28,13] outlined four kinds of uncertainties: technical, market-concerned, organizational and resources-based. Due to these uncertainties, disruptive innovations are usually substituted by incremental innovations [29]. Technical uncertainty includes the scientific knowledge base, technical feasibility and manufacturing process. The market-concerned uncertainty comprises the understanding of the new customer value, in relation to the existing competition [13]. The organizational uncertainty involves the organizational and managerial difficulties at integrating a disruptive innovation while pursuing exploitation activities. This uncertainty is mainly caused by unsupportive top management [10] or by the misfit among the corporate business unit and the innovation team [16]. The last uncertainty is resource-based. It addresses all the issues of acquisition of the resources to get successful exploitation of the disruptive innovation [30,31].

Technology readiness: the research from [32] offers an assessment tool to convert a technology invention into a profitable business, and the study of [33] provides a global view about the Technology Readiness Levels (TRL's). Nonetheless, these scholars only approach the phenomenon under a technology uncertainty perspective.

Ambidexterity perspective: the ambidexterity literature [20] introduces the construct of separated units for exploration and commercialization, coordinated at the top management level. This structural detachment guarantees that the exploration activities are preserved from the bureaucracies, managerial routines, and the culture of exploitation [34]. The works from [35,36,20] have enunciated that the detachment among exploration and exploitation activities foster the benefits of both [37]. Similarly, the work of [36] argues that ambidextrous organizations require methodologies to activate, organize and incorporate separated exploration and exploitation units in organizations.

Separation is mainly required to emphasize on disruptive exploration. Nevertheless, the detachment of these units from the corporate parent is a necessary yet insufficient condition for ambidexterity [38].

Notwithstanding the acknowledged obstacles for venture transition, the extant literature on the process of transference to an existing business is relatively scarce [39]. Research on integration mechanisms is still needed, and as [36] underlined, is required more research about how "transition should be done."

Championship perspective: many different scholars enunciate the relevance of having the support of a champion not only in the innovation team but also at senior management level [40,41]. Several studies also have studied the role of senior management in fostering integration and enhance synergies between exploration and exploitation units [12,35]. Moreover, the likelihood of transition success is also raised if a champion appears in the receiving unit [12, 13] or if it has the support of an informal network [31]. Clear and transparent communication is critical to recognize the right supporters within the corporate parent [29]. [11] also stresses the relevance of exchanges within corporations not only at a management level but also between business units and other stakeholders of the firm.

Regarding CV, the disruptive innovation cell's managers are needed to smooth the integration of the project into the business unit by demonstrating the feasibility of the innovation, making concepts and benefits tangible and finding latent needs from customers.

2.1.1. Corporate ventures transition phases

The work from [12] distinguishes three stages in the transition from a separated venture to a one that is integrated into the established corporate structure: the pre-transition, the transition, and the post-transition phase. The pre-transition phase is described as a stage to develop connecting and learning activities between the CV and the parent business. During the transition phase, the hand-over moment takes place, and the venture is transferred to the corporate organization, while the post-transition phase is defined as the stage when the venture is incorporated in the established organization.

2.1.2. Specific activities in transition phases in corporate ventures

A summary of the existing literature on activities to perform in the commercialization process and activities to be performed within each phase of transition is displayed in Table 1.

2.2. Spinoff (CSO)

There are two approaches to the spinoff. The first approach is a planned spin-off. The planned spin-off is predetermined and is based on the plan of a parent organization. The parent organization often states that a new venture would stem from the commercialization activities of their project. The second approach is a spontaneously occurring spinoff. It happens when a new business venture is created unexpectedly. Generally, this spin-off does not get total support from the parent organization [42]. Commercializing innovation through a spinoff has been studied through different approaches. They are described in the following paragraphs.

Strategic perspective: From the strategic viewpoint, the scholars state that commercializing an innovation requires different strategies, orientations, and decisions. According to [43], there are three strategies: early adoption, adoption network configuration, and mainstream adoption. These authors explained that early adoption strategy is the method when a commercializing team adopts to create awareness, stimulate and motivate people to have a positive attitude towards the new product. Similarly, the authors stated that the adoption of a network configuration is the ability of the team to enable early buyers to be strong supporters of the product. Likewise, the authors mentioned that the mainstream strategy is the decision and effort of the team to transfer a configured network to the primary market. Still, from the strategic perspective, commercializing an innovation also requires different decisions to be made. [44] found that world-leading companies, well-known for their innovation commercialization, made critical decisions by placing commercialization as one of their highest priorities, establishing measurable objectives for proper management, and developing sufficient and essential competencies.

Table 1. Corporate venture activities in commercialization phases

Transition Phase	Category	Specific Activities	Scholars
Pre-Transition	Innovation project preparation for scale-up	Transition readiness assessment	O'Connor, Hendricks and Rice (2002), Rice, Leifer and O'Connor (2002) and van Burg et al. (2012).
		Transition team	Rice, Leifer and O'Connor (2002) and van Burg et al. (2012).
		Transition plan	Kanter et al. (1991) Rice, Leifer and O'Connor (2002).
	Conditions for validation	Achievement of first sales and running of pilot projects	Nieto (2018).
	Early-relations with the potential receiving business units	Training and personal exchange	van Burg et al. (2012).
		Cross-functional interfaces	Jansen et al. (2009).
		Liaison channeling and network building	Gassman et al. (2012).
		Horizontal interactions between teams	Raisch and Tushman (2016).
Transition	Transition time	Transference after achieving first sales	van Burg et al. (2012).
		Laying the groundwork for a significant market	Rice, Leifer and O'Connor (2002).
	Knowledge management	Transfer of the R&D team to the receiving business unit	Nieto (2018).
Post-transition	Specification of suitable KPI's in the business unit	Post transition autonomy. Performance metrics	van Burg et al. (2012).

Marketing perspective: The scholars, from the marketing viewpoint, seem to focus on the marketization of the disruptive innovation through innovation, according to [2]. The high technologies make use of disruptive innovations. Thus, marketing scholars state that innovation would be successful if the final consumers can accept them. Examples of prominent scholars in this group are [45,46]. To reinforce the credibility of this viewpoint, [47] argued that innovation would be successfully commercialized if it could be market oriented. This scholar stated that commercialization must start with the market and end with it. In a similar view, [48] added that the commercialization should focus on the substitute products/services as well as on the functionality of commercializing products concerning its price. However, marketization is cumbersome, tedious and full of risks. According to [49], six challenges are awaiting the commercializers of disruptive innovation. The scholar stated that they market-concerned uncertainty, technological uncertainty, the inconsistency of new products in a complex multi-component system, difficulty in developing networks, the problem of ecosystem complexities and competition, and inherent risks of choice-making (especially with multiple and interdependent product-market options).

Skills perspective: From the skills perspective, the scholars emphasize how the commercialization should be accomplished. Examples of scholars in this perspective are [50,51]. [51] emphasized that innovation can reach the market successfully if the commercialization team can: (1) acquire and possess sufficient technological knowledge, (2) develop the innovation into a product which can be mass-produced, (3) establish commercialization process and relate it to growth strategy, (4) adhere to their process as a learning path, and coordinate and maintain a good network. Furthermore, [52] stressed that, though focused on the strategy, marketing skills are crucial for their successful commercialization. To assist practitioners, these scholars proposed market and user research tools, which include customer ethnography, emphatic designs, lead-user processes, investigating users, and the targeting of new markets.

Considering all these perspectives, the question of "what one has to do in commercializing disruptive innovation successfully in terms of activities" is fragmented depending on the perspective approach.

2.2.1. Spinoff commercialization phases

When commercializing disruptive innovations through a spinoff, three phases are recognized, as acknowledged by [53]-[56]. These phases are pre-commercialization, commercialization and post-commercialization. The pre-commercialization is the stage where any activity aiming at transforming new technology into products and services is done. The commercialization phase contains all the transformation efforts. The post-commercialization includes any attempt to make new products or services sustain market share at a profit for its commercializing team and companies.

2.2.2. Specific activities in commercialization phases in spinoffs

Based on the above grouping, the previous works describe the activities to perform in each phase and they are summarized in the following Table 2.

2.3. Relationship between CV's and CSO's in the commercialization stage.

The work from [57] discussed the role and relevance of internal corporate venturing and spinoffs as means to corporate renewal and to improve competitive positioning.

Meanwhile, similarities and differences between different corporate entrepreneurship structures have been researched by scholars, for instance between Startups and CV's, as enunciated by

Table 2. Spin-off activities in commercialization phases

Commercialization Phase	Specific Activities	Scholars
Pre-commercialization	Basic and applied science /discovery technology/ initiation /	Maine and Garnsey (2007), AbdRahima et al. (2015), Amadi-Echendu and John, (2008), and Pietzsch et al. (2009).
	Formulation/identification of technological opportunity/ Application idea initial technical and economic viability	Maine and Garnsey (2007), AbdRahima et al. (2015), Amadi-Echendu and John (2008).
	Reviewing the technology / Application	Eldred and McGrath (1997) and Amadi-Echendu and John (2008).
On-commercialization	Having a development team and organizing a senior review team / formalizing commercialization project	Eldred and McGrath (1997) and Rogers et al. (2004).
	Formalizing commercialization project	Rogers et al. (2004).
	Scanning and creation of potential alliances/identification of specific need of target market/ conducting of preliminary material investigation /	Maine and Garnsey (2007) and Chen and Panda (2005).
	Designing, building and testing of prototypes/designing and prototyping/design and development / Developing prototypes and integrating the prototype into existing products/incubation	Rogers et al. (2004), Maine and Garnsey (2007), Pietzsch et al. (2009) and Chen and Panda (2005).
	Development of technological product/service	AbdRahima et al. (2015) and Amadi-Echendu and John (2008).
	Customer testing and experimentation	Maine and Garnsey (2007).
	Verification of relating policies/ evaluation of make/buy decision/development of the pilot plant,	Rogers et al. (2004) and Maine and Garnsey (2007).
	Deciding on channels of distribution	Rogers et al. (2004).
	Final validation / final customer testing	Pietzsch et al. (2009) and Maine and Garnsey (2007).
	Developing a structured commercialization method / developing structured processes	Eldred and McGrath (1997) and Chen and Panda (2005).
Post-commercialization	Product launching and post-launching assessment/market, and acceleration	Pietzsch et al. (2009), Amadi-Echendu and John (2008).

[58], USO's (university spinoffs) and CV's, as stressed by [59], USO's and CSO's, as outlined by [60,61], or between IV's (independent ventures) and CV's [62]. Similarly, under the perspective of the leaders of the innovation units, commonalities and divergencies between corporate entrepreneurs and spinoff entrepreneurs have been discussed by [63].

The previous works show that the commercialization process of the corporate venture consists of pre-, transition, and post-transition. The phases are similar to the spinoff, which include pre-commercialization, commercialization and post-commercialization. The previous literature also states the different activities to be done at each phase. However, there is missing knowledge of the commercialization process of disruptive innovation via the corporate venture and spinoff. Thus, this article seeks to provide to the following research questions:

- What are the key activities that facilitate managing the transition and commercialization of disruptive innovations in corporate ventures and spinoffs?
- What are the differences and similarities in the process of commercialization between a corporate venture and a spinoff?
- Do corporate ventures face the same problems that spin-offs are confronted with?

3. Research design

3.1. Methodology approach

In order to answer the research questions, a multiple case study approach has been selected. Case study research involves the examination of a phenomenon in its natural environment. The case study method is specifically appropriate to research new field areas, with a focus on "how" or "why" questions, related to a contemporary set of events. The study of multiple cases is usually considered as a more robust method, as it provides the observation and analysis of a situation in different settings. The multi-case method enables an understanding of the phenomenon beyond each project context and increases generalizability [64]. There were two sets of empirical data in this research. The first set was gathered for corporate ventures and the second for spinoffs.

3.1.1. Corporate venture case selection and data collection

Potential disruptive innovation projects were evaluated according to criteria provided by the definitions of [65], who uses disruptive to describe innovations that could occur in a macro-level as well as micro-level contributions.

Based on the above criteria and according to [66], who state that theoretical sampling is a means to reach a high gain of insight, twelve corporate venture transition processes were selected. Nine of those samples found an internal existing business unit of the corporate parent to be integrated in. One of them found an external firm, and two projects employed a dual destination model to an internal business unit as well as to an external company. Eight of the samples have been successful in the transition process, and the other four were failure cases. The cases are presented in Table 3.

The companies have been named (Telco Co, FMCG Co, Appliances Co, Financial Co, Engineering Co). We also define the

name of the chosen projects as Tel1, Tel2, Tel3, Tel4, Tel5, Tel6, Fast1, App1, App2, Fin1, Eng 1, and Eng2. The real names of companies and projects are not displayed due to the confidentiality research agreements.

For the sample, data were collected through interviews with innovation unit managers and corporate innovation managers to achieve different perspectives on the success of the project, conflicts, key issues and evolution of the project transition, reaching a variety of insights. The research carried out 26 double interviews. Each interview took 1 to 1,30 hrs. Long. The interviews were performed in two rounds. The first round, to understand the overall context of the project and company and the second round to obtain a deeper understanding of each project's details. During the conduction of the interviews, nevertheless, the interview guideline was regularly updated and enriched to be adapted to the insights obtained after the previously analyzed project. The documentation was complemented with secondary data about each project obtained from the corporate company.

3.1.2. Spinoff case selection and data collection

According to the criteria mentioned above, twenty spin-off companies were selected. They were chosen according to the type of disruptive innovations. Also, these companies were founded by serial entrepreneurs and business advisors. The details of the projects are also presented in Table 4. The spin-off projects were denoted by COY 1 to COY 20, respectively. The cases are presented in Table 4. Data were obtained through interviews. The study participants were contacted via email and telephone calls. After booking a date and venue, they were sent interview questions with themes. After a few weeks, the interviews were conducted. Each interview took more than 1 hour. All interview processes were following the qualitative research guideline provided by [67]-[71].

3.2. Data analysis

Qualitative analysis needs a different approach than the quantitative analysis because of the nature of the collected data, mostly textual and descriptive. The research is focused on the process of transition and commercialization, and more specifically, on the tasks developed to overcome the challenges found during the process. The information obtained from interviews was transcripted and later analyzed by using open coding [72] to recognize patterns in transition activities and critical problems influencing the transference and commercialization of the innovation projects. The following step was the axial coding, identifying relationships between categories, organizing them hierarchically with interconnections and sub-categories. The last step was selective coding to produce a theory and recognize core categories. NVivo11 software was used for helping in the analysis and codification of qualitative data obtained at interviews. It is a software that supports data management, in the process of exploration and coding that is not linear, but iterative.

Similar patterns responding to the formulated research questions were codified, defining the main tasks to perform in order to overcome commercialization problems and barriers in corporate ventures and spinoffs. The theory that emerged from the interviews was compared with the existing literature leading to specific conclusions displayed in the following sections. Discovered similarities increase the validity of the findings and link old and new theory. Emerging differences show opportunities for new concepts and avenues for future research.

Table 3. Summary of corporate venture cases and interviewed profiles

Parent Company	Industry	Corporate Venture	Interviewed Profiles
TELCO CO	Telecommunications	Corporate organization	Product innovation director Design Research Lead
		Tel1 project	Head of product/project Head of Innovation Portfolio Innovation Business Development Manager
		Tel 2 project	Corporate Venture Leader Head of Innovation Portfolio
		Tel 3 project	Senior Technical Expert Head of Innovation Portfolio
		Tel 4 project	Service innovation Lead Head of Innovation Portfolio
		Tel 5 project	Head of commercial innovation Head of Innovation Portfolio Innovation Business Development Manager
		Tel 6 project	Corporate Venture Leader Head of Innovation Portfolio
FMCG CO	Laundry & Home Care	Fast 1 project	Innovation Manager - IoT Corporate Venture Leader
APPLIANCES CO	Home appliances	App 1 project	Innovation Transference Director Corporate Venture Leader
		App 2 project	Innovation Transference Director Corporate Venture Leader
FINANCIAL CO	Financial	Fin 1 project	Service Design Lead Product Innovation Director
ENGINEERING CO	Engineering	Eng 1 project Eng 2 project	Division Manager Division Manager

Table 4. Summary of spinoff cases and interviewed profiles

Companies	Industry	Interviewed profiles
Coy 1	Electronics	CEO Chief Engineer
Coy 2	Environment Tech	CEO Chief Engineer
Coy 3	Healthcare Equipment	CEO Head of Venture Capital IPR Manager
Coy 4	Research Equipment	CEO Business developer Head of Venture Capital
Coy 5	Research Equipment	CEO
Coy 6	Electronics	CEO Chief Engineer
Coy 7	Research Instrument	CEO Business developer
Coy 8	Information Technology	Head of Venture Capital IPR Manager
Coy 9	Research Instrument	Principal lecturer
Coy 10	Optics	Head of Venture Capital
Coy 11	Biotechnology	Head of Venture Capital
Coy 12	Biotechnology	Head of Venture Capital
Coy 13	Electronics	Head of Venture Capital IPR Manager
Coy 14	Chemical Production	CEO
Coy 15	Information Technology	Head of Venture Capital IPR Manager
Coy 16	Electronics	Head of Venture Capital IPR Manager
Coy 17	Research Instrument	Head of Venture Capital IPR Manager
Coy 18	Information Technology	CEO Head of Venture Capital IPR Manager
Coy 19	Information Technology	Head of Venture Capital IPR Manager
Coy 20	Paper Production	Head of Venture Capital IPR Manager

4. Empirical results

The first result of the empirical study is related to the key activities performed within the different phases of commercialization. These results are explained separately for Corporate Ventures and Spin-offs in the following subsections:

4.1. Corporate ventures

Analyzing the readiness of the innovation projects, in all cases from the empirical setting, apart from having a clear value proposition for customers and stakeholders, it was also necessary the achievement of first sales to obtain the interest of potential existing corporate units. This fact was enhanced when the innovation team had conducted real pilot programs.

The critical problem to overcome, as discovered across all cases, is the misfit between the R&D project and the established corporate unit. The structure of the business unit was not prepared for the disruptive project that they received. The misfit has been discussed previously by scholars such as [13]. Also, exploitation units could lack crucial knowledge and resources to develop the innovation project. Collaboration from the business members and identifying an owner in the business unit who support and promote the project becomes one of the main challenges in full commercialization.

Another critical barrier for the survival of the transferred venture was the sales expectations the receiving business unit had on the innovation project and the lack of specific and flexible performance metrics to control the development of the venture, as previously discussed by [12].

The interviews and the data collected from the sample, allow us to identify different team activities which are crucial within the different phases of the transference of the projects to the exploitation business units, as well as the critical organizational factors influencing commercialization, providing generalization to the previous work of [73]. They are described as follows.

4.1.1. Pre-transition phase

a) Achievement of first sales and running of pilot projects.

Identifying leading customers willing to pay for the innovation is crucial in the maturity of the project. Another relevant key factor is obtaining real user traction, enhancing the interest of the corporate units, as enunciated by [73].

Moreover, the likelihood of conducting real pilot programs, and if possible, promoted by the customer enables the possibility of testing the hypotheses related to the projects linked to the particularities of the target market.

b) Early-relation with the potential receiving business unit.

Generating a relationship with the potential business unit and exchanging information concerning the R&D project seems to be crucial. The interaction between teams enables a better alignment with the corporate road map and enhances the involvement of the receiving team, as enunciated by [12,29,36,39].

It becomes relevant to recognize potential marketers in the first stages of the R&D process. These interactions could occur at managerial levels but also between the components of the teams.

This kind of relationship allows us to explain the value and potential of the innovation to gain the receiving team's trust. Communication should be transparent, transmitting the full knowledge obtained during the development phase, regarding the product, information about users and markets, including how the product has evolved and why.

Fostering communication between teams and the potential stakeholders for the innovation commercialization allows us to recognize possible future frictions, obtaining essential information to foresee how to overcome these barriers.

Finally, these cross-communications allow us to get more significant credibility for the innovation and future projects. It serves to identify key figures to obtain support from the base of the business unit, and from the management level, reaching a smoother integration.

c) Search for champions and project support network.

It has been observed in all the projects in the sample that senior management has played a supporting role, facilitating contacts and establishing bridges to look for potential marketers for the innovations. Identifying and involving a champion at the management level in the receiving team has been crucial to the success of the project. The role of informal networks has also been fundamental.

This championship perspective has been approached from the senior management perspective by [36,41]. [12,13] also pointed out the relevance of identifying an owner champion in the receiving business unit.

4.1.2. Transition phase

a) Definition of the transition time.

The different innovation unit managers underlined several tasks to get done to define the moment of transition:

- Once the R&D project has reached the first sales with a customer, it is convenient to build customer loyalty and obtain new sales with similar clients to confirm the potential of the innovation through establishing a broader and more stable customer base.
- Another crucial indicator is to have a refined and tested business and operating model ready to scale, a reliable team, and a sales road map.
- Apart from having the product ready, it is also necessary to get ready a technology platform and the complementary services to run the innovation.

These activities have not been discussed in previous literature.

b) Transfer of the R&D team to the receiving business unit

In the projects of the sample in which part of the innovation team was transferred to transmit all the knowledge acquired during the research and development phases, a positive effect was observed in the transition. This specific activity has not been discussed previously by scholars.

4.1.3. Post-transition phase

a) Performance metrics.

Business units that incorporate innovations from corporate ventures must also exploit more incremental or mature projects. For this reason, specific KPI´s must be established to apply to both the business unit teams and the disruptive innovation projects they will exploit. This concept has been previously enunciated by [12].

4.1.4. Other auxiliary tasks to carry out

Besides the similar activities identified in the projects, other patterns also appeared, described here as follows:

- Several unit managers highlighted the importance of identifying and incorporating different profiles from the business units to compose the needed team in the scaling up of the innovation. The search for these profiles aims not only to obtain the primary resources for growth but also to transform these future team members into potential champions of the innovation.
- Locating middle management champions at intermediate levels between the innovation team and the potential business unit was positive, acting as interfaces and transmitters of the benefits of the innovation.
- Another of the strategies recommended by different units and corporate innovation managers was to promote cross-movements of teams, incorporating temporary members from the innovation team into business units, enabling these profiles to approach the project from a business perspective, to detect possible future frictions.

These insights are new to literature.

4.2. Spinoff

It was noted during the interviews that technology entrepreneurs and business advisors acknowledged that certain activities have to be done before the actual commercialization and after it, defining pre-, on- and post-commercialization phases. Each phase has key activities; some of them previously not outlined in the scholarly works. The following section explains each of these critical activities according to the phases of commercialization.

4.2.1. Pre-Commercialization Phase

a) Identification of innovation application.

The study participants were able to identify an industrial process or sector where the innovation could be applied. They noted that the application should aim to solve a technical problem or social specific problem because its identification always enables commercializers to identify target markets for their innovations. This critical activity is also discussed by scholars such as [74]-[76].

b) Professional protection of Intellectual Property.

It is learned that IP protection happened after high-tech identified a business potential. The participants highlighted the importance of IP protection. They did not focus on ordinary protection, but rather professional protection. [54] emphasized the need for it.

c) Establishing of the technology - business team.

Previous works like [77,78] have stated that team formation plays an essential role in technology-based companies. The study participants plainly stated that a team should consist of someone who has a profound knowledge of the technology to be commercialized and someone who knows how to sell.

d) Defining a clear target market.

Scholars such as [45]-[47] have discussed this activity and concluded that marketization is a crucial pillar in commercialization. In the same perspective, the study participants shared that they succeeded in the commercialization because they were able to find a clear target market from the beginning of the commercialization challenge.

e) Gathering sufficient market information.

The study participants tried to gather sufficient market information. Participants stated that conducting market research ab initio is an essential step for commercialization success. They advised that commercializers should try to employ online and offline means to get market-related information on their target market. They added that the use of interpersonal networks to collect target market information played a significant role. This finding is in line with the recommendations of [48,53,57].

f) Staying with the parent company.

Participants shared that they preferred to stay with their research institutions while developing their technologies (during their early businesses). Interviewees said that it provides an opportunity to bring existing networks and resources into play during pre-commercialization. [53] acknowledged this activity in their previous study.

g) Identification of different business models.

Scholars like [79]-[81] explained that business model development is essential. This empirical study found it to be one of the tools that helped to make a business successful. Interviewees pointed out that every commercializer should know and develop several business models in which the best options can be selected in the future.

4.2.2. On - Commercialization Phase

a) Product simplification.

Participants stressed that product simplification is a key factor in the on-commercialization phase, suggesting that a new product should be able to work with existing systems or use existing infrastructure. This activity has a relationship with the recommendations of [43,48,49,77,78].

b) Subcontracting / outsourcing.

It was observed that the study participants preferred to work on their core technology and software aspects of the product while hardware and other parts were outsourced. They said that such a strategy enabled them to reach the market at the right time and to scale-up their production at a later stage of their company growth. This activity was also echoed by [43,53].

c) Having direct contact with end-users.

The participants understood that the real information for validating and improving the product solution came from end-users. Therefore, this key activity is often done during commercialization, as it is stated by [43,53,56,77,78].

d) Testing and defining flexible business models.

It is learned that the participants focused on testing while developing new business models.

e) International awareness.

The participants tried to attend international business events when developing their business models in order to improve awareness and develop networks. This activity has not yet been discussed by the previous scholars on the commercialization of innovations.

f) Reference sales.

The entrepreneur participants affirmed that one of their tasks during the commercialization stage is to make initial sales. They explained that this kind of sales is a pathway to sustainability. They shared that having references helps them to provide feedback for further development as well as create credibility for other clients and fundraising. This activity was discussed by [73] in the context of corporate ventures.

g) Starting early internationalization.

Study participants emphasized early internationalization during commercialization in order to develop a potential sales network.

4.2.3. Post-Commercialization Phase

a) Getting feedback from initial buyers

The study participants stressed that getting feedback is crucial for successful commercialization as a manner to satisfy customers as well as to offer more services, which in turn led to more revenue for the company. This activity is also outlined by [51,56].

b) Managing the supply chain

As it can be noted from the pre- and on-commercialization stages, the study participants advised commercializers to subcontract or outsource the manufacturing process. This activity is related to the work of [55], where the commercialization process from the supply chain point of view is explained.

5. Discussion and conclusions

The case studies inform us about the different activities that corporate ventures and spin-offs carry out in order to confront the main challenges they encounter at pre-commercialization, on-commercialization and post-commercialization stages. The comparative analysis between the specific activities undertaken during the phases of commercialization allows us to define the main similarities and differences among the two structures upon scaling up the innovation project.

5.1. Pre-transition/commercialization phase.

Based on the analysis of collected data, the *commitment of organizational leaders and stakeholders* to commercialize the innovation appeared to be one of the most critical factors in both corporate ventures and spinoff cases. According to [6,77] for an innovation to be commercialized successfully, the organizational leaders and stakeholders must be committed to the process. The cases of this paper revealed that upper management support motivated the commitment of teams and project managers in commercialization teams. In the case of corporate ventures, early relations with the potential receiving business unit were crucial to search owners for the innovation project, as well as to get the involvement and support from all the layers in the commercialization unit. This network building could be obtained through bidirectional personnel exchange, education and training, cross-functional interfaces or horizontal interactions between teams. Endorsing the work of [8], the empirical results suggest that these activities contribute to balance the misfit (commitment, resources and objectives) among the R&D project and the existing

business unit, a key factor influencing the successful commercialization process.

Team formation at the moment of scaling up the innovation plays an essential role in technology-based companies, corroborating the work of [77]. The specific competencies and skills required for successful commercialization encourage corporate ventures and spin-offs to define and to form the right team to face this challenge with the appropriate resources of personnel. It was noted that a commercialization team consists of people from R&D and business people, or even teams with dual technical and business development competencies. Furthermore, the project managers of these cases have the attributes of an intrapreneur, which is a closely related arrangement to the champion approach in corporate ventures. These managers can integrate technological knowledge, business expertise and user perspective. The same feature is evident among the serial entrepreneurs of the spin-off companies.

Team skills and work methodologies seem to be similar in both cases. The disruptive innovation team integrates cross profiles beyond technological qualifications. Customer research, communication and sales skills are the most valued competencies.

Collaboration or industrial networks also appeared to be another relevant factor for the transition of disruptive innovations from the parent organization to a spin-in unit or spin-off company. The cases of this paper showed that the availability of partners in and out company is a must to facilitate commercialization. It was learned that such collaboration motivated the spin-in unit to be active and it encouraged spinoff entrepreneurs to exert more effort.

Innovation project readiness. Besides these similarities, some divergences emerged from the cases studied. The innovation project seems to be more developed in the case of corporate ventures than in the case of spinoffs. Whereas in corporate ventures, the focus is on validating, demonstrating and creating credibility on the potential receiving business unit, spinoff tries to ascertain the real value or business potential of the innovation project by way of clarifying the target market. Spinoffs do so by gathering enough market information or developing several business models in which the best options can be selected in the future. Based on the collected data, in the corporate venture cases, the realization of first sales is a necessary, yet insufficient, condition for transference. It is required also to conduct pilot programs to demonstrate real traction and to maximize learning from real market situations.

This difference could be motivated by a more goal-minded orientation on the part of the project leader and team components of the corporate venture, even if they work separately from the exploitatory units of the parent company.

IP property. The analysis of the cases also reveals that corporate ventures are more financially supported and intellectual property protected thanks to their synergies with the corporate parent, while spin-offs must make an extra effort in IP protection and in search of funding and external partners.

5.2. Transition/Commercialization phase

Knowledge transference. In corporate venture cases, it is common that no one from the innovation team continues on the receiving business unit that will exploit the innovation project. Is for this reason that the study outlines the critical importance of making the right transmission of the complete knowledge acquired and of balancing out the shortcomings in terms of responsibilities within the receiving team, as well as their different motivations and goals, which confirms the previous work from [73], focused on telco industry. The information collected during the project development stage should always be transmitted to the exploitation team for a better understanding of the real needs of the users, the customer's feedbacks, the stakeholder's key information and the integration of all this knowledge into the innovation commercialization. The transference of members of the R&D team helps to manage this knowledge.

Innovation project readiness. It can be noticed that some of the activities that spinoffs perform at the commercialization phase, such as product simplification, prototyping and testing with end-users or testing business models, are a "must" type of tasks that corporate ventures have to accomplish just before the transition time. For example, the innovation should have renewed the trust not only from users but also from clients, as well as have jumped to parallel market niches. The innovation project should also have a tested and refined business and operating model, a "go to market" strategy and the associated services developed to implement the innovation.

Resources. The limited resources that spin-offs have in comparison with corporate ventures make the former focus on their core business activities using subcontracting, while the latter devote their primary efforts to finding the right resources of personnel to exploit the disruptive innovation project.

Awareness and networks. Some of the activities that spin-offs perform at this phase are oriented to maximize awareness and to grow the sales network by the participation in business events, early internalization, creation of potential alliances and the definition and search for the right distribution channels. The synergies with the parent company in the case of corporate ventures help significantly when it comes to facing these challenges.

5.3. Post-transition/commercialization phase

It is during this phase when the approach from the two structures seems to be completely different, according to the analysis of the data collected from corporate ventures and spin-offs.

The following Table 5 summarizes the comparison between activities carried out by corporate ventures and spin-offs and the main challenges to overcome during the different phases of commercialization.

The insights gained from the spinoff cases reveal that even at this phase of post-commercialization, the process of refinement of the product is crucial, requiring the feedback from initial buyers.

Even if continuous refinement is also present in the mindset of corporate ventures, the activities performed by spinoffs during this phase are usually carried out by corporate ventures at the pre-transition phase so that they can offer an optimized product to the receiving business unit.

Table 5. Comparison between corporate venture and spin-off activities and challenges during the different phases of commercialization.

	SPINOFF		CORPORATE VENTURE		
PHASE	CHALLENGES TO OVERCOME	ACTIVITIES	ACTIVITIES	CHALLENGES TO OVERCOME	PHASE
PRE-COMMERCIALIZATION	GETTING COMMITMENT FROM STAKEHOLDERS	Identification of technological opportunity Application. Technical and economic viability	Early relations with potential business units Personal exchange and training Cross-functional interfaces	COMMITMENT FROM BU. SEARCH FOR CHAMPIONS	PRE-TRANSITION
	ASCERTAINING INNOVATION VALUE AND BUSINESS POTENTIAL	Targetting markets Formulate different business models Gathering enough market information	Achieving first sales and running pilot programs	VALIDATION AND DEMONSTRATE REAL TRACTION	
			Reduce all remaining uncertainties	INNOVATION PROJECT READINESS	
	TEAM LACK OF RESOURCES AND SKILLS	Formation of the commercialization team	Definition and formation of the right team	TEAM LACK OF RESOURCES AND SKILLS	
	PROTECTION OF INNOVATION	IP protection			
ON-COMMERCIALIZATION	CONDITIONS FOR COMMERCIALIZATION	Reference sales Product simplification. Ready or existing Technology platform Testing business models Prototype and testing with end-users. Final validation	Renew sales and open new niches Clear operating model and technology platform technology platform. Complementary services Ready business model	CONDITIONS FOR TRANSITION TIMING	TRANSITION
	LACK OF RESOURCES	Subcontracting	Search for the right personal resources	RESOURCES LEVERAGING	
	AWARENESS AND SALES NETWORK	Participation in business events Internationalization Creation of potential alliances Searching for distribution channels	Synergies with corporate parent	AWARENESS AND SALES NETWORK	
			Team transference for knowledge transferences	KNOWLEDGE MANAGEMENT	
POST-COMMERCIALIZ.	PROMOTING SPINOFF	Product launching and post launching. Market assessment			POST-TRANSITION
	REFINING INNOVATION PROJECT	Getting back from initial buyers			
	OPTIMIZATION VALUE CHAIN	Managing supply chain			
			Defining specific performance metrics	BALANCE EXPLORATION & EXPLOITATION PROJECTS	
			Searching for partial autonomy	KEEPING CV MINDSET	

The size and lack of resources that spinoffs have, push these kinds of organizations to focus part of their specific activities on this phase, in order to define and develop the supply chain, the commercialization, and the launching process that will help to scale up the innovation.

The study shows that in the cases of innovation projects from corporate ventures transferred to a business unit, they focus on keeping some autonomy of criteria and mindset (coming from the R&D team) in order to optimize the scaling up of the innovation in the corporate parent. Also, participants asked to define specific performance metrics that could be applied to the commercialization team in order to be able to balance explorative and exploitative projects.

6. Contributions and limitations

The main contribution of this article is that it provides the key commercialization activities for the corporate venture and spinoff. It outlines that team formation, network development, and early relations with potential comercializers and stakeholders are the important commercialization activities that the disruptive innovations require regardless the commercialization approach. Additionally, the article outlines that there are divergences between the corporate venture and the spinoff approach. These divergences include innovation readiness, knowledge management or the approach to the post-transition phase.

Another contribution of the article is the comparison of both corporate ventures and spinoff. Even though there are many literary works on both approaches, there is no scholarly work yet that compares them. This comparison shows that both approaches have various phases and each of the phases has several activities. It also provides an in-depth understanding of both approaches on the commercialization of disruptive innovation, stressing the common challenges corporate venture and spinoff face, as follows: ascertaining and validating the business potential of the innovation, getting the commitment from the corporate parent and stakeholders, overcoming the lack of resources and obtaining awareness and credibility from market and stakeholders.

Additionally, the article contributes to the practice by enhancing understanding of the commercialization process of disruptive innovation via the corporate ventures and spinoffs approaches. It outlines some key barriers that the practitioner might face during the process, as the misfit between the R&D project and the established corporate unit, the lack of specific and flexible performance metrics to control the evolution of the project or how to define the right conditions for the commercialization of the innovation

However, the article has some limitations, defining at the same time fields for future research. Firstly, the case study method applied in the article inherited the problem of generalization, as it is usually the case. This makes the findings of this article to be limited with regards to generalization. Although the findings are generic, which means they can be generalized, yet it is recommended that the findings' generalization is determined by the nature of the concerned technology, its industry and its target market.

Furthermore, this empirical research of the article does not incorporate the perspective of the managers of the business units that receive the innovation. Obtaining the vision from these profiles will enrich the data gathered regarding the research questions.

Further, the collected data were gathered from different countries. The corporate venture data were collected in Spain, Germany, and the UK, whereas spinoff data were collected in Finland. These countries have similarities and differences, and the latter might affect the findings of the article. Therefore, future studies could examine corporate venture and spin-off activities in the same country and the same industry.

Lastly, the findings of the article need to be confirmed through further research, something that creates room for future studies. For instance, it would be good to have a quantitative study where the identified activities are tested or a study of how the key activities impact the commercialization of technology-based companies' high-tech.

Conflict of Interest

The authors declare no conflict of interest.

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Capítulo 4

Determinación del momento de transferencia del proyecto de innovación en las corporate ventures. Actividades e indicadores de madurez

4.1 Introducción y objetivos

Cada fase del ciclo de innovación requiere diferentes metodologías, recursos, competencias y colaboradores. Los equipos de I+D y/o innovación normalmente no disponen de todas las habilidades y competencias necesarias para la comercialización a gran escala de una innovación. Este tipo de competencias son las que se buscan en las unidades de negocio una vez se toma la decisión de escalar el proyecto de innovación. A su vez, el equipo de la unidad de negocio también puede presentar falta de competencias técnicas o de conocimientos para la explotación óptima de la innovación (Ford, 2010).

Determinar la madurez del proyecto y llevar a cabo la integración de este en la unidad de negocio es un proceso de alta complejidad, debido a las diferentes motivaciones, cultura y procesos de ambos tipos de organizaciones.

Un escalado prematuro de los proyectos de innovación puede provocar problemas en el crecimiento y reducir el rendimiento del negocio o su fracaso, debido a las incertidumbres no resueltas de mercado, de carácter tecnológico, de recursos u organizacionales. Por el contrario, cuando la corporación integra la innovación demasiado tarde, puede perder su ventana de oportunidad.

Las compañías deben disponer de indicadores para poder diagnosticar cuáles son los trabajos pendientes de realizar para llevar el proyecto de innovación a un estado de madurez suficiente para su integración en la unidad de negocio y su transición a operaciones (O'Connor et al., 2002).

Por ello, definir el momento correcto y las actividades necesarias para determinar la madurez del proyecto y proceder a la integración en la unidad de negocio es extremadamente relevante para el éxito de la transferencia y el escalado (Ford et al., 2010, Leifer et al., 2001).

En el marco concreto de las corporate ventures, autores como O'Connor y de Martino (2006) y van Burg et al. (2012) afirman que el momento de la transición a unidades de negocio no está lo suficientemente estudiado y es necesaria más investigación para diseñar y definir el proceso de escalado y transición (van Burg et al., 2012, Gassman et al., 2012) así como los mecanismos de integración de proyectos de innovación disruptiva a las unidades de negocio corporativas (Raisch y Tuschman 2016).

Según Andriopoulus y Lewis (2009), los estudios previos han identificado ciertas actividades e indicadores para evaluar la madurez de los proyectos de innovación, pero el conocimiento está fragmentado. Por ejemplo, el estudio de O'Connor et al. (2002) aborda de manera parcial mecanismos de validación y evaluación de la madurez de las ventures. Adicionalmente, O'Connor y de Martino (2006) afirman que la bibliografía existente tampoco describe cómo determinar el momento más adecuado para el escalado e integración del proyecto

A partir de estas premisas, el contenido de este capítulo se articula desde la siguiente pregunta de investigación:

¿Cuáles son los factores y actividades clave para determinar la madurez de una venture y determinar el momento de transferencia y escalado?

El objetivo asociado es establecer criterios para evaluar si el proyecto de innovación presenta una madurez suficiente para su transferencia y cuál es el momento más adecuado para la transición a la unidad de negocio.

4.2 Marco teórico

4.2.1 Transferencia e integración de proyectos de innovación disruptiva en unidades de negocio

Las organizaciones que siguen una estrategia ambidiestra de innovación, creando unidades autónomas para afrontar los proyectos más disruptivos, requieren integrar la innovación desarrollada por la célula independiente en una unidad de negocio de la corporación, al final del proceso de aceleración, cuando el proyecto está lo suficientemente maduro y preparado para generar beneficios.

Es crucial que el proyecto innovador pueda asignarse a una unidad de negocio que esté alineada a nivel de recursos, objetivos, conocimientos y equipo para la explotación de la innovación, ya que una integración forzada por falta de alineamiento puede ser contraproducente tanto para la corporate venture como para la unidad de negocio y la compañía, resultando en múltiples ocasiones en un fracaso del proyecto innovador (McGrath, 2001; Rice et al., 2002).

Adicionalmente, cuando la innovación proviene de células de innovación independientes, se observan ciertas barreras desde la corporación. En primer lugar, existe un miedo respecto a la canibalización que los nuevos productos o servicios pueden suponer de cara a los del portafolio actual. Se observa también un escepticismo sobre proyectos que vienen desde fuera para desplazar a los ya existentes, por lo que se produce una lucha constante por los recursos que se destinan a cada proyecto (McGrath, 2001).

La investigación de Mattes y Ohr (2019) profundiza en las áreas de fricción a tener en consideración en los procesos de transferencia e integración. La principal es la diferencia entre el carácter de explotación de las unidades de negocio, basado en la excelencia y la optimización, y el carácter exploratorio de las corporate ventures, basado en el aprendizaje. Estos autores describen las áreas que muestran mayores divergencias entre ambas tipologías de organización, que se enumeran a continuación: modelos de negocio, estilos de gobernanza, perfiles, cultura y gestión de equipos o sistemas de incentivos.

En los proyectos de innovación disruptiva se identifica habitualmente una brecha entre los equipos de las corporate ventures y las unidades de negocio en relación a como cada uno de ellos valora la madurez del proyecto (O'Connor et al., 2002). Para el equipo de innovación, cuando se decide transferir un proyecto, este ya está lo suficientemente desarrollado, mientras que las unidades corporativas receptoras opinan que requiere más tiempo y recursos para disponer de una innovación escalable y rentable. Consecuentemente, muchos de los proyectos de innovación disruptiva siguen madurando en la unidad de negocio, consumiendo recursos, y habitualmente se pierde la ventana de oportunidad y la

motivación por parte del equipo de negocio y la dirección para seguir empujando el proyecto (O'Connor et al., 2002). Por esta razón identificar y resolver las incertidumbres remanentes de la innovación es crucial para determinar el momento de transferencia y escalado de la innovación.

4.2.2 Categorías de incertidumbre en innovaciones disruptivas

En los procesos de desarrollo de innovaciones disruptivas existen altos niveles de incertidumbre asociados. Durante la fase de aceleración es habitual detectar incertidumbres no resueltas en el proyecto de innovación. La literatura existente, caracteriza la incertidumbre en cuatro categorías (Lynn y Akgün, 1998; Rice et al., 2002).

Incertidumbre tecnológica

Las incertidumbres técnicas se vinculan a la base de conocimientos científicos y técnicos subyacentes a la innovación, incluyendo la viabilidad técnica y de fabricación y la fiabilidad de la solución.

Incertidumbre de mercado

Las incertidumbres asociadas al mercado comprenden hasta qué punto se entienden las necesidades del cliente, cómo se genera un valor superior para el usuario en comparación con la competencia (Rice et al., 2002) y cuáles son las barreras de adopción para los consumidores y para el resto de agentes de la cadena de distribución.

Incertidumbre organizacional

Esta categoría aborda los conflictos organizacionales y de gestión que aparecen al introducir la innovación disruptiva en la cultura de las compañías y al transferir el proyecto innovador a las unidades de negocio. Los retos más relevantes suelen estar causados por la falta de apoyo de la alta dirección (Burgelman y Sayles, 1986) o por el desajuste entre la organización corporativa y el equipo del proyecto de innovación (Dougherty, 1990).

Incertidumbre de recursos

Esta categoría describe todas las dificultades para adquirir interna y externamente los recursos necesarios para la innovación disruptiva (Chandy y Tellis, 2000; O'Connor et al., 2002) sean de ámbito financiero o de conocimiento y competencias vinculados a los equipos de trabajo.

A partir de la revisión bibliográfica, se muestra a continuación una tabla de las actividades citadas por otros autores para la evaluación de la madurez de los proyectos de innovación antes de proceder a su transferencia, categorizadas en función de la tipología de incertidumbre a resolver.

ACTIVITIES TO PERFORM BEFORE SCALING UP. PRIOR LITERATURE SUMMARY		
Category	**Activities**	**Authors**
Readiness assesment & transition preparation	Transition readiness assesment	Kanter et al. 1991, Rice et al., 2002, O'Connor et al., 2002, van Burg et al., 2012
	Transition team	Rice et al., 2002, van Burg et al., 2012
	Transition plan	Rice et al., 2002, van Burg et al., 2012
Market uncertainties	Clear value proposition & Validated Business model	Osterwalder & Pigneur, 2010, Maurya, 2012, Leveland 2019
	Achievement of first sales	Nieto & Consolacion, 2019, van Burg et al., 2012
	Running of pilot projects	Nieto & Consolacion, 2019
	Traction	Maurya, 2012, Leveland, 2019, Conway & Hemphill, 2019
	Laying the groundwork for a big market	Rice et al. 2002
	Go-to-market strategy	Leveland, 2019
Organizational uncertainties	Platform for an scalable and repeteable sales and operations	O'Connor & de Martino, 2006, Leveland 2019
	Interorganizational relations	van Burg et al., 2002, Jansen et al., 2009, Gassman et al., 2012, Raisch and Tushman, 2016, Hill & Birkinshaw, 2008
	Clear & transparent communciation	O'Reilly & Tushman, 2004
	Training to business units	van Burg et al., 2002,
	Specification of balanced KPI's for the venture in the BU	van Burg et al., 2012
Resources uncertainties	Knowledge management	Nieto & Consolacion, 2019
	BU's competences and skills assessment	Raisch & Tushman, 2016
	R&D leader's lacking competences for scaling assesment	Ford, 2010

Tabla 6. Actividades a realizar y factores a considerar antes de la transferencia a unidades de negocio según bibliografía existente. Fuente: Key Activities for Successful Ventures Scaling Up, Javier Nieto Cubero, Carolina Consolacion Segura, Academy of Entrepreneurship Journal, 2020, 26 (4).

4.2.3 Herramientas y modelos de evaluación de madurez de la innovación

Desde el punto de vista de la incertidumbre de mercado, existen diferentes metodologías que proponen herramientas para determinar la madurez de la innovación para afrontar la transferencia y el escalado.

Osterwalder y Pigneur (2010) proponen un modelo, el Business Canvas Model, para refinar de manera iterativa el modelo de negocio, considerando como otros factores influyen en él según van evolucionando, como los canales utilizados, los segmentos de cliente, el modelo de ingresos, etc.

Maurya (2010) introduce el concepto de "tracción", que amplia y permite cuantificar el criterio de validación de mercado que propone Ries (2011) basado en el encaje de producto y mercado. La noción de "tracción" se define como la velocidad con la que el modelo de negocio captura un valor monetizable a través de sus usuarios. Identificar cuanto están dispuestos a pagar los consumidores por la innovación es un indicador clave cuando el proyecto necesita saltar el abismo entre visionarios y pragmáticos.

Ampliando el concepto de tracción, Conway y Hemphill (2019) proponen cómo facilitar el escalado basándose en la medición de la tracción y presentando qué recursos a nivel organizacional serán necesarios para optimizar la introducción a mercado.

Ampliando las visiones previas, centradas en la resolución de incertidumbres de mercado, Leveland (2019) propone un método de evaluación de la madurez de la innovación llamado Traction Gap Framework, basado en el concepto de Minimum Viable Repeatibility (MVR) que establece cuatro indicadores clave a demostrar: la viabilidad de fabricación y/o operaciones del producto/servicio, la tracción, un modelo de negocio validado y una estrategia de comercialización que sea escalable.

Desde una perspectiva más transversal, considerando las cuatro tipologías de incertidumbres, Rice et al. (2002) definen un conjunto de actividades para mejorar la eficiencia de la transición de innovaciones disruptivas a unidades de negocio, mediante una evaluación de la madurez del proyecto. Paralelamente, la investigación de O'Connor et al. (2002) propone una herramienta a modo de lista de verificación para evaluar la madurez de la innovación e identificar las incertidumbres no resueltas a partir de diez criterios clave. Esta herramienta ayuda a identificar cuánto trabajo queda por realizar para lograr la madurez de la innovación para proceder a su transferencia, pero el trabajo de O'Connor et al. (2002) no identifica las actividades clave e indicadores necesarios para obtener dicha madurez.

4.3 Metodología

4.3.1 Explicación y justificación del método

Para este artículo se empleó como método de investigación el estudio de caso múltiple, llevado a cabo durante 24 meses, de Abril de 2018 a Abril de 2020. La justificación del uso de este método de investigación sigue los mismos criterios expuestos en el capítulo 3.3.1., principalmente por la naturaleza exploratoria del fenómeno a estudiar. Particularmente, el estudio de caso múltiple permite a los investigadores tener conocimiento sobre las diferencias y similitudes de un fenómeno y facilita las comparaciones para que se pueda generar un conocimiento en profundidad, especialmente cuando los casos provienen de diferentes industrias y tecnologías (Pellikka, 2014).

4.3.2 Procedimiento

Para el desarrollo de la investigación se siguieron los siguientes pasos:

1. En primer lugar, se realizó un análisis de la literatura.
2. En segundo lugar, se formuló la pregunta de investigación.
3. En tercer lugar, se desarrollaron criterios de selección para la muestra de la investigación. Los criterios son los siguientes:

    a) Los participantes estaban desarrollando una innovación de carácter disruptivo, habiendo pasado o pasando en el momento de la investigación por la etapa de transición a unidades de negocio.
    b) Los participantes formaban parte de una corporate venture.
    c) Los participantes serían elegidos para obtener una muestra final de compañías de diferentes sectores.

4. En cuarto lugar, se configuró la muestra del estudio. Esta se realizó a partir de los participantes de la investigación del artículo Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison, y se enriqueció con 3 empresas más gracias a la adhesión del autor a la asociación Gen Innovación (lo que permitió reclutar los participantes extra que ampliaron la muestra representando dos sectores empresariales diferentes más).
5. En quinto lugar, se desarrollaron las preguntas de las entrevistas semiestructuradas. El guión de las entrevistas se basa en el artículo de Rice et al. (2002) y se muestra en los anexos del documento.
6. En sexto lugar, se realizaron las entrevistas, que se desarrollaron entre Abril de 2018 y Abril de 2020. Algunos de los participantes de la muestra no permitieron la grabación. En estos casos se procedió a transcribir la información clave de las entrevistas, que se realizaron presencialmente o mediante videoconferencia.
7. Por último, se analizó el material obtenido a partir de las entrevistas y la información secundaria aportada por los participantes de la muestra. Se presentaron los resultados, a partir de la comparación de los resultados de la investigación con la literatura existente conduciendo conclusiones específicas.

4.3.3 Muestra

La muestra está formada por 8 multinacionales con origen en España, Reino Unido y Alemania (en las que se investigaron 15 corporate ventures). Con todos los participantes se acordó tratar la información referente a la empresa, producto o proyecto de forma anónima.

En la siguiente tabla se muestra en detalle cada uno de los participantes de la muestra de las corporate ventures, los perfiles entrevistados y el resultado de la transferencia y el escalado en cada uno de los casos. La muestra se denominó de la siguiente manera: MEDIA CO (e-project), EDUCATION CO (Data Project), TELCO CO (Alpha project, Beta project, Gamma project, Delta project, Epsilon project, Omega project), FMCG CO (Digital project), FMCG CO2 (Code project), APPLIANCES CO (Material 1 project y Material 2 project), FINANCIAL CO (Kelvin project) y ENGINEERING CO (Medical project y Train security project).

Corporate organization	Corporate venture case	Industry	Interviewed profiles	Scaling up process
MEDIA CO	e-project	Media	Open Innovation Manager	In progress
EDUCATION CO	Data project	Editorial	Digital innovation manager	Failure
TELCO CO		Telecommunications	Product innovation director Design Research Lead	
	Alpha project		Head of product/project Head of Innovation Portfolio Innovation Business Development Manager	Success
	Beta project		Corporate Venture Leader Head of Innovation Portfolio	Success
	Gamma project		Senior Technical Expert Head of Innovation Portfolio	Success
	Delta project		Service innovation Lead Head of Innovation Portfolio	Failure
	Epsilon project		Head of commercial innovation Head of Innovation Portfolio Innovation Business Development Manager	Failure
	Omega project		Corporate Venture Leader Head of Innovation Portfolio	Success
FMCG CO	Digital project	Laundry & Home Care	Innovation Manager - IoT Corporate Venture Leader	Success
FMCG CO 2	Code project	Consumer goods	Digital innovation manager	Success
APPLIANCES CO	Materials project 1	Home appliances	Innovation Transference Director Corporate Venture Leader	Success
	Materials project 2		Innovation Transference Director Corporate Venture Leader	Failure
FINANCIAL CO	Kelvin project	Financial	Service Design Lead Product Innovation Director	Success
ENGINNERING CO	Medical project	Engineering	Division Manager	Success
	Train security project		Division Manager	Failure

Tabla 7. Muestra de corporate ventures: corporación matriz, sector industrial, perfiles entrevistados y resultado del proceso de escalado. Las entrevistas se llevaron a cabo en el periodo de Abril de 2018 hasta Abril de 2020. Fuente: Key Activities for Successful Ventures Scaling Up, Javier Nieto Cubero, Carolina Consolacion Segura, Academy of Entrepreneurship Journal, 2020, 26 (4).

4.3.4 Análisis

El proceso de análisis llevado a cabo sigue el mismo procedimiento que el del artículo previo, detallado en el capítulo anterior, basado en codificación abierta (Corbin y Strauss, 2008), obtención y categorización de patrones, comparación con bibliografía existente y redacción de conclusiones.

4.3.5 Validación

Para la validación de resultados, se utilizó la triangulación y revisión entre investigadores como estrategia de fiabilidad. Para el análisis y confección de resultados, se llevó a cabo la triangulación entre los autores del artículo. Por otro lado, se empleó la revisión por otros investigadores. En esta tarea participaron colegas de otras instituciones. Los comentarios obtenidos de las revisiones han permitido retroalimentar tanto el análisis de la información como la interpretación de los resultados.

4.3.6 Limitaciones

La investigación presenta diferentes limitaciones. En primer lugar, desde el punto de vista de la generalización de los resultados (posible dependencia de la naturaleza de cada sector o de las especificidades de cada país de origen). Adicionalmente, la investigación carece del punto de vista de perfiles provenientes de las unidades de negocio.

Por último, los resultados empíricos de la investigación requieren ser confirmados. Un estudio de carácter cuantitativo sería muy útil para corroborar la ocurrencia de cada uno de los factores identificados.

4.4 Resultados

4.4.1 Identificación del grado de madurez del proyecto de innovación y momento de transferencia

Las contribuciones del tercer artículo se presentan a continuación en relación a la bibliografía existente, enunciando las actividades e indicadores clave para llevar a cabo la transición en el momento óptimo, agrupadas según las categorías de incertidumbre a resolver (Lynn y Akgun, 1998; Rice et al., 2002).

Incertidumbres técnicas

A pesar de que diferentes autores como Rice et al. (2002), O'Connor et al. (2002) o Leveland (2019) ponen de manifiesto la importancia de haber resuelto todos los desafíos relativos a la viabilidad de fabricación, sólo 3 de los 15 proyectos de la muestra citaron este factor como crítico en la transición de la innovación a la unidad de negocio.

Incertidumbres de mercado

La presente investigación corrobora actividades e indicadores que aparecen de manera fragmentada en la literatura existente. Como enuncian los trabajos de Rice et al. (2002), O'Connor et al. (2002), Osterwalder y Pigneur (2010), Maurya (2012) o Leveland (2019), es necesario disponer de una proposición de valor validada con el mercado y un modelo de negocio testeado (que ha evolucionado en paralelo con las diferentes iteraciones

del producto con el mercado y los usuarios) y preparado para ser escalado. Adicionalmente, los resultados obtenidos a partir de la muestra de proyectos matizan que estas condiciones son necesarias, pero no suficientes.

Los participantes entrevistados mencionan mayoritariamente la necesidad de haber realizado no sólo primeras ventas, como indican también van Burg et al. (2012), sino también de realizar pilotos de implantación en condiciones reales de mercado. Estas actividades permiten optimizar el producto/servicio, evaluar y definir posibles variantes de éste, generar servicios complementarios necesarios para cada nicho de mercado, detectar barreras operativas y de adopción e identificar los intereses reales de los diferentes agentes del ecosistema de la innovación. El esfuerzo necesario para la realización de programas piloto y para la obtención de primeras ventas requiere actividades iniciales de difusión y educación tanto a los equipos de venta como a los nichos iniciales de adopción y genera una visibilidad del proyecto en el mercado.

Es muy relevante mencionar que aparte de los beneficios citados, estas actividades generan no solo indicadores cuantitativos sobre el posible potencial real de ventas del producto/servicio, mostrados por la tracción que presenta, sino también confianza en las unidades de negocio respecto al proyecto de innovación, al cuál se le puede asignar un retorno más plausible.

Los resultados de la investigación también enfatizan dos factores críticos para proceder a la transferencia y escalado del proyecto de innovación. El primero, ser capaces de renovar confianza con los usuarios iniciales y saltar a nuevos clientes o nichos adyacentes, estableciendo una base de trabajo para acceder a un mercado mucho más amplio (Rice et al., 2002), superando el concepto de "*chasm*" enunciado por Moore (2002), entre visionarios (early adopters) y pragmáticos (mainstream customers). Esta actividad facilitará la segunda, disponer de una estrategia comercial que ha evolucionado a partir de todos los aprendizajes obtenidos en las primeras fases de comercialización, que puede ser adaptable y que tiene identificados los recursos y canales para la obtención del cliente n+1. Esta última actividad corrobora los trabajos de O'Connor et al. (2002), Rice et al. (2002) y Leveland (2019).

Incertidumbres de carácter organizacional

La diferencia de culturas, motivaciones, perfiles y competencias, estructura o estilo de gobernanza entre los equipos de innovación y las unidades de negocio acentúa la importancia de las actividades de integración entre ambas organizaciones. La presente investigación identifica actividades clave a realizar para evitar fricciones en la transición y facilitar la adopción del proyecto de innovación en la unidad de negocio.

A pesar de que estudios previos como los de van Burg et al. (2012), Rice et al. (2002) o Kanter et al. (1991), indican la relevancia de establecer una planificación formal para llevar a cabo la integración de la innovación en la unidad de negocio o de la formación de un equipo de transición, ninguno de los participantes de la muestra mencionó la realización de esta actividad. Más explícitamente, algunos de los entrevistados indicaron que los proyectos se transfirieron de manera muy directa desde el equipo de innovación a la unidad de negocio.

Los entrevistados enfatizaron la importancia de poder definir el equipo necesario previamente a la transición para proceder con el escalado incorporando si fuera necesario perfiles de la estructura corporativa a las unidades de negocio no solo como expertos en las diferentes áreas funcionales requeridas, sino también como embajadores internos del proyecto de innovación.

Otra de las actividades claves recogidas en la investigación es establecer un modelo de operaciones escalable. Disponer de una plataforma tecnológica y/o logística, definir la cartera de servicios y el equipo necesario o establecer procedimientos son claves para poder sistematizar y replicar el servicio en diferentes tipologías de clientes y escalarlo, como también enuncia Leveland (2019).

Como se indicaba previamente, en muchas ocasiones el proyecto de innovación a transferir no está alineado con la hoja de ruta, las motivaciones o expectativas de la unidad de negocio. Estas últimas no suelen estar diseñadas para el producto o servicio que reciben. Por ello, es fundamental llevar a cabo un trabajo previo de interacción con los equipos receptores para facilitar el encaje identificando posibles barreras o diferencias, establecer puentes y reducir paulatinamente la brecha para una adopción más fluida de la innovación, corroborando el trabajo previo de Rice et al. (2002).

Llevar a cabo relaciones a nivel interno dentro de la corporación será clave para establecer una serie de condiciones previas a la transición. No solo en el momento anterior a la transferencia del proyecto sino desde estadios más iniciales. En primer lugar, para descubrir posibles sinergias con la unidad de negocio y dejar claro el valor añadido que le aporta el proyecto de innovación (como también citan Raisch y Tushman, 2016). Por otro lado, para obtener apoyos y soportes al proyecto, no solo de los lideres de la unidad de negocio, sino también de la estructura más horizontal. Estos conceptos ya han sido enunciados en los trabajos de van Burg et al. (2012), Hill y Birkinshaw (2008) y Gilbert (2006). Esto se obtendrá implicando a todo el equipo de innovación en estas actividades, que trabajaran la comunicación desde diferentes niveles, y de manera transparente. Jansen et al. (2009) y O'Reilly y Tushman (2004) citan estos retos en el contexto de la incertidumbre organizacional.

La última de las actividades clave previas a la transición es la de establecer junto a la unidad de negocio un sistema de gobernanza y de métricas de rendimiento adecuado a los primeros pasos de la innovación en el proceso de escalado. Es crítico poder definir un equilibrio entre los sistemas de la unidad de negocio y la flexibilidad que puede necesitar el proyecto, que todavía puede requerir ciertas dosis de exploración, corroborando los resultados del trabajo de van Burg et al. (2012).

Incertidumbres de recursos

En relación con los recursos necesarios para proceder a la transferencia y escalado del proyecto de innovación, los entrevistados en la presente investigación citan de manera puntual problemas de financiación por parte de la corporación madre. De manera mayoritaria se asocia este factor a la confianza generada a través de las diferentes actividades a realizar e indicadores conseguidos previamente a la integración.

Son dos las actividades clave a realizar mencionadas por los participantes de la muestra. La primera, la de detectar, por parte del líder y del equipo de innovación, la posible falta de competencias, habilidades o conocimientos de los miembros de la unidad de negocio para explotar la innovación. Si se identifican estas carencias, será extremadamente importante la definición del equipo necesario, la transferencia de algunos miembros del equipo de innovación o de I+D o el entrenamiento adecuado para la unidad de negocio. Este factor ha sido reconocido previamente por Ford (2010).

La otra actividad clave para garantizar la optimización de recursos es la transmisión completa de todo el conocimiento adquirido durante el desarrollo de la innovación, no solo a nivel técnico o de producto, sino también a nivel de opiniones de usuarios y actores clave del proyecto, o la información sobre clientes y potenciales nichos a los que atacar para acceder a un mercado más amplio. En este caso se requiere habitualmente, para balancear la falta de comunicación previa, la transmisión del líder del equipo de innovación u otros de sus miembros a la unidad corporativa. Éstos trasladarán conocimiento, serán embajadores del proyecto y proveerán el entrenamiento necesario para la explotación y el escalado del proyecto.

ACTIVIDADES Y INDICADORES CLAVE PREVIOS A LA TRANSFERENCIA		
Incertidumbres de mercado	**Incertidumbres de carácter organizacional**	**Incertidumbres de recursos**
Propuesta de valor validada	Definición del equipo necesario para el escalado	Falta de competencias
Modelo de negocio testeado	Modelo de operaciones escalable	Transmisión a la unidad de negocio de todo el conocimiento adquirido durante el proceso de desarrollo
Primeras ventas realizadas	Relaciones internas (búsqueda de apoyos)	
Realización de pilotos de implantación	Interacción con unidades de negocio para identificar sinergias, posibles barreras o diferencias a resolver.	
Renovación de ventas con clientes iniciales	Definición de sistema de gobernanza e incentivos para el escalado del proyecto	
Demostración de ventas a nichos adyacentes Disponer de estrategia comercial escalable		

Tabla 8. Actividades clave previos a la transferencia. Indicadores de madurez del proyecto de innovación categorizados en relación a las diferentes tipologías de incertidumbre. Elaboración propia

La tabla resumen, permite visualizar las actividades e indicadores fundamentales a llevar a cabo previamente a la transición y cuya realización y/o validación consecuentemente define el momento adecuado para que el proyecto de innovación pueda ser transferido a la unidad de negocio.

4.5 Artículo publicado en su formato original

KEY ACTIVITIES FOR SUCCESSFUL VENTURES' SCALING UP

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ABSTRACT

The generation of new business models and the renewal of competencies are crucial for mature companies' survival in the long term. Corporate venturing is a recognized mechanism to ensure balancing exploration and exploitation activities in established corporations. Due to fundamental differences in business organizations and culture, and in risk taking behaviors, the integration of these new ventures in existing business units is difficult. A key factor, as well as one of the less studied, is to determine the venture readiness for the scaling up and the right moment to be incorporated in the existing business. Premature venture scaling up could provoke growth failure and reduced post-transition performance because of a number of unresolved market and technology uncertainties. On the contrary, when the corporate organization integrates the venture too late, the established business might miss its window of advantage position.

Based on the results of an empirical study carried out in fifteen corporate venture innovation processes, we identified certain specific activities that will help determine the venture readiness and proper timing to scale up, and integrated the results of the empirical study with knowledge from extant literature, to develop a set of propositions for improving the success of the scaling up. These principles provide practical guidelines to improve corporate venture growth processes.

Keywords: Entrepreneurship, Corporate Venturing, Scale up, Acceleration, Validation Transition Timing.

INTRODUCTION

In a business environment characterized by high uncertainty and rapid technological changes, firms should search for ways to pursuit radical innovations, to acquire new capabilities and to explore new business opportunities to survive in the long term. However, integrating these new capabilities in a corporate organization designed to exploit existing products and technologies is difficult (Van Burg et al., 2012).

Organizational cultures specialized in exploitation and characterized by optimized established processes tend to be hostile towards innovative initiatives, which may be perceived as a threat to the established business of the corporate organization, because they challenge current technologies, cannibalize products, and compete for scarce corporate resources.

In order to manage uncertainties and associated risks, corporations should look for entrepreneurship models or mechanisms to balance exploration and exploitation activities that allow the development and implementation of new businesses.

One of these mechanisms is corporate venturing, which could be defined as the exploration and commercialization of new technologies or products structurally separated from the corporate

organization in a corporate venturing structure that avoids organizational rigidities (Thornberry, 2001). However, without an effectively designed process for aligning and integrating a corporate venture in the established business, the firm increases the risk of venture failure.

Each phase of the innovation life cycle requires different approaches, resources, partnerships and competences. Venture units usually lack resources and specific capabilities for the commercialization of innovations. Determining readiness and proceeding with the integration in a business unit is a crucial task to successfully pursue explorative and exploitative activities simultaneously.

Ideally, the venture should be transferred to the parent firm generating new business opportunities within the company. A forced integration into a business unit could be counterproductive in terms of the potential of the innovation and can also find organizational resistance in the receiving business unit (McGrath, 2001; Rice et al., 2002). If the venture appears not to fit the established business strategy, the venture can become a stand-alone spin-off and attract external funding, or be sold to another firm.

Notwithstanding the important insights of existing studies on corporate venturing, we know little about the 'process of successful venturing' (Miles & Covin, 2002).

As recognized by Van Burg et al. 2012, one crucial challenging aspect of the venture integration in the existing business process is to determine the timing of transition. Some studies have also recognized the importance of timing, but they did not examine the precise moment of venture transition (Ford et al., 2010; Leifer et al., 2001). Also, despite the difficulty of venture transition, the current literature is relatively poor about the key activities to perform to ensure the maturity of a venture before scaling up (O'Connor & de Martino, 2006).

This paper aims to get a better understanding of the critical activities that indicate the readiness of the venture, showing consequently the best timing for transition.

THEORETICAL BACKGROUND

There exists a substantial gap between R&D teams and receiving business units, (Rice et al., 2002). Despite the members of the venture or the business unit receiving the project thinking the innovation is mature enough for scale up and full commercialization, projects usually mature or fail at the business unit. The projects are generally underdeveloped based on a receiving unit's criteria. Resolving the remaining uncertainties becomes crucial to determine the moment to scale up.

It is crucial to proceed with an innovation readiness validation and assessment to diagnose what remaining work should to be done in order to get the project to a mature enough status so that it can be successfully moved into operations (O'Connor et al., 2002). In this section we will focus on different research approaches that have addressed which type of activities are necessary to determine if a venture is mature enough for its growth and scaling up.

DIAC Innovation Life cycle

From a competences-based approach, the works from O'Connor and de Martino, (2006); Story et al. (2009) identify four phases for high uncertainty innovations: discovery, incubation, acceleration and full commercialization, each of which requires distinctive types of competences, expertise and processes. The acceleration phase focuses on building a business to a level of some predictability in terms of sales and operations and trying to make the innovation ready for the

market. Acceleration competency ramps up the new business to a point where it can stand on its own before transferring to the corresponding receiving unit.

Different methodologies globally adopted by practitioners have proposed validation tools to determine the readiness of the innovation to face the growth, scale up or full commercialization stage.

Osterwalder, (2010) proposed a model to iteratively refine the business model taking into consideration how other elements such as the infrastructure, customers, resources, channels… evolve. It helps firms in aligning their business model by evidencing potential trade-offs.

Ash Maurya, (2010) introduces the concept of "traction", expanding the scope of the validation on the project, with respect to the Lean Startup model on the product-market fit (Ries, 2011). Traction could be defined as "*the speed at which the business model captures monetizable value through its users*". This is a key indicator when assessing whether consumers are willing to pay for our innovation and whether it is capable of jumping from the initial niches of visionary users to the more general market.

In their research, Conway and Hemphill, (2019), proposed an evaluation of the growth hacking approach, based on building through traction measurement. Their main contribution is to indicate what resources at the organizational level and what tools are necessary to optimize market introduction, once the product-market fit has been achieved.

Leveland, (2019) proposes a validation method, developed with the venture capital firm Wildcat Venture, Traction Gap Framework, based on the concept of "*Minimum Viable Repeatability*" (MVR), which establishes four main premises: demonstrate that the product or service is manufacturable, that it has a traction proven, a validated business model and a scalable and repeatable go-to-market strategy.

Even if these methodologies are widely recognized, they lack empirical demonstration.

Uncertainties Approach

High uncertainties are involved in the development of corporate venturing innovation projects. In the existing literature, four uncertainties are characterized (Lynn & Akgün, 1998; Rice et al., 2002).

Technical uncertainties apply to the underlying scientific knowledge base, including technical feasibility, manufacturing process, and maintainability. Market uncertainties comprise to what extent customer needs are understood and superior customer value is generated compared to competition (Rice et al., 2002). Organizational uncertainties address the organizational and managerial conflicts at fostering disruptive innovation while pursuing operational activities, mainly caused by a lack of support of senior management (Burgelman and Sayles, 1986) or by the misfit between the mainstream organization and the R&D project team (Dougherty, 1990). Finally, resource uncertainties involve all difficulties of internally and externally acquiring needed resources for disruptive innovation (Chandy & Tellis, 2000; O'Connor et al., 2002).

The research from Rice et al. (2002) based on the uncertainty framework, proposed a set of activities the author required to be tested for improving the effectiveness of transition management and for helping to determine the right moment for scaling up the venture (assessment of transition readiness, detailed transition plan, transition funding, transition team, generation of the groundwork for a big market, senior management championship).

Other studies also corroborate the importance of forming a pre-transition preparation (Kanter et al., 1991), establishing a transition team (Van Burg et al., 2012), who will perform a

transition readiness assessment (O'Connor et al., 2002) from both the ventures and the established corporation's perspective. The work from O'Connor et al. (2002) proposed a tool to assess the innovation readiness based on ten uncertainties. The instrument helps to realize how much work remains to be accomplished to achieve the innovation readiness for scaling up, but this approach does not give an account of the key activities to be performed to learn about the readiness of the venture.

Apart from the necessity of defining a transition plan, the study from Van Burg et al. (2012) stressed that the readiness and capability gap assessment aims at determining the differences between the venture and the established business with regard to technology, business model and culture. This assessment helps to identify critical business functions that require extra attention from the venture or the established business in order to close the gap and facilitate the scale up. Specifically, on the timing to scale up, these authors point out that three elements influence the moment to do it: the criteria for adoption by the established business, the criteria for venture transition by the venture and the pressure of the corporate venturing unit to exit the incubator. But the only specific activity this work cites to determine the moment for scaling up is to achieve first sales.

Under the perspective of uncertainty, the work from Nieto and Consolación, 2019, also identifies the achievement of first sales and running of pilot projects as crucial activities to be undertaken before scaling up. This work also approaches the concept of knowledge management in transition.

Technology and Innovation Readiness Levels

From the perspective of technology readiness, Clausing and Holmes (2010) provides an assessment tool to transform a technology stream into a reliable stream of profit. Additionally, the research of Mankins, (2009) also offers a retrospective about the Technology Readiness Levels (TRLs) along the period between 1980 and 2009. Nevertheless, these approaches only focus on technology uncertainty management.

Based on the Technology Readiness Level, the System Readiness Level and the Market Adoption concept (Moore, 2002); Lee et al. (2011) propose an approach for developing an Innovation Readiness Level framework. This work introduces activities to be performed during the different phases of the Innovation Life Cycle (IRL1: concept, IRL2: components, IRL3: completion, IRL4: chasm, IRL5: competition and IRL6: changeover/closedown) under five categories: Technology, Market, Organization, Partnership, and Risk Management.

During the chasm stage, defined as the challenges and difficulties that an innovation may encounter when first introduced to the market, the authors highlighted some crucial factors to be considered to determine if the innovation is ready to grow, such as the product/service availability in the whole market, the existence of after sales support, the importance of positioning in the market, cooperation with the ecosystem partners and carrying out interorganizational relations to manage the possible organizational conflicts.

Ambidexterity Approach Ventures Integration

Structural separation between disruptive exploration and exploitation is a necessary, yet insufficient, condition for ventures' success (Kaauppila, 2010).

Even if the venture innovation project fits with the global strategy of the parent company, the project is usually transferred into an existing business, therefore inducing strategic tensions

(Rice et al., 2002) caused by a misfit between the goals of the project and the sales team, and also related to capabilities, roadmap or resources from the receiving business unit. The greater the misfit, the greater the difficulty to scale up the project by the business unit. This "force fitting" could have fatal consequences in the success of the venture project.

Scholars have demonstrated the crucial role absorptive capacity plays in mitigating this kind of barriers to then enable the combination of existing capabilities with the corporate venture's competences (Van Burg et al., 2012) by first providing training and establishing personnel transfer between the venture and the business unit in the pre-transition phase, and also by "liaison channeling" (Gassman et al., 2012), further explained as interorganizational relations by Raisch and Tushman, 2016. These authors identify three key conditions to facilitate integration within the business unit: clarify their territories and added value (distinct skills) to be more attractive for resource sharing, identify complementarities and the support from corporate managers.

According to Ford, 2010, managing the scale up phase in the product division may also require the removal of some of the venture team leaders when they no longer have the competences required for operating the venture within the product division. Lacking capabilities in the business unit could also be an important barrier to proceed with the scale up (Raisch and Tushman, 2016).

Existing literature stresses the importance of having the figure of a champion not only in the venture team but also at senior management level (Rice et al., 2002; Van Burg et al., 2012; Gilbert, 2010). Besides this, the probability of venture success is also fostered if a champion is found in the receiving business unit (Rice et al., 2002; Van Burg et al., 2012), as well as if the project counts with the support of an informal network (Gassman et al., 2012).

This support should be mobilized by activities focused on network building, establishing social ties and networks between the members of the venture unit and the operational business. Other studies stress the effect cross functional interfaces and connectedness has at creating linkages between ventures and receiving business units (Hill & Birkinshaw, 2008). They also enunciate the importance of interaction between corporations not only between ventures managers and corporate executives, but also between business units and other stakeholders of the corporation.

Clear and transparent communication is critical to recognize the right supporters and their specific motivations within the corporate parent (Jansen et al., 2009; O'Reilly & Tushman, 2004) (Table 1).

Table 1
ACTIVITIES TO PERFORM BEFORE SCALINGUP.PRIOR LITERATURE SUMMARY

Category	Activities	Authors
Rcadiness assessment & Transition preparation	Transition readiness assessment Transition team Transition plan	Kanter et al. 1991, Rice et al, 2002. O'Connor et al., 2002, Van Burg et al, 2012 Rice et al, 2002, Van Burg et al., 2012 Rice et al., 2002, Van Burg et al. 2012
Market uncertainties	Clear value proposition & Validated Business model Achievement of first sales Running of pilot projects Traction Laying the ground work for a big market Go-to-Market strategy	Osterwalder & Pigneur, 2010, Maurya, 2012, Leveland 2019 Nieto & Consolation. 2019, Van Burg et al, 2012. Nieto & Consolation, 2019 Maurya. 20 12, Leveland. 2019, Conway and Hemphill. 2019

		Rice et al. 2002 Leveland. 2019
Organizational uncertainties	Platform for an scalable and repeatable sales and operations Inter organizational relations Clear & transparent communication Training to business units Specification of balanced KPI's for the venture in the BU	O'Connor & de Martino, 2006, Leveland 2019 Van Burg et al., 2002. Lee et al. 2011. Jansen et al. 2009, Gassman et al., 20 12. Raisch and Tushman, 2016, Hill & Birkinshaw, 2008 O' Reilly & Tushman. 2004. Van Burg et al., 2002, Van Burg et al., 2012
Resources uncertainties	Knowledge management BU's competences and skills assessment R&D leader's lacking competences for Scaling assessment.	Nieto & Consolation, 2019 Raisch and Tushman, 2016 Ford, 2010

In sum, the existing literature identifies certain activities to evaluate the readiness of the venture, but knowledge is fragmented under different approaches. Additionally, none of the studies presents a complete set of key activities to determine if the venture is ready to be transferred in the existing business and, consequently, what is the right moment for scaling up (O'Connor and DeMartino, 2006). Based on these premises, the research question that will lead our study is:

"Which are the key activities determining venture readiness for the right moment to scale up?"

RESEARCH DESIGN

Methodology Approach

To answer the research question a multiple case study approach has been chosen. Case study research involves the examination of a phenomenon in its natural setting. The case study method is especially appropriate for research in new topic areas, with a focus on "how" or "why" questions concerning a contemporary set of events. Multiple cases are generally regarded as more robust, providing the observation and analysis of a phenomenon in several settings. The cross case or multi-case method enables an understanding of the phenomena beyond each individual project context and increases generalizability (Yin, 1994).

Field Study Sample Selection

The research reported in this paper is part of a 24 months prospective study of management practices employed in eight ambidextrous firms (from telco, media, education, financial, home appliances, engineering and FMCG fields,) in the scaling up of "new to the company" innovations (Daneels, 2004). The selected projects fulfill these characteristics:

1. Developed in companies from different sectors.
2. Developed through a corporate venture (formally established, with personnel assigned to the project and with a budget) to be transferred later into a business unit (in-company, new one or out-company),
3. The cases have been approached through semi-structured interviews. The guideline for the interviews is based on the work from Rice et al., 2002 and O'Connor et al., 2002.

The definition of success for the innovations is the scaling up of the project, implemented and commercialized in a business unit.

The empirical data in this research has been gathered in fifteen corporate venture transition processes. Twelve of the projects were transferred into an internal business unit of the company, one of them found an external company and two projects had a dual destination to both an internal business unit and to an external company. Nine of the cases were successful projects in the transference process. Five other resulted in failure cases, and the last is still in the growth phase. All cases will be displayed in Table 2. The cases were selected according to theoretical sampling as a means to achieve a high gain of insight (Eisenhardt, 1989).

Table 2
STUDY PAR TICIPANTS

Corporate-Organization	Corporate venture case	Industry	Interviewed Profiles	Scaling up Process
MEDIA CO	e-Project	Media	Open Innovation Manager	In progress
EDUCATION CO	Data Project	Editorial	Digital Innovation manager	Failure
TELCOCO		Telecommunications	Product Innovation director Design Research Lead	
	Alpha project		Head of product/project Head of innovation Portfolio Innovation Business Development Management	Success
	Beta project		Corporate Venture Leader Head of Innovation Portfolio	Success
	Gamma Project		Senior Technical Expert Head of Innovation Portfolio	Success
	Delta project		Service Innovation Lead Head of Innovation Portfolio	Failure
	Epsilon project		Head of Commercial Innovation Head of Innovation Portfolio Innovation Business Development Management	Failure
	Omega Project		Corporate Venture Leader Head of Innovation Portfolio	Success
FMCG CO	Digital project	Laundry & Home Care	Innovation Manager- IoT Corporate Venture Leader	Success
FMCG C0 2	Code Project	Consumer goods	Digital Innovation Manager	Success
APPLIANCES CO	Material Project 1	Home appliances	Innovation Transference Director	Success
			Corporate Venture Leader	
	Material Project 2		Innovation Transference Director	Failure
			Corporate Venture Leader	
FINANCIAL CO	Kelvin project	Financial	Service Design Lead	Success
			Product Innovation Director	
ENGINEERING CO	Medical project Train security project	Engineering	Division Manager Division Manager	Success Failure

Data Collection

Data was collected by interviews with venture managers and corporate R&D managers in order to get different angles on the success, frictions, key themes and progress of the project scale up, obtaining a variety of insights. The research has performed 27 double interviews of 1 to 1,30h. The interviews were conducted in two rounds. The first round with the aim of understanding the general context and the second round in order to get a deeper understanding of each project details. Nevertheless, the interview guideline was constantly enriched along the conduction of the interviews to adapt to the insights obtained after each selected case. The documentation was complemented by official corporate secondary data about each project.

Data Analysis

Qualitative analysis requires a different approach in comparison with the quantitative analysis because the data is mainly textual and descriptive. The question is the key activities for innovation readiness and the timing of scaling up. The interviews transcripts were analyzed by using open coding (Strauss & Corbin, 1994) and common statements in answer to the research questions were codified identifying the activities and timing for scaling up. The analysis from the cases in combination with the current knowledge has allowed us to integrate the findings of the empirical study with insights from extant literature resulting in a set of propositions.

EMPIRICAL FINDINGS

Based on the results of an empirical study carried out in fifteen corporate venture innovation processes, we present a set of key activities that were identified across the different cases to resolve if the venture is ready to be integrated into a business unit and scaled up. These activities are useful indicators to determine the right moment for transition. The following section describes each of the recognized activities, sorted by the different categories of uncertainty, and illustrates them with examples from the case studies.

Venture Readiness Assessment

Existence of a transition plan

None of the interviewed cases specifically mentioned the existence of a formal and organized transition plan for the projects prior to moving from the exploration phase to the exploitation one.

Existence of a transition team

As recognized by the respondent from *e-project*, when a project is scaled, it is not common to be provided with a team specialized in scaling, but rather the innovation moves directly to the exploitation team unit.

On the other hand, the role of the innovation members in defining the future team (or part of it) that will participate in the scale up could be beneficial to success. The team will be composed not only of functional positions for the new needs of the project but rather the selected profiles should also be its ambassadors within and outside the corporation. In the *Digitalproject*

as well as in the *Betaproject*, the persons interviewed acknowledged the positive effect it had to prepare the innovation to scale by means of defining the suitable team. In the specific case of the *Digitalproject*, the process they followed was to incorporate certain profiles (marketing, supply chain…) from the business unit so they could offer the needed support for the venture project to grow. The selection of these profiles is a crucial challenge because they will also be "champions" of the venture.

Market Uncertainties

All the case studies had carried out qualitative tests with positive results regarding the value proposition of the innovation project. The responses in the different cases also reflected the evolution of the business model in parallel with the learning and iteration of the project. It was demonstrated that a key condition was to be able to replicate and scale the business model in the different potential markets of the innovation. Both factors become necessary but not sufficient conditions for the scale up. Other key activities have been observed across the studied cases:

First sales and traction demonstration

Finding leading customers willing to pay for the product is crucial in the maturity of the project as well as a real user traction demonstration that arouses the interest of the business units. It is very important not to transfer until you have more sales and a broader and more stable customer base, in order to build greater confidence from the business team in relation to the new product.

Deltaproject (Service Innovation Lead): We had a market study in various countries regarding price level and other issues. There was market validation concerning the value proposition, but we did not have clients. It was only research, but positive. There were good indicators but there were no paying customers.

Alphaproject (Innovation Business Manager): The project leader establishes four checks linked to the realization of first sales and customer acquisition: First check: the customer buys. Second check: the client renew. Third check: Find a customer(s) similar to the first. Fourth check: Go to an adjacent niche to replicate it.

Realization of pilots

The possibility of conducting pilots enables the testing of all the hypotheses linked to the project, according to the specificities of the target market. The pilot is an essential tool that can be used to learn, improve the product, implement it in real circumstances and gain credibility within the business unit that will market the innovation.

Digitalproject (Innovation manager): The latest phase in our R&D process is the "LabLaunch": testing the product in a real market in a specific region (on the selected channels) under a limited production, but forcing the scale of the project. This activity allows [us] to gain more knowledge about the product, the market and the users, establishing suitable performance indicators to the kind of product/service that is being launched, focused on the behaviour of the users towards the innovation.

Codeproject (Digital Innovation Manager): As well as in prior projects, this one showed us the importance of implementing a pilot in one of the divisions of the corporation to demonstrate the value of the innovation and the capacity for being implemented technically.

Scalable and repeatable go-to-market plan

The experience acquired in facing a first market niche and obtaining the first clients, also in adjacent markets, should help to establish an easily repeatable and scalable go-to-market plan with regard to the transference of innovation from an exploration phase to an exploitation one.

Alphaproject (Innovation Business Manager): Scale the market strategy is crucial. Client n + 1 should be instantaneous.

Organizational Uncertainties

Operations capacity

Another factor acknowledged as central is to have a clear operating model that identifies the required team, the functioning base technology platform as well as the associated services required to make the implementation of the innovation. These factors can help to operate in the target business unit.

Alphaproject (Innovation Business Manager): *Regardless of the destination of the innovation, it should be prepared to keep working and provide its services, with guaranteed operations.*

Gammaproject (Senior Technical expert): *We must build a model, a platform, a base of operations, a procedure to be able to replicate in different clients and systematize the process.*

Alignment

Even if the project shares the strategic orientation of the company, it could be non-aligned with the receiving business unit. Usually, as the cases showed, the business unit is not designed for the innovative project that it receives. When this happens, frictions are generated, and the organization gets stressed. The business unit usually has other priorities, roadmaps, motivations or different resources to those which are required. Also, the innovation project can be perceived as a threat to the established businesses of the corporate organization. These factors hinder the process of transferring innovation and its exploitation.

Deltaproject (Service Innovation Lead): Despite having a clear channel and a manufacturer willing to invest in the product, there was no business unit interested in the project. They saw the project not mature enough (due to lack of sales and potential customers) and they all had other priorities.

Omegaproject (Corporate Venture Leader): We are a global corporation. We face a "big problem" because we have different territorial divisions, local business units with specific roadmaps and managing their own assets. We should take into consideration their identity and clarify benefits for each of their businesses.

Interorganizational relations

Approaching and interacting with the business unit becomes extremely relevant. This interaction enables the coordination of the alignment and embeddedness of the teams.

From the early stages in the innovation process it is important to be in contact with potential marketers, so that the innovation takes root in the team. These contacts should not only be with the director of the unit, but also among the team base. It is important that the entire team

feels convinced that the new product provides values and new capabilities which are not possible to be implemented during their daily life at work. The contact with the potential stakeholders also enables the identification of possible future frictions. When articulating the projects, the possible problems or gaps to be covered should have already been detected and solutions sought beforehand.

The interaction with stakeholders encourages the generation of greater credibility for the project and for successive innovations and also the garnering of champions from both the base of the receiving unit (acting as a social network supporting the innovation) and from its management, influencing decisions and facilitating integration or other platforms within the corporation.

e-Project (Open Innovation Manager): It is necessary to demonstrate how innovation can help the corporation, through quick wins. Little demonstrations of how you can help to further develop each BU instead of being seen as a potential cannibalizer. By generating this kind of credibility, it is then easier to sell the project.

Codeproject (Digital Innovation Manager): When communicating the project you should put yourself in the shoes of each stakeholder and empathically understand what it can mean in their division or BU to explain it from the perspective that matters to them (e.g. it is not only savings, but also the consequences to workers in a factory). It is about knowing how each possible business unit or profile from the company could perceive the so-called "benefits" from our innovation.

Performance management systems

Different cases showed that when the innovation projects were transferred to the business unit, they adopted immediately the performance measurement systems of the corporate organization, such as profitability and optimization. Consequently, the exploration activities of the corporate venture stopped. This could be counterproductive for the innovation project if it needs more iterations to obtain a final market fit or pivot for refining the business model. The performance measurement system to be adopted in the scaling up should be agreed between the corporate venture, the business unit and the corporate organization.

e-Project (Open Innovation Manager): The project is already scaling, and the metrics that are being imposed are from a great company. Efficiency, profitability… We have not yet found the total market fit. It can lead to failure. Finding metrics during the first steps of scaling is crucial.

Betaproject (Corporate venture leader): Their team will share time in other (exploitation) projects, so it is also a key factor to define specific KPI's to apply these new venture members that should balance exploration and exploitation activities.

Resource Uncertainties

Competences, knowledge and skills in the business unit

An important barrier to the proper growth of an innovation in the business unit is related to the competences, skills and knowledge necessary for its exploitation, especially in projects using emerging or disruptive technologies. If the business unit team does not have them, it will entail a perception of extra risk on the project to be integrated.

e-Project (Open Innovation Manager): In this case, something that helped was the fact that the company estimated that the business unit had the capabilities and the type of users, channels or platforms similar to those required by the innovation project. Therefore lowering the risk perception.

Gammaproject (Senior technical expert): The business unit did have the required competences and skills for the project what helped a lot in the transition. When the recipient business unit does not need new skills to operate the project, the transfer is greatly easier.

Epsilonproject (Head of commercial innovation): The receiving business unit was not aware of the skills its team needed. They were not a product team and they had no idea of all the steps that the deployment required. They did not have the expertise needed.

Knowledge Transfer

In the projects where members from R&D team with the whole knowledge of the project have been transferred, the effects on the transfer process have been positive. It is a key activity for the push of the project, for the leadership, for the knowledge transferred and for the technical training necessary to complete the maturity of the project.

Gammaproject (Senior technical expert): The transfer of the team makes it much easier to take everything to a better port, through all the knowledge acquired during the process, even when it comes to commercial contacts.

DISCUSSION AND CONCLUSIONS

Based on the results of the research carried out we identified certain specific activities that will help determine the venture readiness and proper timing to scale up, and we have integrated the results of that empirical study with knowledge from extant literature, to develop a set of propositions for improving the success of the scaling up.

Despite different authors (Kanter et al., 1991; O'Connor et al., 2002; van Burg et al., 2012) mentioning the importance of drawing up a transition plan prior to the scaling up, none of the interviewees from the success cases indicated developing it.

However, in several of the success cases, defining a team responsible for the scaling up is pointed out as a significant activity to undertake in order to achieve an optimal growth during the scale up phase, corroborating the work of Van Burg et al. 2012. In the only case where the scale up is still ongoing, the interviewee stated his concern for having a "pure" exploitation team and requested a team with previous experience in scaling up, as a key factor in the evolution of the venture newly integrated in the business unit.

P1: To define and to build a team with scaling experience is acknowledged as extremely relevant in order to facilitate the transition of the project.

The work of Van Burg et al. (2012) considers the first sales as a milestone in order to proceed with the scale up. The cases we studied echoed this argument as necessary, yet insufficient. On the contrary, not having any sales is presented as a barrier for attracting the attention and interest of possible business units, as it was the case with failure cases such as the *Deltaproject*.

Different profiles within the success cases emphasized the need to attest the traction of the project in separate market niches, underlining the importance of counting with clients who would

pay for the innovation beyond the early adopters (whose acquisition and usage criteria of the project may be different), a factor also highlighted by authors such as Maurya, (2010); or (Leveland, 2019). This element further demonstrates the necessity to build a steady base of clients in order to muster the attention and interest of business units with regards to the project and the scaling up process itself, as stressed by Rice et al. (2002).

As set out by Nieto and Consolación, (2019); several of the cases studied confirm the positive effect that carrying out pilots prior to the scale up process have, permitting to test hypothesis related to the innovation in real markets. It also contributes to identifying possible barriers previously gone unnoticed and enables the exploration of collaboration opportunities with the different actors in the ecosystem where the product/service will be implemented.

P2: A product-market fit and a validated business model are necessary but no sufficient conditions for scaling up. Obtaining first sales, demonstrating traction from a broader customer base and conducting pilots are beneficial activities to facilitate the scaling up.

A number of success cases signal as crucial the ability of the project to manage its operations, corroborating studies by O'Connor and de Martino, 2006, or Leveland 2019. Simply put, the solid foundations of the new business are being laid so that it can operate almost by itself at a later stage.

P3: In order to kick-start the scale up process it is beneficial to have a clear operating model, with the corresponding associated platforms and services, which enables the scalability and replicability of the market strategy.

It is quite likely that a mismatch between the culture, the interests and motivations or the management systems of the corporate business unit and the innovation project emerges. Therefore it is vital to generate, before the scaling up, different kinds of communication dynamics between the corporation and the innovation team, to search for synergies and possible gaps among the teams a constant process of looking for the "ideal" business unit, and to demonstrate through quick wins the value the innovation has for each of the involved stakeholders. This is further sustained by a number of authors, such as Van Burg et al. (2012) Jansen et al. (2009); Gassman et al. (2012) or Raisch and Tushman, (2016). The gradual reconciliation among the explorative and exploitative organizations will help conform a better realignment of both elements and facilitate a smoother and easier transition, regardless of the context, into the business team.

According to the cases studied in this investigation, the interorganizational relations prior to the scale up are very beneficial in order to gather support from different champions, not only among senior management, but also in the different departments of the business unit and the other areas of the corporation, as indicated by previous works (Van Burg et al., 2012; Gilbert, 2010, Rice et al., 2002; Van Burg et al., 2012; Gassman et al., 2012; Jansen et al., 2009, or Hill and Birkinshaw, 2008). Being able to identify the key stakeholders to correctly implement the innovation, as well as gaining their support ahead of the scale up, are activities that this study reveals as particularly important towards its success.

P4: To establish inter organizational relations before scaling up is beneficial for a smooth integration into the business unit as well as for obtaining the required support within the corporate parent.

A key element in the reconciliation between the business unit, the corporation and the innovation project is to define the type of performance measurements that would be used to evaluate the venture during the initial scale up period. This will help adjusting the expectations among all the teams involved and also carrying out possible explorative activities that may still be needed during the scale up phase. The work of van Burg et al., 2012, considers this activity as crucial, although after the transition into the business unit has taken place, while the different cases within the present study signal that it should be done before the scale up.

P5. Performance metrics should be agreed between the venture, the corporate and the business unit prior to the scale up to facilitate that the innovation is implemented properly after the transition into the existing business team.

With regard to the activities aimed at reducing the uncertainty that is associated with the resources, it is of particular relevance that the business units have the necessary competences and resources to implement the innovation project. Otherwise, the perception of risks associated with the venture integration grows substantially. For this reason, it is very important to detect, in advance of the scale up, if there are any such deficiencies in the exploitation unit and design a strategy to remedy them (Ford, 2010; Raisch & Tushman, 2016).

The transfer of all the knowledge acquired during the initial stages of the innovation project is a key factor in order to guarantee the success of the scale up (technical-scientific know-how, market findings, relations with stakeholders, customer knowledge, specific areas of responsibility…). If a preliminary transference of all this information through targeted trainings is not possible before the scaling up, in many of the cases studied it was necessary to transfer part of the R&D team into the business unit in order to ensure the necessary transfer and distribution of knowledge and also the necessary competences so that the innovation could be implemented and grow.

P6: To perform an assessment on the existence in the business unit of the competences and resources required to implement the innovation would facilitate the scaling up. Training and a proper knowledge transference are key activities for it.

CONTRIBUTIONS AND LIMITATIOS

This study improves the understanding of the time when corporate ventures should initiate the process of scaling an innovation.

Defining the best time to scale is highly relevant because it reduces failure rate, growth time, and cost of implementation. Premature venture scaling up could provoke growth failure and reduced post-transition performance because of a number of unresolved market and technology uncertainties. On the contrary, when the corporate organization integrates the venture too late, the established business might miss its window of advantage position.

The assessment of the venture readiness and the kind of activities that should be done before scaling up could help improving the success and growth of the venture once it is integrated into the business unit.

Even if different studies recommend certain activities to be undertaken before the scaling up of an innovation, none of them propose a complete set of propositions approaching the issue such as it is done in this research.

The contribution of the research lies on the identification of a set of key specific activities that should be performed before the transition into a business unit of the corporate parent takes place, informing also about the best moment to scale up.

The study also corroborates propositions from prior disperse literature which required to be empirically tested and generates new insights about crucial activities to be undertaken before scaling up. The findings shed light on managerial propositions for successful ventures' scaling up and growth through an effective management of the innovation's pre-transition process.

There are some limitations to this paper, which define at the same time fields for future research. Firstly, the case study method applied in this study inherited the problem of generalization, as it is normally the case. This makes the findings of this article to be limited with regards to generalization. Although the findings are generic, which means they can be generalized, yet it is recommended that the findings' generalization is determined by the nature of the concerned technology, its industry and its target market.

Additionally, the current research lacks the perspective from the managers of the adopting business units. Interviews with those profiles could be conducted to get a wider variety of insights on the research questions.

Lastly, these empirical findings need to be confirmed through further research, something that creates room for future studies.

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Capítulo 5

Resultados globales, conclusiones y futuras líneas de investigación

Este capítulo se estructura en tres secciones: resultados globales, conclusiones y futuras líneas de investigación. Los resultados globales exponen las principales contribuciones de la tesis doctoral, respondiendo a las preguntas de investigación y a los objetivos establecidos.

Las conclusiones exponen principalmente el valor de la investigación, así como los principales hallazgos vinculados a los objetivos. Finalmente se introducen diversas líneas de investigación en forma de propuestas que han surgido en el desarrollo de esta tesis y que constituyen temas de interés para la comunidad académica y profesional.

5.1 Resultados globales

En esta sección se presentan las contribuciones de la tesis doctoral haciendo mención a los objetivos establecidos.

Objetivo 1. Desarrollar el concepto de comercialización en el ámbito de la innovación disruptiva

A través de la revisión sistemática de una muestra de 64 artículos de alto impacto, la investigación propone una definición de comercialización concreta para el contexto de la innovación disruptiva, identificando el rol que juega durante el proceso completo de innovación. Adicionalmente, la investigación identifica los factores que más influyen en el proceso de comercialización.

Objetivo 2. Establecer un modelo teórico de comercialización asociado a las diferentes fases de desarrollo de las innovaciones disruptivas.

Esta tesis doctoral propone un modelo de comercialización de innovaciones disruptivas, fruto de la comparación y análisis de la bibliografía existente. La propuesta presenta un marco de trabajo vinculado y categorizado según las fases de innovación del modelo Descubrimiento-Incubación-Aceleración (O'Connor y de Martino, 2006), enunciando las actividades y objetivos de comercialización asociadas al proceso global de innovación.

Objetivo 3. Establecer un modelo que describa las actividades clave de comercialización a llevar a cabo durante la fase de aceleración para mejorar la tasa de éxito en la implementación de innovaciones disruptivas.

Dentro del marco de las organizaciones ambidiestras y de la fase concreta de aceleración, y mediante el análisis de una muestra de corporate ventures y spinoffs, la investigación expone las actividades clave que estas organizaciones deben desarrollar en esta fase del proceso de innovación, categorizadas en etapas concretas, como son la 1) pre-comercialización / pre-transferencia, 2) comercialización / transferencia, y 3) post-comercialización / transferencia (según modelo de Frattini et al., 2012 y van Burg et al., 2012).

Adicionalmente, los resultados de la investigación permiten identificar los retos comunes y divergentes que experimentan las corporate ventures y las spinoffs durante la fase de aceleración y cómo afrontan cada uno de estos retos, comparando su enfoque y grado de madurez.

Objetivo 4. Establecer criterios para definir si el proyecto de innovación está suficientemente maduro para su transferencia a una unidad de negocio y cuál es el momento más adecuado para la transición.

La última parte de la investigación sigue profundizando en la fase de aceleración de las innovaciones disruptivas y en particular dentro del contexto de las corporate ventures. Frente al enfoque fragmentado de la bibliografía existente, esta tesis propone una Lista de Verificación de actividades e indicadores para definir si el proyecto de innovación muestra la madurez suficiente para proceder a su transferencia a la unidad de negocio que implementará su escalado y explotación comercial. Esta Lista de Verificación se presenta agrupando cada uno de sus resultados en las diferentes categorías de incertidumbre que presentan las innovaciones disruptivas (como muestra la Tabla 8 del documento).

Adicionalmente expone una serie de proposiciones que enuncian criterios para facilitar el proceso de transición de un proyecto de carácter disruptivo desde el equipo de innovación a la unidad de negocio y para la identificación del momento más adecuado para la realización de la transferencia.

5.2 Conclusiones

La primera parte de la investigación, reflejada en el artículo **Commercialization of disruptive innovations: Literature review and proposal for a process framework** ha permitido tener una mirada global sobre la bibliografía existente sobre innovaciones de alta incertidumbre, con un enfoque que identifica la relación entre la comercialización y el proceso global de innovación. La metodología desarrollada para la revisión sistemática de la literatura llevada a cabo habilitó un proceso de búsqueda y análisis de artículos de alto impacto, permitiendo la comparación de los hallazgos de la bibliografía existente, segmentada por la terminología utilizada por cada uno de los autores (innovación disruptiva, radical, discontinua, revolucionaria, productos realmente novedosos), como puede observarse en la Tabla 9 de los Anexos.

La investigación ha permitido constatar la evolución de los modelos de innovación disruptiva desde enfoques lineales (Veryzer, 1998 y Markham, 2002) y de carácter más rígido, basado en hitos y puertas (Cooper 1990) a aproximaciones no lineales (O'Connor y de Martino, 2006; O'Connor, 2008 y Story et al., 2009). En los primeros, el concepto de comercialización solo aparece al final del proceso y no presenta la capacidad de modificar las decisiones tomadas previamente durante el desarrollo, con un enfoque muy vinculado al modelo de innovaciones incrementales. El enfoque no lineal, en cambio, propone un concepto de comercialización no solo centrado en la explotación, sino en un proceso basado en la exploración, iterativo y de interacción constante con el desarrollo del producto o servicio. Las actividades de comercialización van más allá de la investigación de mercados, desarrollándose actividades de descubrimiento, aprendizaje constante con usuarios, consumidores y mercados, validación, así como de creación del ecosistema de la innovación, para facilitar el desarrollo, la difusión y adopción del producto o servicio en un mercado no familiar o completamente nuevo.

El análisis de la muestra bibliográfica permite también constatar la consolidación del modelo de innovación de O'Connor y de Martino (2006) basado en tres fases: Descubrimiento, Incubación y Aceleración (DIA) corroborado por diferentes autores como Story et al. (2009), o más recientemente, Petzold et al. (2019) y O'Reilly y Binns (2020). La investigación también expone la relación de los trabajos de Rogers (1963) y Moore (2002), relativa a los segmentos de adopción de la innovación, con el proceso de comercialización, especialmente en la fase de aceleración.

Adicionalmente, también se identifica como han cambiado las líneas de investigación en el ámbito de las innovaciones de alta incertidumbre desde un punto de vista cronológico, partiendo del enfoque de aprendizaje de mercados en los años 90 (Dougherty, 1990; Hamel y Prahalad, 1991; Lynn et al., 1996 y O'Connor, 1998), pasando a la influencia de la orientación a mercado, en el periodo entorno al año 2000 (McGrath, 2001 o Slater y Narver, 1998). A partir del 2000, las líneas de trabajo se centran en el concepto de configuración y creación de mercados (Jaworski et al., 2000; Saravasthy, 2001; Easignwood y Harrington, 2002 ó Sandberg, 2002). Los artículos publicados entre 2005 y 2010 suponen una primera aproximación a cómo el ecosistema y las redes de innovación influyen en la comercialización y adopción de productos y servicios en mercados completamente nuevos (Chacravorti, 2004 ó Bessant et al., 2006). Este enfoque se ha potenciado durante la última década (Chiesa y Frattini, 2011; Aarikka-Stenroos y Sandberg, 2012; Marx et al., 2014 o Ansari et al., 2016). El análisis de las tendencias de investigación en la comercialización de innovaciones disruptivas ha permitido examinar como influyen cada uno de estos conceptos, más allá de las dimensiones y factores tradicionales como el posicionamiento, la identificación del cliente objetivo, la comunicación, la distribución, la configuración completa de producto/servicio, la definición de precio o el tiempo requerido para la adopción de la innovación (Frattini et al., 2012).

Esta primera parte de la investigación propone como resultado un modelo teórico de comercialización de innovaciones disruptivas. Frente a los modelos existentes analizados a través de la revisión bibliográfica, presenta un enfoque más amplio y no desde una mirada parcial y aislada, sino asociado al proceso global de innovación DIA y a cada una de sus fases. De esta manera se plantea una base más sólida, que permite categorizar y relacionar las actividades de comercialización con las de desarrollo de producto/servicio. Este modelo permite además tender puentes entre la investigación académica y las metodologías del ámbito profesional como Customer Development (Blank, 2005) o Lean Startup (Ries, 2011), por la similitud en la descripción de sus diferentes etapas del proceso de innovación con las planteadas en el modelo teórico de la presente investigación.

Por último, gracias a la revisión sistemática de la literatura llevada a cabo se identificaron áreas de estudio más específiicas, que permitieron enfocar de una manera más concreta esta investigación, centrándose en la fase de aceleración de proyectos de innovación disruptiva.

La segunda parte de la investigación se centra consecuentemente en la fase de aceleración de procesos de innovación disruptiva, y se tangibiliza en los artículos **Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison** y **Key Activities for Successful Ventures Scaling Up**.

Los resultados del artículo Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison enumeran las actividades de comercialización que las corporate ventures y las spinoffs llevan a cabo durante la fase de

aceleración. El artículo presenta un listado más completo que el identificado en la bibliografía existente. Permite además la comparación entre ambos modelos organizacionales de innovación y la identificación de retos comunes y divergentes.

Las principales conclusiones que se extraen a partir de esta comparación son las siguientes.

En primer lugar, durante la etapa de pre-comercialización/pre-transferencia de la fase de aceleración es clave tanto la formación de equipos para el escalado, como el compromiso de los líderes de la organización y/o los actores involucrados en el proyecto. Para facilitar este factor, el desarrollo del ecosistema de innovación y las relaciones tempranas con potenciales comercializadores son clave. Por otro lado, se pueden apreciar diferencias entre el grado de madurez del proyecto y los métodos y estadios de validación del potencial de la innovación que presentan las corporate ventures y las spinoffs. Adicionalmente, en el caso de las últimas, los retos vinculados a la protección intelectual del proyecto toman especial importancia.

Durante la etapa de comercialización/transferencia, las corporate ventures y las spinoffs presentan diferentes enfoques para afrontar los retos que se plantean. En relación a los recursos necesarios para el escalado, las corporate ventures se centran en cómo poder aprovechar los recursos de la corporación matriz, frente a la preocupación por la búsqueda de medios financieros y de equipos de las spinoff. Ambos modelos organizacionales también presentan claras diferencias entorno a la madurez del proyecto de innovación en esta etapa, presentando las corporate ventures de la muestra un nivel de validación más consolidado respecto a las spinoffs. La creación de la red de ventas y la visibilidad en mercado es un reto donde las corporate ventures aprovechan las sinergias con la corporación matriz, frente a las dificultades de las spinoffs, que deben emplear amplios recursos para comenzar a tener presencia y credibilidad en el mercado.

Es en la etapa de post-comercialización/post-transferencia donde los retos que afrontan las corporate ventures y las spinoffs son complemente diferentes. Las primeras están centradas en poder equilibrar un enfoque entre explotación y exploración, para resolver las últimas situaciones de incertidumbre que se plantean, siendo claves las métricas a emplear para los equipos de comercialización, mientras que, en el caso de las spinoffs, éstas se focalizan todavía en una optimización de la innovación a partir de la opinión de los primeros clientes, en la definición de un sistema de operaciones viable y escalable y en la constante búsqueda de visibilidad y credibilidad en el mercado.

El último artículo, **Key Activities for Successful Ventures Scaling Up,** se centra en la actividad concreta de transferencia, para el caso específico de las corporate ventures, que entregan el proyecto de innovación a una unidad de negocio para su comercialización a gran escala.

La investigación permite facilitar el enfoque de esta actividad concreta del proceso de innovación, mejorando su tasa de éxito, proporcionando criterios para determinar si el proyecto está listo para ser transferido a la unidad de negocio. La investigación genera una lista de verificación que permite identificar la madurez del proyecto, minimizando las incertidumbres no resueltas, reduciendo un exceso de tiempo de escalado y de costes no esperados y evitando una posible caída de la confianza de la unidad de negocio respecto al proyecto de innovación.

Adicionalmente, la lista de verificación permite definir el momento adecuado para la transferencia, mejorando el tiempo requerido para el escalado con la finalidad de no perder la ventana de oportunidad del proyecto.

Los resultados de la investigación enfatizan las actividades e indicadores para resolver las incertidumbres de mercado, organizacionales y de recursos frente a las de carácter técnico que apenas se mencionan por los entrevistados de la muestra.

Respecto a las incertidumbres de mercado, los participantes de la muestra buscan indicadores que ratifiquen no solo primeras ventas sino también obtener una base sólida de mercado en diferentes nichos, así como la realización de pilotos, para identificar los detalles más concretos en cuanto a la implantación y a las barreras que plantean los mercados. La muestra también pone en evidencia la relevancia no solo de un modelo de negocio validado y testeado, sino también de la necesidad de una estrategia comercial escalable que garantice la adquisición del cliente n+1 de la manera más sencilla posible.

En relación a las incertidumbres de recursos, el foco de la muestra no se centra en los medios financieros para el escalado sino en la identificación de las competencias del equipo necesarias para el escalado, así como en la relevancia de la transferencia de conocimiento entre el equipo de innovación y la unidad de negocio de la corporación.

Por último, la investigación revela la criticidad de los aspectos organizacionales y operacionales. Establecer un modelo de operaciones escalable es una actividad clave y necesaria antes de la transferencia, así como la formación del equipo adecuado para el escalado. En estados previos a la transferencia, e incluso desde etapas tempranas (en fase de incubación incluso) es fundamental llevar a cabo actividades de interacción con la corporación y las posibles unidades comercializadoras, para poder validar el posible encaje del proyecto de innovación en sus líneas de negocio, adquirir apoyos en sus equipos y detectar barreras antes de la transferencia. Por último, es fundamental la definición y negociado con la unidad corporativa del sistema de gobernanza e incentivos que se utilizará para la explotación del proyecto de innovación una vez transferido.

La investigación ha seguido un proceso de enfoque constante, desde una mirada global del concepto de comercialización dentro del proceso de innovación, pasando por el análisis de las actividades de comercialización en la fase de aceleración, hasta profundizar en una actividad muy concreta, la de la transferencia a unidades de negocio para un modelo concreto de organización innovadora, las corporate ventures. El proceso seguido ha permitido contextualizar y acotar el marco de trabajo, presentar resultados concretos y detectar nuevas líneas de investigación, que se presentan a continuación en la última sección del documento.

5.3 Futuras líneas de investigación

La primera parte de la investigación, correspondiente al primer artículo, ha permitido identificar diferentes líneas de investigación dentro del marco general de la comercialización de innovaciones disruptivas.

En primer lugar, el modelo teórico de comercialización propuesto presenta paralelismos con metodologías procedentes del mundo profesional y del emprendimiento como el Customer Development (Blank, 2005) o Lean Startup (Ries, 2011). Estas similitudes son indicadores de la brecha existente entre los estudios académicos y profesionales en el ámbito de la innovación disruptiva, motivando una posible línea de investigación para acercar

ambos enfoques, identificar puntos de encuentro y dotar de una base teórica más sólida a las metodologías del ámbito profesional en este área de conocimiento.

En relación a la fase de incubación, autores como Aarikka-Stenroos y Lethimaki (2014) sugieren una interesante línea de investigación en cuanto a como crear y gestionar las relaciones del ecosistema y las redes de innovación en nuevos mercados.

La revisión de la bibliografía existente en la primera fase de la investigación y los resultados obtenidos en la segunda parte de la misma indican otra línea de investigación, centrada en la gestión de las métricas de evaluación de rendimiento de los proyectos de innovación disruptiva en las fases iniciales del escalado, para poder equilibrar actividades exploratorias y de explotación y evitar la tendencia a priorizar los resultados a corto plazo y en consecuencia la prevalencia de innovaciones incrementales en las unidades de negocio.

Adicionalmente, sería necesario una validación empírica del modelo teórico de comercialización presentado en el primer artículo, generando una vía muy concreta de investigación al respecto.

Por otro lado, una de las limitaciones de los estudios de caso llevados a cabo en la segunda parte de la investigación (a través de una metodología cualitativa) sugiere a su vez una línea de estudio futura. Las muestras de los proyectos analizados en el segundo y tercer artículo estaban formadas por miembros del equipo de innovación y del departamento de innovación corporativa, pero carecían de perfiles provenientes de las unidades de negocio que explotarían el proyecto. Complementar y corroborar los resultados de estos dos artículos ampliando la muestra con estos perfiles dotaría de mayor credibilidad a los hallazgos presentados.

Por último, y en relación a los hallazgos enunciados en el segundo y tercer artículo, sería de sumo interés llevar a cabo un estudio cuantitativo que pueda validar la ocurrencia y criticidad de las actividades e indicadores enunciados.

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Anexos

I Muestra de artículos objeto de la SLR del artículo: "Commercialization of Disruptive Innovations: Literature Review and Proposal for a Process Framework"

Journal type	Nº of publications	Author	Type of innovation	Main approach
INNOVATION	**24**			
Journal of Product Innovation Management	15	O'Connor, 1998	Radical	Market Learning
		Song and Montoya, 1998	Really new	Success Factors
		Veryzer, 1998a	Discontinuous	Disruptive Innovation
		Veryzer, 1998b	Discontinuous	User Involvement
		O'Connor and Veryzer, 2001	Radical	Market Visioning
		McDermott and O'Connor, 2002	Radical	Strategic Issues
		O'Connor and de Martino, 2006	Radical	Organization
		Govindarajan and Kopalle, 2006	Disruptive	Performance Metrics
		Markides, 2006	Disruptive	Business Model Innovation
		O'Connor, 2008	Major innovation	Disruptive Innovation Process
		Govindarajan et al., 2011	Radical/Disruptive	Market Orientation
		Chiesa and Frattini, 2011	High technology	Adoption and Networks
		O'Connor and Rice, 2012	Breakthrough	Commercialization Process
		O'Connor, 2013	Radical	Uncertainty Management
		Slater and Mohr, 2014	Radical	Organization
R&D Management	3	Lettl et al., 2006	Radical	User's Involvement
		Gassman et al., 2012	Radical	Transition
		Hansen et al., 2019	High technology	Transition
Technovation	2	Easingwood and Harrington, 2002	High technology	Market Configuration
		Bessant et al., 2006	Discontinuous	Networks
Research Policy	1	Gans and Stern, 2003	High technology	Market Orientation
Journal of Engineering and Technology Management	1	Lettl, 2007	Radical	User's Involvement
Journal of High Technology	1	O'Connor, 2008	Radical/Really new	Market Learning
Creativity and Innovation Management	1	Petzold et al., 2019	Disruptive	Disruptive Innovation Process
GENERAL MANAGEMENT	**15**			
California Management Review	5	Lynn et al.,1996	Discontinuous	Market Learning
		Stringer, 2000	Radical	Market Learning
		Dellbridge et al., 2007	Discontinuous	Networks
		O'Connor and Rice, 2001	Breakthrough	Market Visioning
		O'Reilly and Binns, 2019	Disruptive	Disruptive Innovation
Harvard Business Review	5	Hamel and Prahalad, 1991	Disruptive	Market Learning
		Von Hippel and Thomke, 1999	High technology	User's Involvement
		Chacravorti, 2004	Radical	Networks
		Garvin and Levesque, 2006	Radical/disruptive	Organization
Academy of Management Journal	2	McGrath,2001	Radical	Market Learning
		Saravasthy, 2001	Radical	Market Configuration

MIT Sloan	1	Rice et al., 2008	Breakthrough	Uncertainties
Management Science	2	Von Hippel, 1986	High technology	User's Involvement
		Marx et al. 2014	Disruptive	Networks
Journal of Business Review	1	Aarijja and Lehtimaki, 2014	Radical	Commercialization Process
MARKETING	**11**			
Industrial Marketing Management	5	Story et al., 2009	Radical	Competences/ DI
		Möller, 2010	Radical	Networks
		Aarikkaa and Lehtimaki, 2014	Radical	Commercialization
		Story et al., 2014	Radical	Barriers
		Aarikka and Sandberg, 2014	Radical	Barriers
Journal of Marketing	3	Chandy and Tellis, 2000	Radical	Success Factors
		Zhou et al., 2005	Breakthrough	Market Orientation
		Coviello and Joseph, 2012	Major innovations	User's Involvement
J. Targeting, Measurement & Analysis for Marketing	1	Sandberg, 2002	Radical	Market Configuration
Journal of Marketing Research	1	Chandy and Tellis, 2000	Radical	Organization
Journal of the Academy of Marketing Science	1	Jaworski et al., 2000	Disruptive	Market Configuration
OPERATION AND TECHNOLOGY MANAGEMENT	**7**			
Research Technology Management	4	O'Connor et al., 2002	Radical	Transition
		Markham, 2002	Radical	Disruptive Innovation Process
		Paap and Katz, 2004	Disruptive	User's Involvement
		O'Connor and Ayers, 2005	Radical	Competences
IEEE Transactions on Engineering Management	3	Rice et al., 2002	Discontinuous	Commercialization Process
		Walsh et al., 2002	Disruptive	Market orientation
		O'Reilly and Tushman, 2004	Radical/disruptive	Organization
STRATEGY	**4**			
Strategic Management Journal	4	Dougherty, 1990	Radical	Market Learning
		Slater and Narver, 1998	Disruptive	Market Orientation
		Ahuja, 2001	Breakthrough	Barriers
		Ansari et al., 2016	Disruptive	Networks and ecosystems
ORGANIZATION	**2**			
Organization Science	2	Day, 1994	Radical	Championship
		Andriopoulus and Lewis, 2009	Radical	Organization
ENTREPREN.	**1**			
Entrepreneurship		Shepherd and Gruber, 2020	Radical	Market learning

Tabla 9. Muestra de artículos objeto de la SLR del artículo: Commercialization of Disruptive Innovations: Literature Review and Proposal for a Process Framework, Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, International Journal of Innovation Studies, 5(3), 2021, páginas 132-133.

II Guión de las entrevistas semiestructuradas del artículo "Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison" (basado en O'Connor et al. (2002)

QUESTIONS FOR INTERVIEWS WITH COMPANIES ABOUT THE MANAGEMENT OF THE DI PROJECT.

TECHNOLOGY AND PRODUCT/SYSTEM READINESS.

- Is the product/system ready? Or is it only a prototype?
- Is there a plan to make evolve the technology into a platform of products? Underlying technology is ready, reliable and understood?
- Are there any technical or manufacturing issues to solve?

KNOWLEDGE (FOR CORPORATE VENTURES)

- How the knowledge has been transferred?
- What kind of knowledge has been transferred?

MARKET ENTRY STRATEGY.

- Is the business model appropriate taking into account the whole value chain?
- Is the product/system value proposition clear? (validated in the market place by customers)
- Is there a plan for initial market entry and follow on applications?
- Are there initial customer partners to be addressed? Are they interested in the application and willing to pay for it?
- Is there a distribution channel for the entry application established?

MARKET DEVELOPMENT READINESS.

- Is there a plan for exploring alternative applications? Is the market aware that the product exists?
- Are there resources and a plan to educate the initial entry segment of the market and follow on segments?

TEAM.

- Who will be the Project leader in commercialization?
- Who will be the project leader in the business unit? Is part of the R&D team continuing together with the business unit? (FOR CORPORATE VENTURES)

RECEIVING UNIT (FOR CORPORATE VENTURES)

- Is the receiving unit aware about the extra funding/time that could be needed comparing to a "standard Project"?
- Is the risk involving commercialization of innovation understood by the business unit?
- What is the time horizon for new market creation?
- Have the sales team a list of potential customers for the project? Is the business unit agree with the business model?

PARTNERS READINESS

- Are current partnerships appropriate and reliable for operations phase?

CORPORATE (FOR CORPORATE VENTURES)

- Is there a "champion" from senior management? Is there a clear idea about the right home for the Project?
- Are the expectations of senior management and receiving unit clear about the project?
- Relation with internal stakeholders. Is there an informal support to the project? Is there knowledge about the potential organizational resistors?

III Guión de las entrevistas semiestructuradas del artículo "Key Activities for Successful Ventures Scaling Up" (basado en Rice et al., 2002)

QUESTIONS FOR INTERVIEWS WITH COMPANIES ABOUT THE READINESS OF THE DISRUPTIVE INNOVATION PROJECT.

- Does the innovation have any technical or manufacturing issue?
- Does the innovation project have a clear value proposition?
- Does the innovation project have made first sales?
- Does the innovation project have developed a pilot program?
- Does the innovation project have been proved in parallel niches?
- Does the innovation project have a sales strategy ready for mainstream customers?
- Does the innovation project have a clear operating model and the required team identified?
- Does the innovation project have support from the business unit manager?
- Does the innovation project have support from the business unit team?
- Does the innovation project have support from corporate senior management and middle profiles?
- Does the innovation project have a plan and team for transition?
- Does the innovation project have a defined team for scale up?
- Does the business unit have clear performance metrics to measure the evolution of the innovation project in post-transition phase?
- Have the innovation team identified possible barriers or misfits with potential explotation units?
- Have the exploitation project the right skills and competences for scaling up the innovation project?
- Have the exploitation unit the whole knowledge about the innovation project?

IV Resumen de las actividades de comercialización recogidas a través de revisión bibliográfica para las corporate ventures y las spinoffs en la fase de aceleración

Commercialization phase	Specific activities	Scholars
Pre-commercialization	Basic and applied science /discovery technology/ initiation	Maine and Garnsey (2007), AbdRahima et al (2015), Amadi-Echendu and John, (2008), and Pietzsch et al. (2009).
	Formulation / identification of technological opportunity/ Application idea initial technical and economic viability	Maine and Garnsey (2007), AbdRahima et al (2015), Amadi-Echendu and John (2008).
	Reviewing the technology / Application	Eldred and McGrath (1997) and Amadi-Echendu and John (2008).
On-commercialization	Having a development team and organizing a senior review team / formalizing commercialization project	Eldred and McGrath (1997) and Rogers et al. (2004).
	Formalizing commercialization project	Rogers et al. (2004).
	Scanning and creation of potential alliances / identification of specific need of target market/ conducting of preliminary material investigation /	Maine and Garnsey (2007) and Chen and Panda (2005).
	Designing, building and testing of prototypes / designing and prototyping / design and development / Developing prototypes and integrating the prototype into existing products / incubation	Rogers et al (2004), Maine and Garnsey (2007), Pietzsch et al. (2009) and Chen and Panda (2005).
	Development of technological product/service	AbdRahima et al (2015) and Amadi-Echendu and John (2008).
	Customer testing and experimentation	Maine and Garnsey (2007).
	Verification of relating policies/ evaluation of make/buy decision / development of pilot plant,	Rogers et al (2004) and Maine and Garnsey (2007).
	Deciding on channels of distribution	Rogers et al. (2004).
	Final validation / final customer testing	Pietzsch et al (2009) and Maine and Garnsey (2007).
	Developing a structured commercialization method / developing structured processes	Eldred and McGrath (1997) and Chen and Panda (2005).
Post-commercialization	Product launching and post-launching assessment / market, and acceleration	Pietzsch et al (2009), Amadi-Echendu and John (2008).

Tabla 10. Resumen de las actividades de comercialización recogidas a través de revisión bibliográfica para las spinoffs en la fase de aceleración. Fuente: Fuente: Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 2020, 5(2), página 624.

Phase	Category	Specific activities	Scholars
Pre-Transition	Innovation project preparation for scale-up	Transition readiness assesment	O'Connor, Hendricks and Rice (2002), Rice, Leifer and O'Connor (2002) and van Burg et al. (2012).
		Transition team	Rice, Leifer and O'Connor (2002) and van Burg et al. (2012).
		Transition plan	Kanter et al. (1991) Rice, Leifer and O'Connor (2002).
	Conditions for validation	Achievement of first sales and running of pilot projects	Nieto (2018).
	Early-relations with the potential receiving business units	Training and personnal exchange	van Burg et al. (2012).
		Cross-functional interfaces	Jansen et al. (2009).
		Liaison chanelling and network building	Gassman et al. (2012).
		Horizontal interactions between teams	Raisch and Tushman (2016).
Transition	Transition time	Transference after achieving first sales	van Burg et al. (2012).
		Laying the groundwork for a big market	Rice, Leifer and O'Connor (2002).
	Knowledge management	Transfer of the R&D team to the receiving business unit	Nieto (2018).
Post-transition	Specificatio of suitable KPI's in the business unit	Post transition autonomy. Performance metrics	van Burg et al. (2012).

Tabla 11. Resumen de las actividades de comercialización recogidas a través de revisión bibliográfica para las corporate ventures en la fase de aceleración. Fuente: Fuente: Commercialization Process of Disruptive Innovations in Corporate Ventures and Spinoff Companies: A Comparison. Javier Nieto Cubero, Saheed Adebayo Gbadegeshin, Carolina Consolación, Advances in Science, Technology and Engineering Systems Journal, 2020, 5(2), página 625.

V Certificados de las participaciones en Congresos y Workshops de doctorado internacionales

CERTIFICATE OF ATTENDANCE

This is to certify that

JAVIER NIETO

- Has participated in the IPDMC DOCTORAL WORKSHOP, held in JUNE 10-11, 2017
- Has presented the paper entitled:

COMMERCIALIZING DISRUPTIVE INNOVATIONS.

ECTS Assigned : 2

Professor John Christiansen – *CBS - Copenhagen, Denmark*
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IPDMC Doctoral Workshop (Reykjavik, Iceland, Junio 2017)

CERTIFICATE OF ATTENDANCE

This is to certify that

JAVIER NIETO

- Has participated in the 24TH INNOVATION AND PRODUCT DEVELOPMENT MANAGEMENT CONFERENCE, held in REYKJAVIK, ICELAND - JUNE 11-13, 2017
- Has presented the paper entitled:
  - *COMMERCIALIZING RADICAL INNOVATIONS. REVIEW AND ANALYSIS OF THE LITERATURE. INFLUENCE OF COMMERCIALIZATION IN PRODUCT DEVELOPMENT*

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XXIV Innovation and Product Development Management Conference (IPDMC, Reykjavik, Iceland, Junio, 2017). Título de la ponencia: **Commercializing Radical Innovations. Review and Analysis of the Literature**

XXIX ISPIM INNOVATION CONFERENCE
Stockholm, Sweden • 17-20 June 2018

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INNOVATION, THE NAME OF THE GAME

Javier Nieto Cubero

Presented the paper

"Managing integration of disruptive innovations in ambidextrous organizations"

at the ISPIM Innovation Conference

Stockholm, 17th – 20th June 2018

Signed:

Dr Steffen Conn, Operations Director, ISPIM

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ENTREPRENEURSHIP, INNOVATION, INTERNATIONALIZATION: A MULTIDISCIPLINARY PERSPECTIVE

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PAPER PRESENTATION CERTIFICATE

JAVIER NIETO CUBERO

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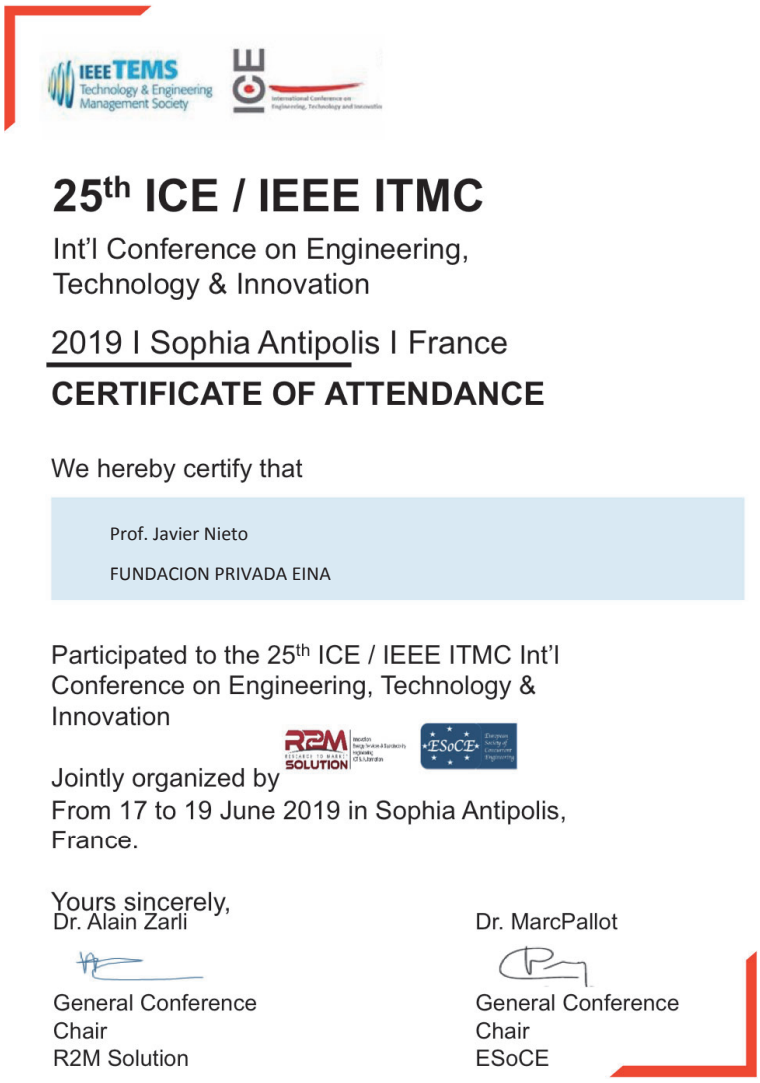
III AEM & TIM PhD Programs: Joint Paper Development Workshop "Entrepreneurship, Innovation, Internationalization: A Multidisciplinary Perspective" (Online, 2020). Título de la ponencia: **Commercialization of Disruptive Innovations: Literature Review and Proposal of Process Framework.**



25th ICE / IEEE ITMC

Int'l Conference on Engineering, Technology & Innovation

2019 I Sophia Antipolis I France

CERTIFICATE OF ATTENDANCE

We hereby certify that

Prof. Javier Nieto

FUNDACION PRIVADA EINA

Participated to the 25th ICE / IEEE ITMC Int'l Conference on Engineering, Technology & Innovation

Jointly organized by

From 17 to 19 June 2019 in Sophia Antipolis, France.

Yours sincerely,

Dr. Alain Zarli

General Conference Chair
R2M Solution

Dr. MarcPallot

General Conference Chair
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XXV IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Junio 2019, Vallbone, Francia.

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A continuación se anexa el artículo publicado en el Libro de Actas, precursor de los artículos 2 y 3 de la tesis, que muestra los primeros hallazgos de la investigación relacionados con el estudio del momento de transición de las corporate ventures.

The role teams and organizational factors play in disruptive innovations in ambidextrous organizations

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***Abstract*—One of the biggest challenges that large companies challenge at commercializing innovations is how to successfully transfer the project to the business unit at the moment of scaling up the innovation. This research has deployed multiple case methodology to study the process of transference of twelve disruptive innovations in ambidextrous organizations to improve the understanding of how corporate ventures face the transition from a disruptive innovation to a receiving business unit. The study identifies different crucial team activities within the process of transferring the projects to the receiving business units as well as key organizational factors between the R&D team, the business unit and the corporation, as it follows: 1) the achievement of first sales and running of pilot projects, 2) early-relations with the potential receiving business unit, 3) misfit between the innovation project and the business unit, 4) transfer of the R & D team to the receiving team, 5) presence of champions and project support network. The research also provides insights about the most appropriate time for the realization of the transfer.**

Keywords—commercializing technology, transition management, disruptive innovations, radical innovations, ambidexterity, corporate venturing, , intrapreneurship.

I. INTRODUCTION

In today's fast pace environments technologically based, to sustain long- term competitiveness, firms need to generate disruptive innovations as well as incremental ones [1]. Even if scholars state that commercialization is the most important phase, it is also the less studied [2].

One of the biggest challenges that big companies face at the commercialization stage is how to successfully transfer an innovation project to the business or product units "unpublished" [3] at the moment of scaling up the innovation.

Despite the members of R&D or the business unit receiving the project would think the innovation is mature enough for transition and full commercialization, projects usually mature at the business unit. The projects are generally underdeveloped based on a receiving unit's criteria. Resolving the remaining uncertainties during transition takes usually longer and requires further investment or more personal resources.

Corporate venturing could be defined as the exploration and commercialization of new technologies or products structurally separated from the corporate organization in a corporate venturing structure that avoids organizational rigidities. A difference should be established between Corporate Venture and Intrapreneurship, defined as instilling the behavior and mindset of independent entrepreneurs in the firm's employees and thus create an innovative environment within the firm, as stated by [4].

Ideally, the venture should be transferred to the established firm generating new business opportunities within the company. Interaction between new ventures and established business units create frictions [5]. Moreover, corporate ventures could be perceived as a threat to the established business of the corporate organization, because they can challenge current technologies or cannibalize current products [6]. A forced integration into a business unit could be counterproductive in terms of potential of the innovation [7] as well as find organizational resistance in the receiving business unit [8].

Although scholars have described the corporate venturing process from many approaches, such as the corporate parent [9], the venturing unit [10] and the corporate venture, they are not integrated in a process model that describes potential interventions for the transition of the corporate venture to the established business environment [11].

Disruptive innovation units usually lack resources and specific capabilities for the commercialization of innovations and integration is a crucial task to successfully pursue explorative and exploitative activities simultaneously [12].

Despite the difficulty of venture transition, the current literature is relatively poor about how to design the transition process [11], and ambidexterity studies do not formally analyze the transition scale [13], offering only fragmented and incomplete guides to balance separation and integration [14].

Literature neither gives any explanation about the optimum way to do it [15] or about which is the most suitable moment [16].