TESIS DOCTORAL

2021

ANÁLISIS DEL IMPACTO DE LAS TECNOLOGÍAS DE INTERACCIÓN CON CLIENTES EN LA DIGITALIZACIÓN DE LOS ESPACIOS DE VENTA FÍSICOS

JAVIER LORENTE MARTÍNEZ

PROGRAMA DE DOCTORADO EN ECONOMÍA Y EMPRESA

DIRECTOR: JULIO NAVÍO MARCO

CODIRECTORA: BEATRIZ RODRIGO MOYA

AGRADECIMIENTOS

No es fácil atreverse a realizar una tesis después de más de dos décadas de profesión en la empresa privada. Quiero en primer lugar agradecer a Julio Navío Marco su apoyo incondicional desde el inicio de la tesis. Desde esos primeros momentos, Julio me ha apoyado con su experiencia, consejo, palabras de ánimo, correcciones y disponibilidad total a lo largo de los cuatro años de realización de este trabajo.

Otras dos personas han sido claves, desde el punto de vista académico, en la finalización de esta investigación. Por un lado, Beatriz Rodrigo Moya, que ha estado siempre de apoyo y de guía en los hitos de esta tesis, y cuya aportación ha permitido ir consiguiendo diversos logros como la firma del convenio entre la UNED y Telefónica onthespot que ha facilitado el trabajo de campo de esta investigación. Por otro lado, quiero agradecer a Ana Laguía González su colaboración en la parte estadística más compleja de los diversos estudios. Sin su presencia y profesionalidad, posiblemente la calidad del trabajo se habría resentido, y en el mejor de los casos, prolongado varios años más. Y también me habría perdido conocer a una persona fantástica y encantadora.

Quiero también agradecer a mis compañeros de Telefónica Onthespot Services su total disponibilidad en los momentos puntuales que he podido necesitar de su colaboración, en especial Carlos Marina, Eva Pérez y Silvia Varela. Si bien me he organizado lo mejor posible para que la realización de la tesis no impactara en nada en mi trabajo, he tenido la tranquilidad de saber que podía tener ayuda y colaboración si la necesitaba.

Por último, no puedo más que agradecer a mi familia su paciencia con los muchos cientos de horas que he sustraído a la convivencia y los planes familiares. Poder embarcar a sufridos marineros en un barco que no es el suyo y hacia un destino que les he marcado no hace más que demostrar la entrega y cariño con la que hacen las cosas. Y aunque esté muy agradecido, no estoy nada sorprendido: Sabía que me ayudarían a llegar a puerto desde que se apuntaron al viaje.

A Marta, Alejandro, Jorge y Laura.

Soy un afortunado por compartir la vida con vosotros.

INDICE

ÍNDICE DE TABLAS

ÍNDICE DE FIGURAS

1. INTRODUCCIÓN

1 INTRODUCCIÓN

El sector del comercio denominado en la práctica empresarial por su denominación inglesa, *retail*, es un sector estratégico en todas las economías, y en concreto en la española. Según los datos que se desprenden de la Contabilidad Nacional (INE, 2020), su Valor Actual Bruto (VAB) supone un 13% del total del PIB español, algo por encima de la media europea que se sitúa en el 11,2%. Es además el principal sector de la economía en cuanto a empleo, con 17,1% del total de los afiliados a la Seguridad Social, y ha presentado una productividad creciente hasta el inicio de la pandemia de 2020 (INE, 2020). Este sector está dominado por las pequeñas y medianas empresas (PYMEs), que suponen el 74,7% del total de los empleados (CEOE, 2019)[1]. Al mismo tiempo, el sector está sometido en los últimos años a un profundo proceso de transformación por la irrupción del comercio electrónico como canal alternativo a los existentes hasta el momento, amenazando el negocio de las tiendas físicas tradicionales. El crecimiento del comercio electrónico, por encima del 20% anual (Lal & Chavan, 2019), supone la aparición de nuevos competidores globales que fundamentan su negocio en el nuevo

[1] Este estudio de la CEOE arroja una serie de datos adicionales que muestran la importancia del sector tanto por su volumen como por otros factores: La calidad del empleo es mayor, con un porcentaje de temporalidad del 22,5%, por debajo de la media de la economía; se trata de un empleo más joven que la media y con un reparto equitativo entre hombres y mujeres. Compara de forma muy positiva con la media europea, estando por encima en productividad y se comporta mejor que el resto de la economía en cuanto a competitividad.

canal (Wu & Gereffi, 2018), detrayendo del canal físico un volumen creciente de compras (Somoza-Medina & López-González, 2017). Las PYMEs se ven especialmente afectadas por esta transformación, al no disponer de los recursos ni de la cultura empresarial necesarios para reinventarse y hacer frente al nuevo escenario (Arrieta-Paredes et al., 2020; Cowling et al., 2020). En muchos casos la única ventaja competitiva de este pequeño comercio es la cercanía física al cliente (Gahinet & Cliquet, 2018), aspecto que desaparecerá si no se consigue revigorizar el comercio físico y conservar su valor en convivencia con las ventajas indudables en ciertos aspectos del comercio electrónico, como la inmediatez y la disponibilidad en todo momento y lugar (Bollweg et al., 2016; Pous et al., 2013), y realiza intentos para replicar la experiencia física (Jimenez-Delgado et al., 2018). La disyuntiva que algunas voces plantean al pequeño comercio entre estar exclusivamente en el mundo *online* o no estar en absoluto (Khaskheli et al., 2017), no es ni deseable ni realista. El comercio electrónico juega un papel importante también para los comercios físicos tradicionales (Agnihotri, 2015), pero como en cualquier otra disrupción de estas proporciones, se trata de encontrar cuáles son las palancas de transformación del comercio físico en este nuevo escenario, que permitan la supervivencia de al menos una parte del pequeño comercio de proximidad que tan relevante es para el tejido social y económico de nuestras ciudades y pueblos.

Sin embargo, el apoyo y los planes de digitalización del sector comercio por parte de las administraciones han versado casi exclusivamente sobre la presencia en internet y, en una segunda fase, en la implantación del comercio electrónico, dando el mensaje a los pequeños comercios de que la única salida es adoptar este nuevo canal, sin profundizar en una digitalización del canal físico actual. A lo largo de la investigación realizada para esta tesis doctoral no se han encontrado paquetes de ayudas o planes de recuperación específicamente diseñados para la supervivencia y digitalización del comercio físico. Es precisamente la constatación de este hecho lo que motiva este trabajo, buscando profundizar en diversas dimensiones de la transformación del espacio físico, de cara a producir un cambio de visión que permita que se afronte la transformación del canal tradicional y no la sustitución de éste.

Al tratarse de una transformación debida a una evolución tecnológica, la palanca más relevante en esta transformación es por tanto la tecnología. El comercio electrónico es digital de forma nativa, en su concepción, mientras que el comercio físico debe aplicar tecnología sobre procesos analógicos para la modificación de estos, su registro y optimización (Jayaram, 2017; Radhakrishnan et al., 2016). La tecnología no tiene únicamente una función de optimización de los procesos internos del comercio para buscar una eficiencia mayor o la toma de decisiones basadas en datos, sino que la propia relación con el cliente se modifica gracias a la tecnología (Dacko, 2017; Vojvodić, 2019). La tecnología permite mejorar la experiencia de cliente, reduciendo tiempos de espera, proporcionando información o comunicación de marca de forma personalizada y dinámica, o produciendo interacción entre el cliente y los productos mediante tecnologías de proximidad como *RFID* (*Radio-Frequency IDentification*), las pantallas táctiles o la realidad aumentada (Dekimpe et al., 2020a). El propio perfil de consumidor se ha modificado en los últimos años y exige formas de relacionarse digitales incluso en el espacio físico (Ramadhan & Syahputri, 2020). Términos como la omnicanalidad (experiencia unificada de compra en cualquier canal) o el comercio *On2Off* (entendido como llevar a los clientes *online* a los espacios físicos para ciertas transacciones) se han convertido en habituales en las estrategias de los comercios que disponen de canal físico (Mishra et al., 2021). Las decisiones de las compañías sobre su canal físico deben responder a todas estas oportunidades para asegurar la continuidad del canal.

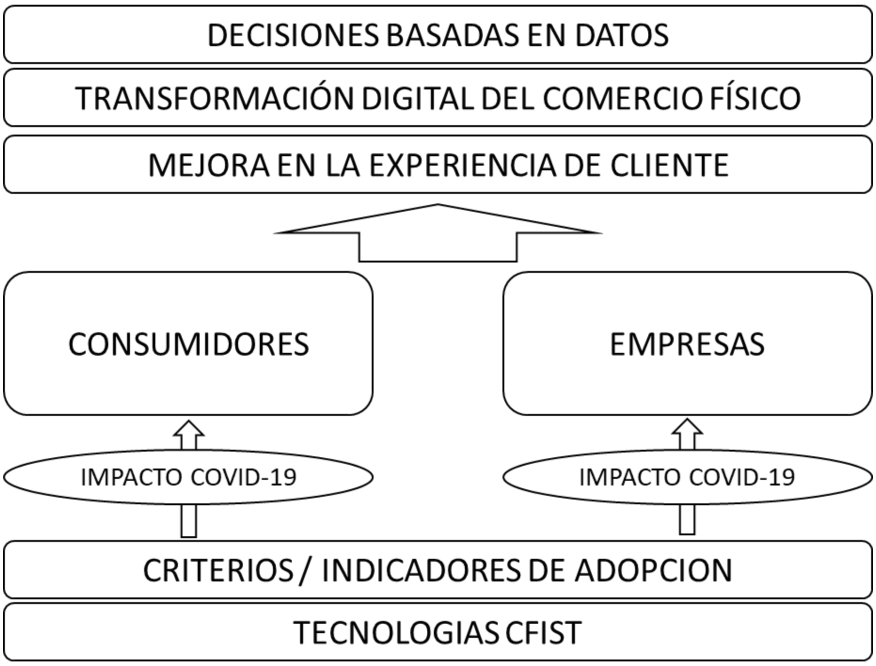
El objetivo de esta tesis doctoral es contribuir a la evolución del rol del comercio físico, en concreto mediante su transformación digital. Para este fin, el trabajo se centra en el impacto de la tecnología en la evolución de los procesos de relación con el cliente (lo que se denomina habitualmente experiencia de cliente) en el comercio físico. A lo largo de la investigación se profundiza en la manera de adoptar, aplicar y entender la tecnología por parte de los directivos de las empresas (en particular las PYMEs) y por parte de los consumidores, realizando una serie de hallazgos que permiten a los diversos actores de esta transformación (en particular directivos y dueños de comercios, fabricantes de soluciones e instituciones públicas de apoyo al sector) disponer de recomendaciones prácticas para actuar.

El ámbito de la investigación se ciñe a un entorno económico específico (PYMEs del sector comercio) y a un conjunto de tecnologías específicas (tecnologías de interacción con el cliente en el punto de venta, denominadas en nuestro estudio CFIST, por sus siglas en inglés). Con respecto al ámbito geográfico, nos ceñimos al ámbito español. Esta concreción se debe a dos razones. Por un lado, el interés de partida de la investigación es colaborar en el mantenimiento del comercio físico en nuestro país, por lo que un estudio localizado permitirá una mejor adecuación de los hallazgos a la realidad nacional. Por otro lado, un alcance nacional facilita la realización e interpretación de los estudios empíricos que se han realizado en diversos momentos de la investigación. La razón de seleccionar las tecnologías CFIST es su exclusividad de uso en el canal físico de los comercios. En la transformación digital del comercio existen diversas tecnologías de la información relacionadas con la eficiencia y la venta que son similares para el comercio físico y para el comercio *online*: Tecnologías de mejora de la cadena de suministro, o sistemas de inteligencia de negocio para la selección dinámica de precios o el conocimiento del cliente, entre otros (Krymov et al., 2019; Reinartz et al., 2019). Sin embargo, las soluciones de la categoría CFIST tienen un componente físico que las relaciona exclusivamente con el objetivo de nuestra investigación. Aunque se describen con más detalle en páginas posteriores, podemos enumerar aquí algunos ejemplos de la categoría CFIST, como las cajas de autopago , la interacción por parte de clientes con las etiquetas de radiofrecuencia RFID o la comunicación de marca basada en circuitos de marketing dinámico telegestionados (Nysveen & Pedersen, 2016; Pantano & Vannucci, 2019; Poncin & Ben Mimoun, 2014).

Durante el desarrollo de este trabajo de investigación se ha producido uno de los eventos más disruptivos a los que se podría enfrentar el comercio físico: La pandemia producida por el virus COVID-19 (Donthu & Gustafsson, 2020), que ha obligado al cierre completo del comercio físico en la mayoría de sus subsectores (Pantano et al., 2020), de forma abrupta y por un periodo de varias semanas. Tras esta primera fase se produjo una situación de cierres y confinamiento parcial, que genera numerosas barreras y restricciones para la experiencia tradicional de compra en el espacio físico, y que aún experimentamos en el momento en el que se escriben estas líneas (Ganesha & Aithal, 2021; Seetharaman, 2020; Shankar et al., 2020). Si bien no se dispone aún de una perspectiva suficiente para analizar cuál será la situación una vez se supere la pandemia, sí que hemos considerado relevante recoger algunos aspectos relacionados con el impacto del COVID-19 en nuestro estudio, ya que existen riesgos de una quiebra masiva del pequeño comercio debido a la pandemia (Cowling et al., 2020), lo que supondría un impacto muy importante en nuestra economía.

En la Figura 1.1. se representa el marco conceptual de esta tesis doctoral. El primer paso es definir la categoría de tecnologías CFIST. A continuación, se pretende arrojar luz sobre las razones para la adopción de dichas tecnologías por parte de empresas y usuarios. La literatura académica nos proporciona unos modelos generales de adopción de tecnología que pueden ser aplicados en este entorno específico (Davis, 1989; DePietro et al., 1990). Estos modelos se componen de criterios que favorecen o perjudican la adopción, como la complejidad de la tecnología, las capacidades financieras de la empresa o el valor percibido. Situaciones como la pandemia COVID-19 pueden añadir nuevos criterios, por lo que el análisis de la relación de las tecnologías con la pandemia supone un área de estudio adicional a las previstas al inicio de la investigación (Shankar et al., 2020). La adopción de la tecnología CFIST no se puede desvincular de la experiencia de cliente, ya que, por su propia naturaleza, la tecnología impacta directamente en dicha experiencia (Foroudi et al., 2018). En última instancia, lo que deben buscar las compañías es la transformación digital en todos los procesos de su negocio (Loonam et al., 2018) y una gestión de la información generada por la digitalización que les permita abordar decisiones basadas en datos (Hänninen et al., 2018).

Figura 1.1: Marco conceptual de la tesis doctoral.



Fuente: Elaboración propia

De acuerdo con el marco conceptual presentado en la Figura 1.1., el trabajo de investigación se organiza alrededor de seis estudios sobre aspectos concretos del impacto de las tecnologías CFIST. Cada uno de los estudios conforma en sí mismo una investigación autocontenida, utilizando la metodología más apropiada para las hipótesis y objetivos de cada uno de ellos, según la praxis común de investigación académica en el ámbito universitario. Todos ellos en conjunto presentan un hilo conductor común y creciente de acuerdo con el marco conceptual, que comienza con una exhaustiva revisión bibliográfica, para a continuación presentar cuatro investigaciones empíricas sobre aspectos específicos de adopción de dichas tecnologías, uno de ellos midiendo el impacto del COVID-19 en la percepción de la misma. El sexto estudio pretende recoger algunos de los aprendizajes para la reflexión y toma de decisiones estratégicas sobre la situación de las PYMEs del sector *retail* ante los desafíos actuales.

En el capítulo 2 se recoge el primer estudio, que consiste en una revisión bibliográfica sistemática de la literatura científica relacionada con las tecnologías CFIST de los últimos 20 años. En él se realiza una revisión bibliométrica de 168 artículos relevantes, seleccionados entre los 2918 que conformaban la muestra inicial. Entre las conclusiones obtenidas en este estudio, es especialmente relevante señalar que más de la mitad de los artículos seleccionados han sido escritos en los últimos cuatro años, lo que muestra la relevancia que estas tecnologías están tomando como campo de investigación. El estudio evidencia la falta de una taxonomía común en estas tecnologías que permita un estudio más ordenado por parte de la comunidad académica para ir cubriendo áreas de conocimiento y realizando análisis que combinen distintas tecnologías CFIST dentro de una única experiencia de usuario. Esta verticalidad tecnológica, frente a la trasversalidad tecnológica que sería deseable si lo que se quiere estudiar es la experiencia de cliente en todo el proceso de compra, es otra de las carencias observadas en la literatura actual. El estudio también muestra cuáles son las tres tecnologías más frecuentes en la literatura: Los sistemas de autoservicio, la tecnología RFID (en su vertiente de experiencia de cliente) y las pantallas de marketing dinámico presentes en los comercios. Finalmente se proponen, en base a los resultados, recomendaciones concretas tanto para la investigación en el ámbito académico como para los gestores de comercios, que les permitan abordar de forma práctica el conocimiento y adopción de estas tecnologías.

El capítulo 3 presenta el segundo estudio, que analiza cuáles son los factores de adopción de las tecnologías CFIST por parte de las PYMEs. Partiendo de modelos ampliamente fundamentados para analizar la adopción de tecnología por las organizaciones e individuos, como son TOE (DePietro et al., 1990) para las primeras y TAM (Davis, 1989) para los segundos, el estudio plantea una investigación empírica sobre un conjunto de 164 propietarios o directores generales de PYMEs que expresan su opinión en cuanto a la tecnología. La decisión de basar el estudio en un modelo más orientado a empresa y otro más orientado a individuos se fundamenta en una de las hipótesis relevantes, en cuanto al rol del responsable de la empresa, como individuo, en la toma de decisiones. La investigación muestra la importancia de las características del perfil personal del director general en cuanto a la toma de posición de la compañía frente a la tecnología seleccionada, por encima de otros criterios más objetivos, como los recursos financieros o la funcionalidad de la tecnología. Este hallazgo tiene consecuencias evidentes a nivel práctico en cuanto a cómo enfocar los planes de transformación digital del comercio físico, tanto desde las instituciones públicas, como por parte de los diversos suministradores de servicios de tecnologías de la información (TI), debiendo hacer hincapié en la formación e información de los decisores.

El capítulo 4 tiene como objetivo a los restaurantes, que comparten con el comercio físico un conjunto de necesidades similar en lo que se refiere a la experiencia de cliente. Se trata de un estudio exploratorio realizado sobre 41 propietarios de restaurantes. En este caso es la percepción de la tecnología (dominio tecnológico del modelo de adopción TOE) la que muestra una mayor influencia en las decisiones a tomar sobre la instalación de esta en el espacio físico, por delante de otros aspectos como el coste o la presión competitiva. Este estudio, si bien es exploratorio, abre diversas vías de investigación en un terreno aún poco explorado como es la tecnología CFIST en restaurantes.

El capítulo 5 recoge nuevamente una investigación empírica sobre directivos de empresas, pero en este caso con muestras individuales y grupales y con metodología basada en entrevistas semiestructuradas abiertas. En la investigación se propone a los entrevistados un potencial servicio de análisis del comportamiento de clientes de tiendas físicas (que denominamos en la investigación *InStore Analytics*), cuyo funcionamiento es el siguiente: A través de tecnologías CFIST, recaba datos de actividad comparables a los que se obtienen habitualmente en el comercio electrónico. Los resultados muestran que los comercios están en las fases iniciales de la transformación digital, especialmente en los aspectos que atañen a la digitalización del canal físico, sobre todo comparado con los avances en comercio electrónico. Los hallazgos muestran diferencias relevantes de interés por subsector, dependiendo del tipo de servicio prestado. Por ejemplo, es más relevante conocer el número de clientes en el comercio en negocios que no exigen cita previa. Más allá de estas diferencias, que permiten formular hallazgos de aplicación inmediata, los resultados generales muestran que no existe apoyo ni organizativo ni presupuestario para afirmar que exista un plan de acción claro en lo que se refiere a la transformación digital del canal físico, y por lo tanto se está lejos de realizar una gestión inteligente de los datos de comportamiento de los clientes en ese canal. Gracias a las conclusiones del estudio se establece una sencilla metodología para avanzar hacia la implantación de una gestión del dato en el espacio físico, proponiendo acciones en los campos formativo, de procesos, de organización y de presupuesto.

El capítulo 6 centra su interés en los consumidores en vez de en los gestores de las compañías. El trabajo de campo inicial del estudio se realizó escasos días antes del primer confinamiento en España a causa del COVID-19, en el mes de marzo 2020. Se decidió repetir dicho estudio una vez finalizado el confinamiento total, en un momento donde los consumidores ya eran conscientes de los cambios que la pandemia había supuesto en el comercio físico. Se introdujo además una pregunta adicional sobre los aspectos relacionados con la sensación de seguridad de la tecnología, en concreto con las cajas de autopago, denominadas *Self-Checkouts*. Los resultados permiten afirmar que la percepción de seguridad sanitaria de la tecnología se ha convertido en un aspecto relevante en la actitud de los usuarios para evaluar su interés en usar una solución tecnológica como los *Self-Checkouts*. Las implicaciones para la investigación en el campo de la adopción de tecnología son importantes ya que no se han encontrado precedentes de investigaciones que tengan en cuenta este aspecto, aunque se prevé que se convierta en una característica más de este tipo de investigaciones. Se trata además de un elemento muy específico del comercio físico, ya que no se plantean riesgos similares en los entornos virtuales. Este resultado principal tiene también aplicación directa para dueños de comercios, fabricantes de tecnología, integradores, y en general toda la cadena de valor de las tecnologías de punto de venta. Diversos aspectos prácticos de formación de personal, información a clientes y diseño de las interacciones con la tecnología surgen de este estudio, si bien requerirán cada uno de sus propios análisis para disponer de conclusiones más precisas. El estudio también relaciona la percepción de la tecnología con la percepción del comercio en general, con implicaciones prácticas en cuanto a las decisiones que se tomen para la introducción de la tecnología en el espacio físico. Un último hallazgo relevante se refiere a la relación entre diversión en el uso de la tecnología y la actitud ante la misma, y en definitiva ante el comercio. Aunque la tecnología pueda tener objetivos de eficiencia del negocio, si dicha tecnología se sitúa en el proceso de interacción con el cliente (como es el caso de cualquiera de las tecnologías CFIST, por definición), debe ser percibida como entretenida, y su uso como algo satisfactorio en sí mismo, más allá del objetivo funcional del mismo.

En el capítulo 7, que recoge el último estudio, se realiza un análisis de las fortalezas y debilidades de las PYMEs del sector comercio que basan su negocio en las tiendas físicas frente a una crisis como la producida por el COVID-19, en una situación donde el crecimiento del comercio electrónico ya suponía una fuerte disrupción. El estudio de las actuaciones llevadas a cabo por las empresas en las distintas fases del confinamiento (confinamiento y posteriores restricciones con distanciamiento social) y el valor que a las mismas le han dado los consumidores permiten realizar una propuesta teórica de cómo las PYMEs deben responder a la crisis en cada una de sus características principales: la casi imposibilidad de predecirla (que sólo puede ser afrontada con flexibilidad y adaptabilidad de procesos), la completa disrupción del canal físico (que requiere evolucionar hacia una mayor digitalización y omnicanalidad de los negocios), y la prioridad de la salud sobre cualquier otro condicionante, que requiere de las empresas un marketing más responsable y empático. Los hallazgos de este estudio teórico abren vías de investigación académica para profundizar en cada una de las tres características señaladas. Además, ofrece aplicabilidad directa dentro del análisis transformacional que deben realizar las empresas, facilitando un punto de partida concreto para los gestores de las compañías.

La tesis se completa con el capítulo 8, de conclusiones generales, obtenidas de la visión en conjunto de los estudios, y la enumeración de las diversas líneas de trabajo tanto académicas como empresariales que surgen de este trabajo y que permiten seguir profundizando en el área de la digitalización del tejido empresarial de la pequeña y mediana empresa en el sector del comercio físico.

Dada la amplitud de aspectos abordados en los estudios, el incipiente estado del arte de la investigación en la mayoría de los temas tratados, y el momento de disrupción que se está viviendo en el espacio físico, se presentan numerosos hallazgos en cada uno de los capítulos de esta tesis doctoral, así como en las conclusiones globales. Pero se pueden anticipar tres contribuciones principales del conjunto del estudio. La primera es la sistemática de tratamiento de una serie de tecnologías a priori dispares entre sí, pero con efectos similares desde el punto de vista de la experiencia de cliente. Esta aproximación, desde el cliente y no desde la tecnología, tiene mucho más interés para la estrategia y la organización de empresas, ya que la tecnología se convierte por el propio método de investigación en habilitador y no en objeto de estudio per se. Si bien existen algunos ejercicios de organización de las tecnologías en la literatura (Pantano et al., 2018; Wolpert & Roth, 2020), no han sido tratados por los académicos como marcos de referencia y por lo tanto no han fundamentado aún una línea de investigación sistemática. El presente trabajo refuerza la necesidad de fundamentar esta categoría para darle cohesión al trabajo científico en este campo.

Una segunda aportación general es el foco en las PYMEs como sujeto relevante de este tipo de tecnologías. Tan sólo algún estudio se ha focalizado de forma parcial y aislada en las tecnologías CFIST y los pequeños comercios locales (Bollweg et al., 2016; Pantano & Viassone, 2014). El enfoque de todo lo referente a la experiencia de cliente digitalizada en tienda física para este tipo de comercio es clave para su supervivencia, y son necesarias líneas de trabajo como la aquí presentada para que puedan ser continuadas y completadas por parte de la comunidad académica.

Por último, queremos resaltar como aportación global de esta tesis las numerosas recomendaciones para empresarios y organismos públicos. Esta tesis tiene su origen en la colaboración con el mundo de la empresa, donde se ha recogido conocimiento y necesidades reales de todo tipo de empresas y en concreto de las PYMEs. Es relevante mencionar que esta tesis se ha enmarcado dentro de un acuerdo de colaboración con la empresa privada. Mediante un convenio suscrito con Telefónica On The Spot Services, la empresa experta en tecnologías de retail del grupo Telefónica, se han podido realizar algunos de los trabajos de campo y se ha podido acceder a información relevante para los objetivos y hallazgos de esta investigación. Este tipo de colaboración permite contar con el pulso real del mercado en aspectos tan relacionados con la actividad empresarial como el que nos ocupa. Más allá de la colaboración para la obtención de datos de empresarios y clientes reales, esta relación con el sector de las tecnologías del punto de venta ha aportado un nivel de practicidad muy elevado de sus resultados. A pesar de la amplitud del campo conceptual de la tesis y de la poca estructuración de los estudios hasta la fecha, la selección de los aspectos más relevantes a analizar se ha realizado en base a preocupaciones reales existentes hoy en día en el mercado. En un campo de aplicación tan directa como el objeto de esta investigación, cualquier otra aproximación quedaría ciertamente más lejos de su aplicación práctica.

Los estudios realizados dentro del marco conceptual de esta tesis muestran las enormes posibilidades de transformación y de supervivencia que están al alcance de las empresas del sector comercio. Nuestro objetivo y nuestro deseo es que este trabajo sirva como punto de partida para futuros trabajos que desarrollen los conceptos y hallazgos obtenidos. Esperamos que esta modesta contribución sea de utilidad para conseguir la necesaria transformación y el aumento de competitividad del comercio físico en España.

2. THE DIGITALIZATION OF THE BRICK-AND-MORTAR RETAIL:

A LITERATURE REVIEW ON CUSTOMER FACING TECHNOLOGIES (CFIST)

2 THE DIGITALIZATION OF THE BRICK-AND-MORTAR RETAIL: A LITERATURE REVIEW ON CUSTOMER FACING INSTORE TECHNOLOGIES (CFIST)

2.1 Abstract

This article reviews the progression of the research about Customer Facing InStore Technologies (CFIST) in brick-and-mortar retail since 2000. Following a methodology-based review, our study combines a quantitative and a qualitative analysis of 168 papers. After a bibliometric review, we conduct an analysis of the main topics of interest and research trends. Our study shows that despite the rising interest (half of the papers have been published in the last 4 years), CFIST research is still at its early stages, as there are no stablished research frameworks, adoption models or technology categorizations. Technology adoption is the most researched topic, specifically for self-service technology, RFID, and digital signage. Our work contributes to undertake new avenues of research by highlighting the research gaps and the major trends. Furthermore, we provide practitioners with practical conclusions to review the digital transformation of their physical stores.

2.2 Introduction

Brick-and-mortar stores are undergoing drastic business changes since the beginning of e-Commerce. The online shopping grows every year (Clement, 2019) while brick-and-mortar shops decrease (Corkery, 2017). Although the situation has been described as a retail apocalypse (Helm et al., 2018), customers do see a future for physical stores, if they transform (Balaji et al., 2018; Grewal et al., 2020). This transformation must focus on experience over convenience (Balaji et al., 2018; Chocarro et al., 2013; Pantano et al., 2018) and provide integrated omnichannel experiences (Arora & Sahney, 2017; Rashid et al., 2015). Customers look to improve their experience in the physical retail, shopping quicker and with a higher control and satisfaction (Spanke, 2020; Wilson, 2013). Customer Facing InStore Technologies (CFIST) help to fulfil these requirements, creating a new shopping experience (Pantano et al., 2018; Roy et al., 2018). CFIST technologies may be defined as the "group of technologies that digitise and enhance the customer experience in the physical stores" (Lorente-Martínez et al., 2020, p.2).

CFIST help retailers to face the disruption generated by eCommerce (Lal & Chavan, 2019), and play an important role in the evolution of the experience for two main reasons. First, as customers are becoming much more technology-aware in all aspects of their life, they expect all their interactions, including physical ones, to be managed digitally (Baier & Rese, 2020). Technology mediates all customer experiences, its satisfaction and loyalty in retail, according to Parasuraman (Parasuraman, 2000). Second, thanks to CFIST, retailers improve the digital information of the customer behaviour, optimize supplies related processes, and integrate their online and offline channels through technology (Grewal et al., 2020; Inman & Nikolova, 2017a). The installation of digitalization devices from the Internet of Things (IoT) (Nowodzinski et al., 2016) allows retailer to gather data of interactions and improve customer knowledge leading to data-driven decisions (Celik, 2016).

This paper reviews the evolution of CFIST in brick-and-mortar retail since 2000. Although there has been a raising interest in the last few years for CFIST technologies, they are not yet treated as a single business concept where the different technologies and approaches must be complementary and create an overall proposition. Most of the previous literature reviews related with CFIST technologies only cover specific areas of the category, like self-service technology or digital signage (Burke, 2009; Vakulenko et al., 2018). Furthermore, the last years have seen a raising interest of the CFIST category and the concept of *smart retail* (Adapa et al., 2020), making more pressing the need to analyse all the related research through a methodical literature review.

The main objective of our study is to answer the following research question: What CFIST technologies are the most studied by scholars and what is the viewpoint of the research on this topic? For this purpose we conduct a systematic literature review, based on previous methodology (Aguinis et al., 2018) to analyse, from a quantitative and a qualitative perspective, the selected papers.

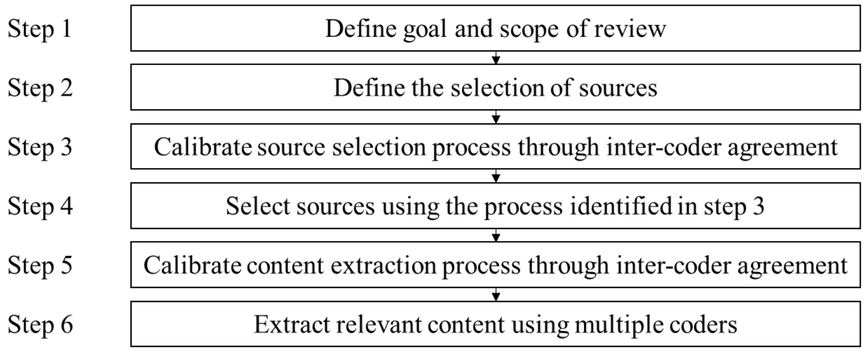
The contribution of this paper is mainly threefold: First, it is the only systematic literature review related with CFIST in the last years, despite the increasing number of works published. This study therefore contributes to develop the CFIST category. Second, thanks to our holistic and all-encompassing approach, we present the state of research in this field, highlighting the more common topics of discussion, their findings, and the understudied areas. Third, we provide a simplified proposal to mitigate current research limitations and provide scholars and practitioners with a reference to undertake the digital transformation of the brick-and-mortar stores.

The rest of this study is structured as follows. The next section details the methodology of selection and analysis of the sample. Section 3 presents the bibliometric results and a qualitative analysis on the main fields of research, leading to a discussion and presentation of main findings. We finally set out conclusions in section 4, along with limitations and future avenues of research.

2.3 Methodology

The design of our study comprises a mixed methods review, similar to other studies reviewing the impact of technology (Vakulenko et al., 2018), combining a quantitative and qualitative research approach and including a systematic review of the literature. From a methodology perspective, we decided to follow the recommended steps for literature review provided by Aguinis et al. (Aguinis et al., 2018) in order to improve study transparency. A summary of the proposed steps is presented in Figure 2.1. To ensure replicability of our work, we report all steps.

Figure 2.1: Literature Review Process.



Source: Adapted from Aguinis et al. (2018)

First, we defined the goal and scope of the review. Our objective was to analyse all literature that relates to the impact of CFIST in retail during the period 2000-2021. Several studies were related to customer facing technologies in brick-and-mortar stores but do not mention CFIST or similar terms in their papers, having Betzing et al. (Betzing et al., 2018) or Willems et al. (Willems, Smolders, et al., 2017), as examples. Therefore, we decided to broaden the criteria included in the first data collection. Following systematic frameworks from CFIST literature (Grewal et al., 2017, 2020; Roggeveen & Sethuraman, 2020), we added searches for specific technologies. Table 2.1 includes the search terms and their relationship, with the exclusions to be considered in each group of terms.

Table 2.1: Search criteria for the initial extraction.

	Block 1	Block 2 (AND)	Exclusions	Results
1	Brick, Physical, Offline	Customer facing, Customer interfacing, CFIT, CFIST, Shopper facing, Technology, Technologies		708
2	Digital Signage, Atmospherics, e-Atmospherics		Scent, music or illumination.	233
3	SST, Self-Service Technology, Self-Service Information Technology, Self-Checkout, Self-Service Kiosk, Self-Scan			228
4	RFID, Shopping Carts, Beacons, BLE		Supply Chain, Backoffice and technology-only works	483
5	Wifi, Wi-Fi, Analytics, Tracking		Technology-only works	1020
6	IoT, Internet of Things		Technology-only works	162
7	Smart Mirror, Digital Price Tag, Smart Shelf, Smart Shelves, Electronic Shelf Label, ESL, Smart fitting room		Technology-only works	84
			TOTAL	2918

NB: The term “Retail” is mandatory in all results.

We then defined the sources for the review. The main search over the terms of Table 2.1 was conducted on January 3rd, 2021 using the Web of Science (WoS) core collection database as unique information source. In addition to the searches in Table 2.1, the following parameters were also included: Only English full-length papers from 2000 to 2020; all types of journals; all research areas, countries, and regions. The seven different searches brought a total of 2.918 papers, including duplicates, as shown in Table 1.

Due to the number of results, we conducted a first selection of this initial sample by reading the titles and keywords, classifying the studies as “related”, “unrelated”, “unclear” and “duplicated”. Documents were tagged as related when the title clearly addressed a CFIST technology from a customer impact perspective. Documents tagged as ‘unclear’ were also included in this first selection. This work led us to a list of 373 studies that met our criteria and relevance.

We then adopted a coding framework to be applied for the rest of the study. Table 2.2 shows the name and values used for the coding.

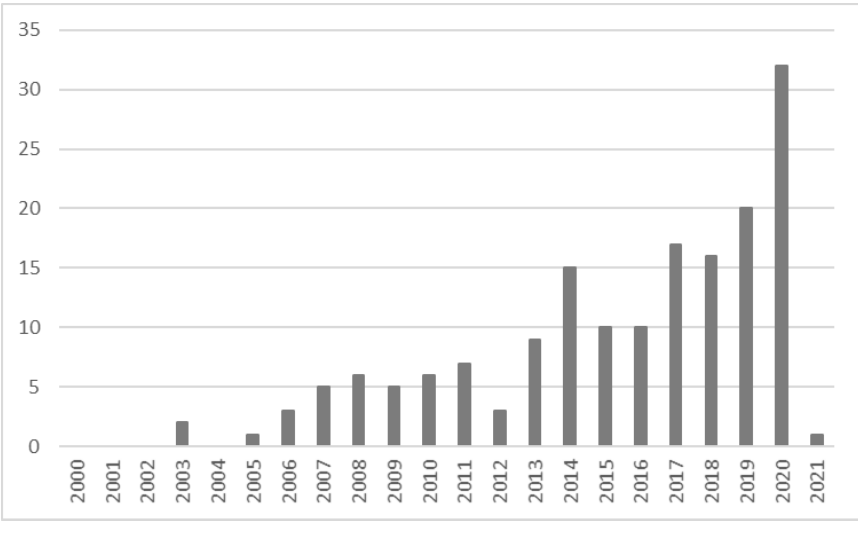
Table 2.2: Coding framework.

Item	Potential values
Code assigned to the paper	1 to 373
Title of the paper	
Authors of the paper	
Journal Title	
Publication Year	
DOI of the paper	
Technology studied	Beacons, Digital Signage, Electronic Shelf Labels (ESL), Internet of Things (IOT), RFID, Self-Service Technologies, Self-Checkouts, Wi-Fi, Rest of Technologies, or CFIST in general
Research topic	Analytics, Customer Experience, Management, Technology Review, Technology Adoption
Adoption Models (Technology Adoption Only)	Diffusion of Innovation (DOI), Self Determination Theory (SDT), SSTQUAL, Stimulus Organism Response (SOR), Technology Acceptance Model (TAM), Technology Organization Environment (TOE), Theory of Planned Behaviour (TPB), Theory of Reasoned Action (TRA), UTAUT, Other

The research team then reviewed the 373 papers to code them according to the coding framework. Classifications were done independently by two reviewers. When there was any difference in their criteria, the paper was analysed by a third reviewer and a final criterion was agreed. The review of the abstract and in some cases of the full paper led to the exclusion of 205 papers: 161 were not truly related with the field of the study for different reasons (not directly related with retail, technology, and customers at the same time), and 44 others were books and book sections that were excluded as our research focus only on journals. Finally, a total of 168 papers from 97 journals were fully coded and shaped our research ground.

Figure 2.2 shows the trend over time (2000-2021) in the number of publications. The evolution clearly emphasises the raising interest for the subject of CFIST in retail. The year 2021, that includes only 3 days, is likely to end with such a rising trend.

Figure 2.2: Number of papers by year of publication (n=168).



Source: Prepared by authors

Although the average of papers per journal is 1.73, 9 journals (9.3%) published 41,7% of the works. Table 2.3 shows the journals with more than 3 papers published in the period. Furthermore, 12 journals have published 2 papers and 76 journals have published a single paper on the topic. The concentration of papers in relevant journals related with retail could be expected, and the limited number of publications in management or marketing journals shows that the approach to CFIST is still more focused in technology than strategy. Nevertheless, the total number of journals (97) shows that the CFIST raise interest in several areas.

Table 2.3: List of journals with 3 or more papers published.

Name of Journal	Papers
Journal of Retailing and Consumer Services	26
International Journal of Retail & Distribution Management	11
Journal of Retailing	7
International Review of Retail Distribution and Consumer Research	6
Journal of Business Research	6
Journal of Marketing Management	5
International Journal of RF Technologies Research and Applications	3
Computers in Human Behaviour	3
European Journal of Information Systems	3

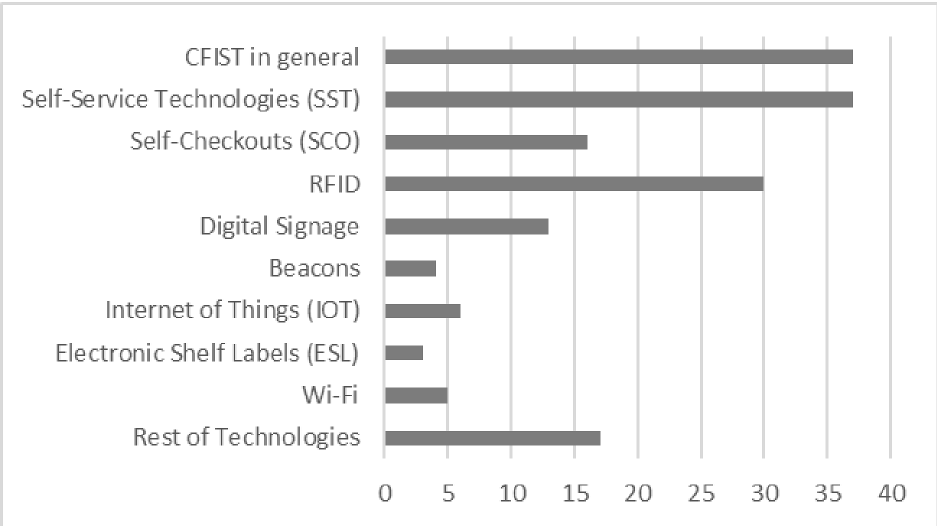
2.4 Empirical analysis

2.4.1 Quantitative analysis

Documents were coded by type of technology, selecting the one that was the main purpose of the paper (e.g., an RFID kiosk was coded as RFID and not SST if the purpose of the paper was to research on RFID). We can see in Figure 2.3 the number of papers by main technology. We find that 131 papers (78,0%) address a specific technology or use case. In the case of RFID (17,9%), the studies specified several types of use cases, like kiosks, smart assistants, smart fitting rooms, shopping trolleys or smart shelves.

Self-service technologies appear as the most researched, as Self- Checkouts are a specific type of SST and have been differentiated due to the volume of Self-Checkout studies.

Figure 2.3: Number of papers by technology (n=168)

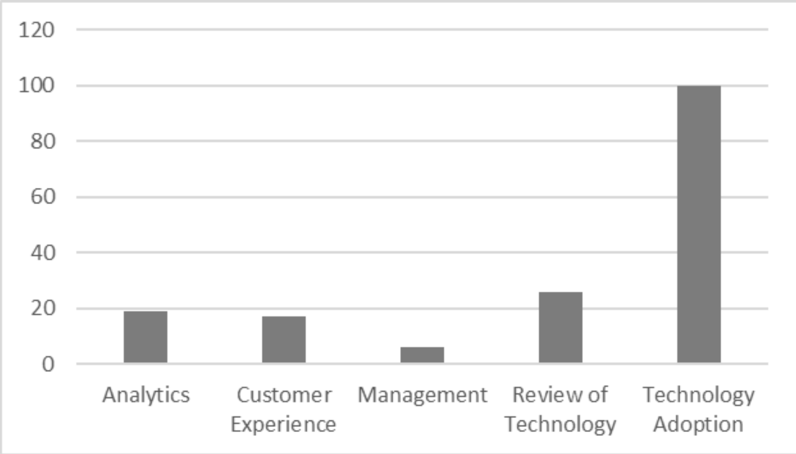


Note: Self-Checkouts is a specific type of Self-Service Technologies

Source: Prepared by authors

Figure 2.4 represents the number of papers by area of interest. Most studies (59,5%) focus on aspects related with technology adoption or aspects related with such adoption such as quality perception or sales impact.

Figure 2.4: Number of papers by area of interest (n=168)



Source: Prepared by authors

Technology adoption is by far the area of interest where scholars have published more papers. Although this fact is consistent with the nature of CFIST technologies and their impact in customer experience, it shows that management and strategy have not embraced these technologies as a key element for survival. Only 6 papers (3,6%) approach CFIST from a management perspective.

Table 2.4 shows the models used to analyse technology adoption. Most of the studies (71,0%) are not using a specific model. Although they might include a constructs framework, the choice of constructs is research-specific, and they do not refer to a single model as the theoretical background. In some cases, there is no framework, and the findings are supported in surveys or interviews that are then translated into findings through qualitative analysis.

Table 2.4: Number of technology adoption papers by theoretical model (n=100).

Technology Acceptance Model (TAM) (Davis, 1989)	13
Theory of Reasoned Action (TRA) (Hill et al., 1977)	4
Diffusion of Innovation (DOI) (Rogers, 1983)	3
Scale for Self-Service Technology Quality Assessment (SSTQUAL) (Lin & Hsieh, 2011)	2
Stimulus Organism Response (SOR) (Mehrabian & Russell, 1974)	2
Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003)	2
Self Determination Theory (SDT) (Deci et al., 1994)	1
Technology Organization Environment (TOE) (DePietro et al., 1990)	1
Theory of Planned Behaviour (TPB) (Ajzen, 1991)	1
No model or no standard model	71

2.4.2 Analysis by technology

As presented in Figure 2.3, the three more frequent technologies represent 73,3% of all the papers that focus on a specific technology: Self-Service Technologies (including Self-Checkouts), RFID and Digital Signage. The analysis by technology will focus on these three technologies as the number of papers for the rest of technologies is too small to extract conclusions of the trends of the research. Table 2.5 shows the distribution of the papers for each technology by area of interest. None of the papers is related with management and therefore such category does not appear in the table.

Table 2.5: Number of papers by area of interest for the three main technologies (n=96)

	Self-Service Technologies (includes Self-Checkouts)	RFID	Digital Signage
Technology Adoption	50	8	11
Analytics	1	4	0
Customer Experience	1	8	0
Review of Technology	1	10	2

2.4.2.1 Self-Service Technologies and Self-Checkouts.

As we can see in Table 2.5, the interest of scholars has been fully focused on the different aspects of technology adoption of self-service technologies. There is a variety of theoretical approaches to technology acceptance in the papers. The most used model is TAM, although it is only present in 8 papers. Through different methodologies, most papers confirm the relationship of perceived ease of use (PEOU) and perceived usefulness (PU) with attitude and adoption. The findings also show the relevance of technology anxiety (Kazancoglu & Kursunluoglu, 2018; W. I. Lee et al., 2011), perceived control and previous usage (Demoulin & Djelassi, 2016; H. J. Lee & Lyu, 2019), and enjoyment (Demoulin & Djelassi, 2016; H. J. Lee & Lyu, 2019; Weijters et al., 2007), to predict adoption. Eastlick (Eastlick et al., 2012) focused on the co-production aspects of SST and found that the attitude towards co-production of services was relevant for future intent of use.

The rest of models, represented in 9 papers, address functional aspects in line with PU and PEOU: Service quality (Demirci Orel & Kara, 2014), relative advantage (Johnson et al., 2020) or performance expectancy (Chiu et al., 2010), to name a few. Hedonic motivations (Ha, 2020; Park et al., 2020) and previous usage (Chiu et al., 2010;

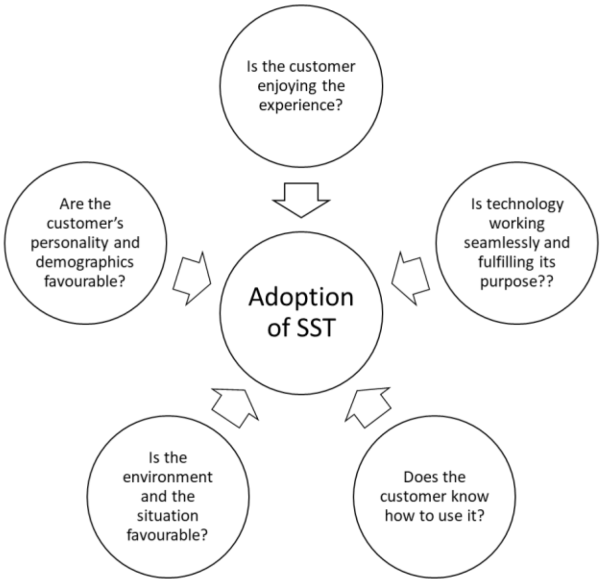
Wang et al., 2013) appear as very specific elements than contribute to SST adoption. Finally, Ha (Ha, 2020) introduce the employee presence as an element that moderates the attitude towards the retailer.

The rest of papers (33) carry out the research using other methodologies and theoretical frameworks. New research topics appear, especially personal traits and demographics, that are analysed profusely. Lee et al. (H. J. Lee et al., 2010) show that personal traits are more relevant that demographics factors. Other studies stress specific aspects, for example the need for human interaction (H. Lee & Leonas, 2020), lifestyle (Leng & Wee, 2017), gender (H. J. Lee et al., 2013), personal values (H. J. Lee & Lyu, 2016) or learning style (Cassidy et al., 2015). Akesson & Edvardsson (Åkesson & Edvardsson, 2018) define four archetypal roles of SST users that influence the perception of the technology. Situational factors and specific service moments are also interesting for scholars (Dabholkar et al., 2003) , as waiting time (Djelassi et al., 2018; Kourouthanassis et al., 2007), social pressure (Bulmer et al., 2018) or incidence recovery situations (Le et al., 2020; Zhu et al., 2013). Finally, the impact of SST in patronage is also present in the literature. Patronage may be improved by the type of SST (Esch et al., 2020), the quality of the service (Fernandes & Pedroso, 2017; H. J. Lee, 2015; H. J. Lee et al., 2009; H. J. Lee & Yang, 2013; Li et al., 2013), or the satisfaction and pleasure of using the SST (E. Y. Kim & Yang, 2018; Marzocchi & Zammit, 2006).

The 3 papers not related with SST adoption focus on Self-checkout tracking based on RFID (Hauser et al., 2019), crime prevention in self-scan checkouts (Beck, 2011) and a cross-sectors kiosk-oriented literature review (Vakulenko et al., 2018).

Figure 2.5 summarises the five main blocks found in the analysis, represented in the form of simplified questions that can be used by practitioners to take SST-related decisions.

Figure 2.5: Simplified questions to evaluate the adoption of SST technology.



Source: Prepared by authors

2.4.2.2 RFID.

The 32 papers that address RFID as main topic have an even distribution among areas of interest. Technology adoption studies use DOI and TAM as standard adoption models. Bhattacharya (Bhattacharya, 2015) and Tsai et al. (Tsai et al., 2010) prove the applicability of Roger's diffusion of innovation (Rogers, 1983) to RFID technology. Based on the TAM model, Chen (Chen, 2012) highlights that the aesthetic experience of RFID is as relevant for the intention to use than PEOU and PU. Müller-Seitz et al. (Müller-Seitz et al., 2009) highlight that, beyond the importance of PEOU and PU from the TAM model, data security concerns are relevant for the perception of RFID. Interestingly, the rest of the papers related with technology adoption focus or touch upon privacy. The legitimate concerns that exist about data privacy (Erickson & Kelly, 2007) appear as relevant traits against adoption in the work of Pramatari & Theotokis (Pramatari & Theotokis, 2009) and Venkatesh et al. (Venkatesh et al., 2017). Rothensee & Spiekermann (Rothensee & Spiekermann, 2008) defined a profile of extreme rejecters of RFID technology due to privacy concerns.

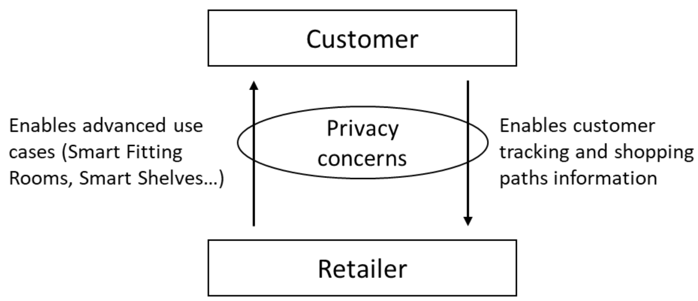
Three of the RFID articles devoted to analytics are empirical works addressing customer behaviour and data paths in physical retail environments, using data sets generated by an RFID tag attached to the bottom of a shopping cart: Larson et al. (Larson et al., 2005) obtain new paradigms related with shopper travel behaviour; Terano et al. (Terano et al., 2014) evaluate a store layout from a visit duration perspective. Finally, Syaekhoni et al. (Syaekhoni et al., 2018) propose a way to create generic shopping patterns based on a new definition of distance, to complement the previous clusters method. The fourth paper leverages the RFID-enabled products of a fashion store to demonstrate the value of the data obtained in the fitting rooms by the technology (Landmark & Sjøbakk, 2017).

Customer-experience RFID paper focus on the use case rather than in the data or the technology adoption. RFID smart assistants, described in three of the works (Chen et al., 2014; Choi et al., 2015; Hou & Chen, 2011), improve customer experience in different steps of the shopping process. The experience of a smart fitting room is used by Mukherjee et al. (Mukherjee et al., 2018) to describe the improvement of brand reputation through experience. The rest of the papers describe the value of use cases and specific applications (Ngai et al., 2008; Novotny et al., 2015; Uhrich et al., 2008). Rizzi et al. (Rizzi et al., 2016) go one step beyond and propose, after an RFID literature review, a framework to organize all potential RFID use cases.

Technology review papers focus on the technology itself from two main points of view: Technology improvements and data privacy management. Technology studies describe full operational systems (Konomi & Roussos, 2007) and propose improved systems for smart shelves and shopping trolleys (Athauda et al., 2018; Chen, 2014). Scalability of RFID systems is addressed by Sheng et al. (Sheng et al., 2008), including data management an privacy. Privacy concerns is once again relevant, due to the amount of data and interactions that can be potentially recorded; scholars have analysed the concerns and potential solutions to address this issue (Lu et al., 2011; Roussos, 2006; Slettemeås, 2009).

The approach of the research shows the specific nature of RFID technology, as an enabler of advanced use cases and a source of shopping data. A schematic representation of such relationship can be found in Figure 2.6.

Figure 2.6: Summary of research findings for RFID technology.



Source: Prepared by authors

2.4.2.3 Digital Signage.

The third technology by scholars' interest is far from the two first by number of papers. Digital signage works cover only two of the areas of interest: Technology adoption and technology review. Although probably TAM or UTAUT would be acceptable models to conduct digital signage experiments, none of the 11 papers on perception of digital signage is based in them. Research is mainly focus on how the presence of digital signage affects the attitude towards the retailer or the store (Harrison & Andrusiewicz, 2004). Digital signage increases cognition and cognition influences shopping behaviour and improves retailer perception (Dennis, Michon, et al., 2010; Dennis, Newman, et al., 2010; H. Y. Kim et al., 2020; Otterbring et al., 2014). Context and content are the two main elements that Burke (Burke, 2009) found already present in literature in 2009, and more contemporary papers are consistent with such elements. The location (context) of the screens affects their impact (Roggeveen et al., 2016; van de Sanden et al., 2020; Willems, Brengman, et al., 2017) and is relevant in waiting areas as it improves waiting experience (Garaus & Wagner, 2019). The content presented in the screens is the other key element for their influence. Recently Xaba et al. (2020) have proposed a taxonomy of types and guidelines for contents to increase utilitarian and hedonic value. Dennis et al. (Dennis et al., 2013, 2014) show the impact of information content versus experience content in the decisions taken by shoppers, and how affective content may improve brand loyalty. Roux (Roux et al., 2020) shows differences in mall perception depending on the content displayed in the screens.

2.4.3 General views on CFIST technology

The review of 9 papers that present technology overviews of CFIST technology complete the analysis. Willems et al. (Willems, Smolders, et al., 2017) present an inventory of technologies based on a systematic screening of papers and documents, and organise them based on the shopping value, and the stage of the shopping journey they are used. A similar approach is done by Wolpert & Roth (Wolpert & Roth, 2020). Using a framework based on four dimensions, they classify the 35 technologies that appeared in their review. Inman & Nikolova (Inman & Nikolova, 2017b) go one step further by defining a shopper-centric decision calculus, as they present shopper reactions as a key element to ensure technology ROI. Using Kano methodology, Baier & Rese (Baier & Rese, 2020) analyse the way that retailers may prioritise CFIST technology and apply it, based on 37 technology options, to a real case study. Beyond the proposition of frameworks, literature present empirical analysis of the situation of brick-and-mortar retail in specific environments, specifically in UK and Croatia (Pantano & Vannucci, 2019; Renko & Druzijanic, 2014). All works acknowledge the role that smart technology plays in the future of brick-and-mortar retail and the still limited research done in this field (Dekimpe et al., 2020; Grewal et al., 2018; Hwangbo et al., 2017).

2.4.4 Discussion

The analysis of the studies included in this literature review generates several relevant findings. First, table 3 shows that the interest for the technology focuses on retail journals, while management and marketing journals lag behind. This fact shows that the importance of CFIST technologies is still reduced to the technology itself, and scholars are not linking the technology with the strategy of the company. Although we can find extant literature about e-commerce management and strategy, only 6 papers (3,6%) of the sample are classified as having a management approach, and only two one of them are published in management journals: Jocevski (Jocevski, 2020) in *California Management Review* and Vojvodić (Vojvodić, 2019) in *Strategic Management*. Strategies for the brick-and-mortar survival are still at their early stages and the CFIST technologies have not burst yet into the management scene.

Second, although there is a lot of research around CFIST technologies, "there is, as of yet, no investigation that comprehensively explains how they [the technologies] can be combined together seamlessly in the real world retail environment." (Hwangbo et al., 2017). The number of works related with CFIST technologies is important, but the breadth of the category make scholars state that most of areas are understudied. (Dekimpe et al., 2020). Although some works pretend to organize the category and create frameworks (Rizzi et al., 2016; Wolpert & Roth, 2020), there is no conceptual organization allowing scholars to delve into understudied topics in a systematic way on top of previous research. Technology adoption works cover specific and isolated technologies; a unified and commonly accepted framework could help to analyse the combination of technologies in a single experiment.

Third, although all works claim that CFIST technologies improve customer satisfaction or retailer's efficiency, none of the works show actual data that relates the technologies with an objective increase on sales and a return of investment (ROI). Retailers are not sharing the information related with objective performance and therefore scholars are only able to work on perceived constructs or secondary data, like store dwell time (Terano et al., 2014). This gap reduces the value of the findings for practitioners, that are reluctant to invest in technologies without evidence of ROI.

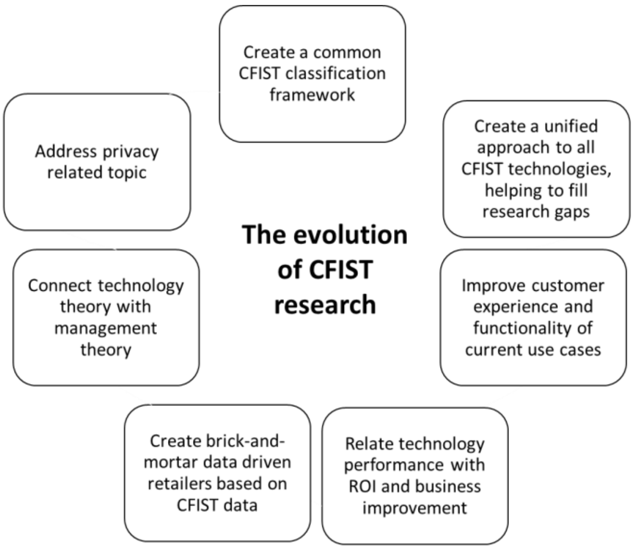
Fourth, there is an uneven distribution of the interest of scholars in CFIST. Some topics are addressed by several papers while we find noteworthy gaps in some others. For example, the perceived risks are not studied for SST (Kazancoglu & Kursunluoglu, 2018; W. I. Lee et al., 2011), but are found relevant in the studies related with RFID (Chen, 2012; Müller-Seitz et al., 2009). Although RFID may be seen as less respectful with privacy than other technologies (Thiesse, 2007), topics like security should be more horizontal to the overall research and all CFIST related technologies should be studied under the data privacy scope. This situation requires the standardization of the relevant aspects of the technology from a business perspective. A methodology would help to detect and fill the gaps, together with the abovementioned common framework.

Fifth, all studies related with analytics show the ability of the technology to obtain in-depth data of the shopping journey of the customers inside the store. But none of them use this data to improve the revenues or any other key point indicator of the business. Although there is several studies of the value of data in eCommerce

(Vakhutinsky et al., 2019; Zumstein & Kotowski, 2020), and even studies of revenue impact of some data in the physical retail (Anic et al., 2010; Yiu & Ng, 2010), when it comes to CFIST we could not found evidence of such relationship. This finding is relevant in the current evolution of all businesses towards data-driven organizations and consistent with the study of Germann et al. (Germann et al., 2014), that shown that top managers did not see potential in the physical analytics in order to invest in appropriate levels. Nevertheless, there are several benefits in data-driven organisations (Santoro et al., 2019), and we predict an increase of such studies in the next years.

Figure 2.7 sums up the main findings of this study, presented as a proposed set of actions to mitigate the limitations of the status of the research.

Figure 2.7: Recommendations for the evolution of CFIST research.



Source: Prepared by authors

2.5 Conclusions

The objective of this paper was to conduct a literature review of existing works related with CFIST technology and their impact in customer experience. Through a quantitative and qualitative analysis, we have presented the main research topics and the main conclusions of scholars. Previous literature reviews were partial (Rizzi et al., 2016; Vakulenko et al., 2018) or lacking of a quantitative methodology (Willems, Smolders, et al., 2017). Our work updates also previous literature reviews as 51,2% of all relevant papers have been published in the period 2017-2020. This also shows the growing importance of the topic that we address and how it is becoming more interesting in the last few years.

There are three main contributions of this study. First, we provide scholars and practitioners with a unique and updated overview of CFIST technologies from a research point of view, accelerating further research. Second, we highlight the most relevant findings of the papers analysed, showing research gaps and the major trends. Third, our results enable scholars and practitioners to undertake specific actions thanks to the action proposals that summarise the findings, as shown in Figure 7. Scholar looking to contribute to the CFIST research may use the seven recommendations to guide their work.

This study also has managerial implications. Retail managers must include CFIST technology in their strategies, not as an experiential element but as a transformational element that will reshape the brick-and-mortar business. They must focus on the ROI of their investments and the value of the data generated by the interactions of customers.

Chief Digital Officers of retail companies must consider the physical channel technology in the same way that they consider the online technology, demanding similar management tools to CFIST technologies. Our work may help them to have a first overview of the benefits of the different technologies.

This work is not free of limitations. As there is no clear definition or taxonomy of CFIST services, the scope of technologies and their organisation for the research has been decided by the authors, and probably other scholars could provide different frameworks to address the same topic. Although all papers included in this work belong to CFIST category, it is likely that other views could add additional works to the analysis. Sources can also be a limitation of this paper. Retail technology is very close to business and part of the exploratory research may be published in symposiums or non-scientific documents that we have decided to exclude here. Further work could analyse the use cases of technologies of such sources, mentioning the limitations of their value from a scientific point of view.

This work opens several avenues of research for scholars, as multiple gaps and limitations of existing research have been pointed out. To name some examples, scholar can choose to follow Figure 5 to delve into the definition of the best SST solutions to improve the customer experience and store revenue; they can also analyse empirical evidence of increases of sales due to CFIST technologies or address the privacy issues of the technology for all CFIST technologies, as proposed in Figure 7. Among all the options, we encourage scholars to propose systematic frameworks to build the future research in a structured way. Both practitioners and scholars must collaborate to retrieve and use commercial information of the impact in the business of CFIST technologies, to obtain conclusive findings that relate technology with business. Practitioners should review the main findings of this work that may help them to decide the priorities to evolve in their digital transformation of their physical stores.

2.6 References

Adapa, S., Fazal-e-Hasan, S. M., Makam, S. B., Azeem, M. M., & Mortimer, G. (2020). Examining the antecedents and consequences of perceived shopping value through smart retail technology. *Journal of Retailing and Consumer Services*, *52*(August 2019), 101901. https://doi.org/10.1016/j.jretconser.2019.101901

Aguinis, H., Ramani, R. S., & Alabduljader, N. (2018). What you see is what you get? Enhancing methodological transparency in management research. In *Academy of Management Annals* (Vol. 12, Issue 1, pp. 83–110). Routledge. https://doi.org/10.5465/annals.2016.0011

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Åkesson, M., & Edvardsson, B. (2018). Customer roles from a self-service system perspective. *International Journal of Quality and Service Sciences*, *10*(2), 196–210. https://doi.org/10.1108/IJQSS-10-2017-0089

Anic, I. D., Radas, S., & Lim, L. K. S. (2010). Relative effects of store traffic and customer traffic flow on shopper spending. *International Review of Retail, Distribution and Consumer Research*, *20*(2), 237–250. https://doi.org/10.1080/09593961003701841

Arora, S., & Sahney, S. (2017). Webrooming behaviour: a conceptual framework. In *International Journal of Retail & Distribution Management* (Vol. 45, Issues 7–8). https://doi.org/10.1108/IJRDM-09-2016-0158

Athauda, T., Marin, J. C. L., Lee, J., & Karmakar, N. C. (2018). Robust Low-Cost Passive UHF RFID Based Smart Shopping Trolley. *IEEE Journal of Radio Frequency Identification*, *2*(3), 134–143. https://doi.org/10.1109/jrfid.2018.2866087

Baier, D., & Rese, A. (2020). How to increase multichannel shopping satisfaction? An adapted Kano based stage-gate approach to select new technologies. *Journal of Retailing and Consumer Services*, *56*, 157–163. https://doi.org/10.1016/j.jretconser.2020.102172

Balaji, M. S., Roy, S. K., Sengupta, A., & Chong, A. (2018). User Acceptance of IoT Applications in Retail Industry. In IGI Global (Ed.), *Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications* (pp. 1331–1352). https://doi.org/10.4018/978-1-5225-5201-7.ch061

Beck, A. (2011). Self-scan checkouts and retail loss: Understanding the risk and minimising the threat. *Security Journal*, *24*(3), 199–215. https://doi.org/10.1057/sj.2011.13

Betzing, J. H., Hoang, A. Q. M., & Becker, J. (2018). In-store technologies in the retail servicescape. *MKWI 2018 - Multikonferenz Wirtschaftsinformatik*, *2018-March*, 1671–1682.

Bhattacharya, M. (2015). A conceptual framework of RFID adoption in retail using Rogers stage model. *Business Process Management Journal*, *21*(3), 517–540. https://doi.org/10.1108/BPMJ-06-2014-0047

Bulmer, S., Elms, J., & Moore, S. (2018). Exploring the adoption of self-service checkouts and the associated social obligations of shopping practices. *Journal of Retailing and Consumer Services*, *42*, 107–116. https://doi.org/10.1016/j.jretconser.2018.01.016

Burke, R. R. (2009). Behavioral effects of digital signage. *Journal of Advertising Research*, *49*(2). https://doi.org/10.2501/S0021849909090254

Cassidy, K., Baron, S., & Lu, X. (2015). How customers 'learn' to work for retailers. *Journal of Marketing Management*, *31*(17–18), 1747–1772. https://doi.org/10.1080/0267257X.2015.1020329

Celik, F. (2016). Internet of Things as a source of future marketing tools. *7th IBA Bachelor Thesis Conference*.

Chen, C. C. (2012). Identifying drivers for adoption intention in RFID service. *International Journal of Mobile Communications*, *10*(3), 231–247. https://doi.org/10.1504/IJMC.2012.048110

Chen, C. C. (2014). RFID-based intelligent shopping environment: a comprehensive evaluation framework with neural computing approach. *Neural Computing and Applications*, *25*(7–8), 1685–1697. https://doi.org/10.1007/s00521-014-1652-7

Chen, C. C., Huang, T. C., Park, J. J., Tseng, H. H., & Yen, N. Y. (2014). A smart assistant toward product-awareness shopping. *Personal and Ubiquitous Computing*, *18*(2), 339–349. https://doi.org/10.1007/s00779-013-0649-z

Chiu, Y. T. H., Fang, S. C., & Tseng, C. C. (2010). Early versus potential adopters: Exploring the antecedents of use intention in the context of retail service innovations. *International Journal of Retail & Distribution Management*, *38*(6), 443–459. https://doi.org/10.1108/09590551011045357

Chocarro, R., Cortiñas, M., & Villanueva, M. L. (2013). Situational variables in online versus offline channel choice. *Electronic Commerce Research and Applications*, *12*(5), 347–361. https://doi.org/10.1016/j.elerap.2013.03.004

Choi, S. H., Yang, Y. X., Yang, B., & Cheung, H. H. (2015). Item-level RFID for enhancement of customer shopping experience in apparel retail. *Computers in Industry*, *71*, 10–23. https://doi.org/10.1016/j.compind.2015.03.003

Clement, J. (2019). *E-commerce share of total global retail sales from 2015 to 2023*. Statista. https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/

Corkery, M. (2017). *Is American Retail at a Historic Tipping Point?* The New York Times. https://www.nytimes.com/2017/04/15/business/retail-industry.html

Dabholkar, P. A., Bobbitt, L. M., & Lee, E. J. (2003). Understanding consumer motivation and behavior related to self-scanning in retailing implications for strategy and research on technology-based self-service. *International Journal of Service Industry Management*, *14*(1), 59–95. https://doi.org/10.1108/09564230310465994

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Deci, E. L., Eghrarl, H., Patrick, B. C., & Leone, D. R. (1994). Facilitation Internalization: The Self-Determinatlon Theory Perspective. *Journal of Personality*, *62*(March 1994), 119–142.

Dekimpe, M. G., Geyskens, I., & Gielens, K. (2020). Using technology to bring online convenience to offline shopping. *Marketing Letters*, *31*(1), 25–29.

https://doi.org/10.1007/s11002-019-09508-5

Demirci Orel, F., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. *Journal of Retailing and Consumer Services*, *21*(2), 118–129. https://doi.org/10.1016/j.jretconser.2013.07.002

Demoulin, N. T. M., & Djelassi, S. (2016). An integrated model of self-service technology (SST) usage in a retail context. *International Journal of Retail & Distribution Management*, *44*(5), 540–559. https://doi.org/10.1108/IJRDM-08-2015-0122

Dennis, C., Joško Brakus, J., & Alamanos, E. (2013). The wallpaper matters: Digital signage as customer-experience provider at the Harrods (London, UK) department store. *Journal of Marketing Management*, *29*(3–4), 338–355. https://doi.org/10.1080/0267257X.2013.766628

Dennis, C., Joško Brakus, J., Gupta, S., & Alamanos, E. (2014). The effect of digital signage on shoppers' behavior: The role of the evoked experience. *Journal of Business Research*, *67*(11), 2250–2257. https://doi.org/10.1016/j.jbusres.2014.06.013

Dennis, C., Michon, R., & Newman, A. (2010). The appeal of a town's separately branded environments to market segments and the segmented appeal of digital signage. *Place Branding and Public Diplomacy*, *6*(2), 156–175. https://doi.org/10.1057/pb.2010.14

Dennis, C., Newman, A., Michon, R., Josko Brakus, J., & Tiu Wright, L. (2010). The mediating effects of perception and emotion: Digital signage in mall atmospherics. *Journal of Retailing and Consumer Services*, *17*(3), 205–215. https://doi.org/10.1016/j.jretconser.2010.03.009

DePietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology and environment. In L. G. Tornatzky & M. Fleischer (Eds.), *The processes of technological innovation* (pp. 151–175). Lexington Books.

Djelassi, S., Diallo, M. F., & Zielke, S. (2018). How self-service technology experience evaluation affects waiting time and customer satisfaction? A moderated mediation model. *Decision Support Systems*, *111*, 38–47. https://doi.org/10.1016/j.dss.2018.04.004

Eastlick, M. A., Ratto, C., Lotz, S. L., & Mishra, A. (2012). Exploring antecedents of attitude toward co-producing a retail checkout service utilizing a self-service technology. *International Review of Retail, Distribution and Consumer Research*, *22*(4), 337–364. https://doi.org/10.1080/09593969.2012.690775

Erickson, G. S., & Kelly, E. P. (2007). Building competitive advantage with radio frequency identification tags. *Competitiveness Review*, *17*(1–2), 37–46. https://doi.org/10.1108/10595420710816597

Esch, P. van, Cui, Y., & Jain, S. P. (2020). Stimulating or Intimidating: The Effect of AI-Enabled In-Store Communication on Consumer Patronage Likelihood. *Journal of Advertising*. https://doi.org/10.1080/00913367.2020.1832939

Fernandes, T., & Pedroso, R. (2017). The effect of self-checkout quality on customer satisfaction and repatronage in a retail context. *Service Business*, *11*(1), 69–92. https://doi.org/10.1007/s11628-016-0302-9

Garaus, M., & Wagner, U. (2019). Let me entertain you – Increasing overall store satisfaction through digital signage in retail waiting areas. *Journal of Retailing and Consumer Services*, *47*, 331–338. https://doi.org/10.1016/j.jretconser.2018.12.008

Germann, F., Lilien, G. L., Fiedler, L., & Kraus, M. (2014). Do Retailers Benefit from Deploying Customer Analytics? *Journal of Retailing*, *90*(4), 587–593. https://doi.org/10.1016/j.jretai.2014.08.002

Grewal, D., Motyka, S., & Levy, M. (2018). The Evolution and Future of Retailing and Retailing Education. *Journal of Marketing Education*, *40*(1), 85–93. https://doi.org/10.1177/0273475318755838

Grewal, D., Noble, S. M., Roggeveen, A. L., & Nordfalt, J. (2020). The future of in-store technology. *Journal of the Academy of Marketing Science*, *48*(1), 96–113. https://doi.org/10.1007/s11747-019-00697-z

Grewal, D., Roggeveen, A. L., & Nordfält, J. (2017). The Future of Retailing. *Journal of Retailing*, *93*(1), 1–6. https://doi.org/10.1016/j.jretai.2016.12.008

Ha, Y. (2020). The effects of shoppers' motivation on self-service technology use intention: Moderating effects of the presence of employee. *Journal of Asian Finance, Economics and Business*, *7*(9), 489–497. https://doi.org/10.13106/JAFEB.2020.VOL7.NO9.489

Harrison, J. V., & Andrusiewicz, A. (2004). A virtual marketplace for advertising narrowcast over digital signage networks. *Electronic Commerce Research and Applications*, *3*(2), 163–175. https://doi.org/10.1016/j.elerap.2004.02.004

Hauser, M., Günther, S. A., Flath, C. M., & Thiesse, F. (2019). Towards Digital Transformation in Fashion Retailing: A Design-Oriented IS Research Study of Automated Checkout Systems. *Business and Information Systems Engineering*, *61*(1), 51–66. https://doi.org/10.1007/s12599-018-0566-9

Helm, S., Kim, S. H., & Van Riper, S. (2018). Navigating the 'retail apocalypse': A framework of consumer evaluations of the new retail landscape. *Journal of Retailing and Consumer Services*, *April*, 0–1. https://doi.org/10.1016/j.jretconser.2018.09.015

Hill, R. J., Fishbein, M., & Ajzen, I. (1977). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. *Contemporary Sociology*, *6*(2), 244. https://doi.org/10.2307/2065853

Hou, J. L., & Chen, T. G. (2011). An RFID-based Shopping Service System for retailers. *Advanced Engineering Informatics*, *25*(1), 103–115. https://doi.org/10.1016/j.aei.2010.04.003

Hwangbo, H., Kim, Y. S., & Cha, K. J. (2017). Use of the Smart Store for Persuasive Marketing and Immersive Customer Experiences: A Case Study of Korean Apparel Enterprise. *Mobile Information Systems*, *2017*. https://doi.org/10.1155/2017/4738340

Inman, J. J., & Nikolova, H. (2017a). Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, *93*(1), 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Inman, J. J., & Nikolova, H. (2017b). Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, *93*(1), 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Jocevski, M. (2020). Blurring the Lines between Physical and Digital Spaces: Business Model Innovation in Retailing. *California Management Review*, *63*(1), 99–117.

https://doi.org/10.1177/0008125620953639

Johnson, V. L., Woolridge, R. W., Wang, W., & Bell, J. R. (2020). The Impact of Perceived Privacy, Accuracy and Security on the Adoption of Mobile Self-Checkout Systems. *Journal of Innovation Economics & Management*, *31*(1), 221. https://doi.org/10.3917/jie.pr1.0065

Kazancoglu, I., & Kursunluoglu, E. (2018). How food retailing changed in Turkey: spread of self-service technologies. *British Food Journal*, *120*(2), 290–308. https://doi.org/10.1108/BFJ-03-2017-0189

Kim, E. Y., & Yang, K. (2018). Self-service technologies (SSTs) streamlining consumer experience in the fashion retail stores: The role of perceived interactivity. *Journal of Global Fashion Marketing*, *9*(4), 287–304. https://doi.org/10.1080/20932685.2018.1503558

Kim, H. Y., Lee, Y., Cho, E., & Jung, Y. J. (2020). Digital atmosphere of fashion retail stores. *Fashion and Textiles*, *7*(1). https://doi.org/10.1186/s40691-020-00217-6

Konomi, S., & Roussos, G. (2007). Ubiquitous computing in the real world: Lessons learnt from large scale RFID deployments. In *Personal and Ubiquitous Computing* (Vol. 11, Issue 7, pp. 507–521). https://doi.org/10.1007/s00779-006-0116-1

Kourouthanassis, P. E., Giaglis, G. M., & Vrechopoulos, A. P. (2007). Enhancing user experience through pervasive information systems: The case of pervasive retailing. *International Journal of Information Management*, *27*(5), 319–335. https://doi.org/10.1016/j.ijinfomgt.2007.04.005

Lal, B., & Chavan, C. R. (2019). A Road Map: E-Commerce to World Wide Web Growth of Business World. *Global Journal of Management And Business Research*, *19*(11), 1–

11.

Landmark, A. D., & Sjøbakk, B. (2017). Tracking customer behaviour in fashion retail using RFID. *International Journal of Retail & Distribution Management*, *45*(7–8), 844–858. https://doi.org/10.1108/IJRDM-10-2016-0174

Larson, J. S., Bradlow, E. T., & Fader, P. S. (2005). An exploratory look at supermarket shopping paths. *International Journal of Research in Marketing*, *22*(4), 395–414. https://doi.org/10.1016/j.ijresmar.2005.09.005

Le, N. T., Rao Hill, S., & Troshani, I. (2020). Perceived Control and Perceived Risk in Self-service Technology Recovery. *Journal of Computer Information Systems*. https://doi.org/10.1080/08874417.2020.1756533

Lee, H. J. (2015). Consumer-to-store employee and consumer-to-self-service technology (SST) interactions in a retail setting. *International Journal of Retail & Distribution Management*, *43*(8), 676–692. https://doi.org/10.1108/IJRDM-04-2014-0049

Lee, H. J., Cho, H. J., Xu, W., & Fairhurst, A. (2010). The influence of consumer traits and demographics on intention to use retail self-service checkouts. *Marketing Intelligence and Planning*, *28*(1), 46–58. https://doi.org/10.1108/02634501011014606

Lee, H. J., Fairhurst, A., & Cho, H. J. (2013). Gender differences in consumer evaluations of service quality: self-service kiosks in retail. *Service Industries Journal*, *33*(2), 248–265. https://doi.org/10.1080/02642069.2011.614346

Lee, H. J., Fairhurst, A. E., & Lee, M. Y. (2009). The importance of self-service kiosks in developing consumers' retail patronage intentions. *Managing Service Quality*, *19*(6), 687–701. https://doi.org/10.1108/09604520911005071

Lee, H. J., & Lyu, J. (2016). Personal values as determinants of intentions to use self-service technology in retailing. *Computers in Human Behavior*, *60*, 322–332. https://doi.org/10.1016/j.chb.2016.02.051

Lee, H. J., & Lyu, J. (2019). Exploring factors which motivate older consumers' self-service technologies (SSTs) adoption. *International Review of Retail, Distribution and Consumer Research*, *29*(2), 218–239. https://doi.org/10.1080/09593969.2019.1575261

Lee, H. J., & Yang, K. (2013). Interpersonal service quality, self-service technology (SST) service quality, and retail patronage. *Journal of Retailing and Consumer Services*, *20*(1), 51–57. https://doi.org/10.1016/j.jretconser.2012.10.005

Lee, H., & Leonas, K. K. (2020). Millennials' Intention to Use Self-Checkout Technology in Different Fashion Retail Formats: Perceived Benefits and Risks. *Clothing and Textiles Research Journal*. https://doi.org/10.1177/0887302X20926577

Lee, W. I., Chiu, Y. T., Liu, C. C., & Chen, C. Y. (2011). Assessing the effects of consumer involvement and service quality in a self-service setting. *Human Factors and Ergonomics In Manufacturing*, *21*(5), 504–515. https://doi.org/10.1002/hfm.20253

Leng, H. K., & Wee, K. N. L. (2017). An examination of users and non-users of self-checkout counters. *International Review of Retail, Distribution and Consumer Research*, *27*(1), 94–108. https://doi.org/10.1080/09593969.2016.1221842

Li, M., Choi, T. Y., Rabinovich, E., & Crawford, A. (2013). Self-service operations at retail stores: The role of inter-customer interactions. *Production and Operations Management*, *22*(4), 888–914. https://doi.org/10.1111/j.1937-5956.2012.01321.x

Lin, J. S. C., & Hsieh, P. L. (2011). Assessing the Self-service Technology Encounters:

Development and Validation of SSTQUAL Scale. *Journal of Retailing*, *87*(2), 194–206. https://doi.org/10.1016/j.jretai.2011.02.006

Lorente-Martínez, J., Navío-Marco, J., & Rodrigo-Moya, B. (2020). Analysis of the adoption of customer facing InStore technologies in retail SMEs. *Journal of Retailing and Consumer Services*, *57*, 1–9. https://doi.org/10.1016/j.jretconser.2020.102225

Lu, M. C., Ku, C. Y., Hwang, L. C., & Chao, H. M. (2011). Using smart card in RFID infrastructure to protect consumer privacy. *International Journal of Innovative Computing, Information and Control*, *7*(4), 1777–1788.

Marzocchi, G. L., & Zammit, A. (2006). Self-scanning technologies in retail: Determinants of adoption. *Service Industries Journal*, *26*(6), 651–669. https://doi.org/10.1080/02642060600850790

Mehrabian, A., & Russell, J. A. (1974). An approach to environmental psychology. In *The MIT Press*. https://doi.org/10.1049/ep.1972.0130

Mukherjee, A., Smith, R. J., & Turri, A. M. (2018). The smartness paradox: the moderating effect of brand quality reputation on consumers' reactions to RFID-based smart fitting rooms. *Journal of Business Research*, *92*, 290–299. https://doi.org/10.1016/j.jbusres.2018.07.057

Müller-Seitz, G., Dautzenberg, K., Creusen, U., & Stromereder, C. (2009). Customer acceptance of RFID technology: Evidence from the German electronic retail sector. *Journal of Retailing and Consumer Services*, *16*(1), 31–39. https://doi.org/10.1016/j.jretconser.2008.08.002

Ngai, E. W. T., Moon, K. K. L., Liu, J. N. K., Tsang, K. F., Law, R., Suk, F. F. C., & Wong, I. C.

L. (2008). Extending CRM in the Retail Industry: An RFID-Based Personal Shopping Assistant System. *Communications of the Association for Information Systems*, *23*, 277–294. https://doi.org/10.17705/1cais.02316

Novotny, Á., Dávid, L., & Csáfor, H. (2015). Applying rfid technology in the retail industry - benefits and concerns from the consumer's perspective. *Amfiteatru Economic*, *17*(39), 615–631.

Nowodzinski, P., Łukasik, K., & Puto, A. (2016). Internet Of Things (Iot) In A Retail Environment. The New Strategy For Firm's Development. *European Scientific Journal, ESJ*, *12*(10), 332–341.

Otterbring, T., Wästlund, E., Gustafsson, A., & Shams, P. (2014). Vision (im)possible? The effects of in-store signage on customers' visual attention. *Journal of Retailing and Consumer Services*, *21*(5), 676–684. https://doi.org/10.1016/j.jretconser.2014.05.002

Pantano, E., Priporas, C. V., & Dennis, C. (2018). A new approach to retailing for successful competition in the new smart scenario. *International Journal of Retail & Distribution Management*, *46*(3), 264–282. https://doi.org/10.1108/IJRDM-04-2017-0080

Pantano, E., & Vannucci, V. (2019). Who is innovating? An exploratory research of digital technologies diffusion in retail industry. *Journal of Retailing and Consumer Services*, *49*, 297–304. https://doi.org/10.1016/j.jretconser.2019.01.019

Parasuraman, A. (2000). Technology Readiness Index (Tri): A Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *Journal of Service Research*, *2*(4), 307–320. https://doi.org/10.1177/109467050024001

Park, J. S., Ha, S., & Jeong, S. W. (2020). Consumer acceptance of self-service technologies in fashion retail stores. *Journal of Fashion Marketing and Management*. https://doi.org/10.1108/JFMM-09-2019-0221

Pramatari, K., & Theotokis, A. (2009). Consumer acceptance of RFID-enabled services: A model of multiple attitudes, perceived system characteristics and individual traits. *European Journal of Information Systems*, *18*(6), 541–552. https://doi.org/10.1057/ejis.2009.40

Rashid, Z., Peig, E., & Pous, R. (2015). Bringing online shopping experience to offline retail through augmented reality and RFID. *Proceedings - 2015 5th International Conference on the Internet of Things, IoT 2015*, *June 2017*, 45–51. https://doi.org/10.1109/IOT.2015.7356547

Renko, S., & Druzijanic, M. (2014). Perceived usefulness of innovative technology in retailing: Consumers' and retailers' point of view. *Journal of Retailing and Consumer Services*, *21*(5), 836–843. https://doi.org/10.1016/j.jretconser.2014.02.015

Rizzi, A., Romagnoli, G., & Thiesse, F. (2016). A new framework for RFID use cases in fashion and apparel retailing. In *International Journal of RF Technologies: Research and Applications* (Vol. 7, Issues 2–3, pp. 105–129). https://doi.org/10.3233/RFT-150075

Rogers, E. M. (1983). *Diffusion of Innovations* (Free Press of Glencoe (ed.); 3rd ed.).

Roggeveen, A. L., Nordfält, J., & Grewal, D. (2016). Do Digital Displays Enhance Sales? Role of Retail Format and Message Content. *Journal of Retailing*, *92*(1). https://doi.org/10.1016/j.jretai.2015.08.001

Roggeveen, A. L., & Sethuraman, R. (2020). Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions. In *Journal of Retailing* (Vol. 96, Issue 3, pp. 299–309). Elsevier Ltd. https://doi.org/10.1016/j.jretai.2020.08.001

Rothensee, M., & Spiekermann, S. (2008). Between extreme rejection and cautious acceptance: Consumers' reactions to RFID-based IS in retail. *Social Science Computer Review*, *26*(1), 75–86. https://doi.org/10.1177/0894439307307687

Roussos, G. (2006). Enabling RFID in retail. *Computer*, *39*(3), 25–30. https://doi.org/10.1109/MC.2006.88

Roux, T., Mahlangu, S., & Manetje, T. (2020). Digital signage as an opportunity to enhance the mall environment: a moderated mediation model. *International Journal of Retail and Distribution Management*, *48*(10), 1099–1119. https://doi.org/10.1108/IJRDM-10-2018-0220

Roy, S. K., Balaji, M. S., Quazi, A., & Quaddus, M. (2018). Predictors of customer acceptance of and resistance to smart technologies in the retail sector. *Journal of Retailing and Consumer Services*, *42*, 147–160. https://doi.org/10.1016/j.jretconser.2018.02.005

Santoro, G., Fiano, F., Bertoldi, B., & Ciampi, F. (2019). Big data for business management in the retail industry. *Management Decision*, *57*(8), 1980–1992. https://doi.org/10.1108/MD-07-2018-0829

Sheng, Q. Z., Li, X., & Zeadally, S. (2008). Enabling next-generation RFID applications: Solutions and challenges. *Computer*, *41*(9), 21–28. https://doi.org/10.1109/MC.2008.386

Slettemeås, D. (2009). RFID - The "next step" in consumer-product relations or orwellian nightmare? Challenges for research and policy. *Journal of Consumer Policy*, *32*(3), 219–244. https://doi.org/10.1007/s10603-009-9103-z

Spanke, M. (2020). Retail Isn't Dead. In Palgrave McMillan (Ed.), *Retail Isn't Dead*. Springer International Publishing. https://doi.org/10.1007/978-3-030-36650-6

Syaekhoni, M. A., Lee, C., & Kwon, Y. S. (2018). Analyzing customer behavior from shopping path data using operation edit distance. *Applied Intelligence*, *48*(8), 1912–1932. https://doi.org/10.1007/s10489-016-0839-2

Terano, T., Kitazawa, M., Yamada, T., Takahashi, M., Yamamoto, G., Yoshikawa, A., & Fujino, T. (2014). Analyzing In-store Shopping Paths from Indirect Observation with RFIDTags Communication Data. *Journal on Innovation and Sustainability*, *5*(1), 88. https://doi.org/10.24212/2179-3565.2014v5i1p88-96

Thiesse, F. (2007). RFID, privacy and the perception of risk: A strategic framework. *Journal of Strategic Information Systems*, *16*(2), 214–232. https://doi.org/10.1016/j.jsis.2007.05.006

Tsai, M. C., Lee, W., & Wu, H. C. (2010). Determinants of RFID adoption intention: Evidence from Taiwanese retail chains. *Information and Management*, *47*(5–6), 255–261. https://doi.org/10.1016/j.im.2010.05.001

Uhrich, F., Sandner, U., Resatsch, F., Leimeister, J. M., & Krcmar, H. (2008). RFID in Retailing and Customer Relationship Management. *Communications of the Association for Information Systems*, *23*, 219–234. https://doi.org/10.17705/1cais.02313

Vakhutinsky, A., Mihic, K., & Wu, S.-M. (2019). A Prescriptive Analytics Approach to

Markdown Pricing for an E-Commerce Retailer. *Journal of Pattern Recognition Research*, *13*(1), 1–21. http://jprr.org/index.php/jprr/article/view/842

Vakulenko, Y., Hellström, D., & Oghazi, P. (2018). Customer value in self-service kiosks: a systematic literature review. In *International Journal of Retail & Distribution Management* (Vol. 46, Issue 5, pp. 507–527). Emerald Group Publishing Ltd. https://doi.org/10.1108/IJRDM-04-2017-0084

van de Sanden, S., Willems, K., & Brengman, M. (2020). How do consumers process digital display ads in-store? The effect of location, content, and goal relevance. *Journal of Retailing and Consumer Services*, *56*. https://doi.org/10.1016/j.jretconser.2020.102177

Venkatesh, V., Aloysius, J. A., Hoehle, H., & Burton, S. (2017). Design and evaluation of auto-ID enabled shopping assistance artifacts in customers' mobile phones: Two retail store laboratory experiments. *MIS Quarterly: Management Information Systems*, *41*(1), 83–113. https://doi.org/10.25300/MISQ/2017/41.1.05

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Vojvodić, K. (2019). Brick-and-mortar retailers: Becoming smarter with innovative technologies. *Strategic Management*, *24*(2), 3–11. https://doi.org/10.5937/straman1902003v

Wang, C., Harris, J., & Patterson, P. (2013). The Roles of Habit, Self-Efficacy, and Satisfaction in Driving Continued Use of Self-Service Technologies: A Longitudinal Study. *Journal of Service Research*, *16*(3), 400–414.

https://doi.org/10.1177/1094670512473200

Weijters, B., Rangarajan, D., Falk, T., & Schillewaert, N. (2007). Determinants and outcomes of customers' use of self-service technology in a retail setting. *JOURNAL OF SERVICE RESEARCH*, *10*(1), 3–21. https://doi.org/10.1177/1094670507302990

Willems, K., Brengman, M., & van de Sanden, S. (2017). In-store proximity marketing: experimenting with digital point-of-sales communication. *International Journal of Retail & Distribution Management*, *45*(7–8), 910–927. https://doi.org/10.1108/IJRDM-10-2016-0177

Willems, K., Smolders, A., Brengman, M., Luyten, K., & Schöning, J. (2017). The path-to-purchase is paved with digital opportunities: An inventory of shopper-oriented retail technologies. *Technological Forecasting and Social Change*, *124*, 228–242. https://doi.org/10.1016/j.techfore.2016.10.066

Wilson, M. (2013). *Consumers prefer customized in-store experiences over online*. CSA. https://chainstoreage.com/operations/survey-consumers-prefer-customized-store-experiences-over-online

Wolpert, S., & Roth, A. (2020). Development of a classification framework for technology based retail services: a retailers' perspective. *International Review of Retail, Distribution and Consumer Research*, *30*(5), 498–538. https://doi.org/10.1080/09593969.2020.1768575

Xaba, E. M., Roux, A. T., & Drotsky, G. A. P. (2020). Taxonomy of digital signage message execution and media placement considerations. *The Retail and Marketing Review*, *16*(1), 11–25.

Yiu, C. Y., & Ng, H. C. (2010). Buyers-to-shoppers ratio of shopping malls: A probit study in Hong Kong. *Journal of Retailing and Consumer Services*, *17*(5), 349–354. https://doi.org/10.1016/j.jretconser.2010.03.016

Zhu, Z., Nakata, C., Sivakumar, K., & Grewal, D. (2013). Fix It or Leave It? Customer Recovery from Self-service Technology Failures. *Journal of Retailing*, *89*(1), 15–29. https://doi.org/10.1016/j.jretai.2012.10.004

Zumstein, D., & Kotowski, W. (2020). Success Factors of E-Commerce - Drivers of the Conversion Rate and Basket Value. *18th International Conference E-Society 2020*, *April*, 43–50. https://doi.org/10.33965/es2020_202005l006

3. ANALYSIS OF THE ADOPTION OF CUSTOMER FACING IN-STORE TECHNOLOGIES IN RETAIL SMEs

3 ANALYSIS OF THE ADOPTION OF CUSTOMER FACING IN-STORE TECHNOLOGIES IN RETAIL SMES

3.1 Abstract

Brick and mortar stores are suffering the dramatic revolution of the retail sector. Customer facing in-store technologies (CFIST) are a key component of the inevitable transformation of retail stores; yet the reasons to adopt such technologies by business owners may be little known. Based on a TOE and TAM inspired framework, this study analyses the drivers of such decision by small and medium size enterprises using a survey methodology. The results show that the attitude towards technology is the strongest predictor of the intention to adopt CFIST, highlighting the role of the top management in technology decisions. This conclusion has important implications for practitioners. This research is the first to address the adoption of CFIST by SMEs and therefore set the path for further studies about the impact and adoption of in-store technology in SMEs.

3.2 Introduction

Small and Medium Enterprises (SMEs)[2] are the most common form of enterprise in the European Union, accounting for 66% of all jobs and 99% of all companies (Eurostat, 2018). In the retail sector alone there are 3.6 million businesses, employing 8.3% of the whole European labour force (Euro Commerce, 2017). SMEs make the economy more resilient and diversified (OECD, 2017), bring flexibility to it and are a source of innovation (Awa et al., 2015). Several studies have addressed the adoption of different technologies in SMEs (Dincer & Dincer, 2016), as Information and Communication Technologies (ICT) in general contribute greatly to productivity growth and competitiveness (European Commission, 2016; Gërguri-Rashiti et al., 2017; Loonam et al., 2018). But none of them has addressed the specific technologies that are emerging for the transformation of brick and mortar retail, at a time when the sector is undergoing a major disruption (Hagberg et al., 2017; Mende & Noble, 2019).

Retail is shifting to online at a dramatic rate. eCommerce is growing over 20% Year over Year (YoY) (Clement, 2019a; Lal & Chavan, 2019), with global retailers like Amazon seizing a large part of this opportunity (Stanton, 2019). Although some scholars believe that eCommerce is the only future for retail SMEs (Khaskheli et al., 2017; Lal & Chavan, 2019), retail SMEs are mostly local and must leverage the proximity to their

[2] The EU Official Journal defines SMEs as “enterprises which employ fewer than 250 persons and which have an annual turnover of under 50 million EUR, and/or an annual balance sheet total of under 43 million EUR.” (European Commission, 2003).

customers, as the physical space will still play an important role in the future of shopping (Vojvodić, 2019). Technologies that interact with customers in brick and mortar stores can help to fulfil the needs of new buyers and become a hub for cross-channel strategies (Härtfelder & Winkelmann, 2016; Vojvodić, 2019). Hence, studying how SMEs adopt such technologies is critical for the future of local retail. We group these technologies under the name of customer facing in-store technologies (CFIST), although this term is not fully established in the literature and researchers employ different denominations (Betzing et al., 2018; Bonetti et al., 2018; Grewal et al., 2020; Inman & Nikolova, 2017; Roy et al., 2017). Furthermore, some of these emerging technologies have been studied from a customer adoption perspective (Adapa et al., 2020; Chiu, Fang, & Tseng, 2010; Pantano & Di Pietro, 2012; Roy et al., 2017).

The objective of this work is to answer the following research question: Which are the drivers that predict the adoption of CFIST technologies by SMEs? For this purpose, we build an adoption model that considers previous works based on the Technology, Organization and Environment model (TOE) and the Technology Acceptance Model (TAM), adapting them to the specificities of the target technologies. Some works have addressed the managerial process of decision for CFIST (Bonetti et al., 2018); but to the best of our knowledge, there are no studies of the adoption from an organisational perspective, making this a new avenue of research. The results will bring new relevant insights and determine the key elements that hinder or boost the digital transformation of retail SMEs.

The rest of this paper is structured as follows. In the next section we include the theoretical foundations of our research. First, we explain the technologies behind the

CFIST concept. We then overview the main SMEs technology adoption models and show why a model based in TOE and TAM is suitable for our study. We close this section with a brief literature review of the adoption of CFIST. In the third section we develop our research model based on TOE and TAM. The development of the research and the analysis of data are presented in sections four and five. We finally discuss and explain our findings, the contributions of our work and set up the basis for future research.

3.3 Theoretical framework

3.3.1 An overview of customer facing in-store technologies (CFIST)

Since the start of the internet, changes in business have been drastic for traditional retail shops. The impact of the internet is growing over time and the most recent data show a major increase in online shopping (Clement, 2019b; European Union Commission, 2016), concentrated around massive companies like Amazon or Alibaba (Blazyte, 2019; Stanton, 2019), and a decrease in the number of brick and mortar shops and shopping centres in most countries (Corkery, 2017; Mitrofanoff, 2019).

Despite this situation, which has been dramatically defined as the retail apocalypse (Helm et al., 2018), customers do not want the physical stores to disappear, but to transform (Balaji et al. 2018; Grewal et al., 2020). Physical retail must focus on experience over convenience (Balaji et al., 2018; Pantano et al., 2018) and must provide an integrated omnichannel experience (Arora & Sahney, 2017; Rashid et al., 2015).

Furthermore, brick and mortar retailers can benefit from the digitisation of the physical space by installing devices that are part of Internet of Things (IoT) (Nowodzinski et al. 2016) to gather data of all digitised interactions to improve customer knowledge and take actions accordingly (Celik, 2016). Before these technologies were available some of these data were too costly to obtain and others were just no available at all (Kambies et al., 2016).

We group all the technologies that digitise and enhance the customer experience in the physical store under the term *Customer Facing In-Store Technologies* (CFIST), similar to the definition of Betzing et al. (2018) and Bonetti et al. (2018). These technologies perform different functions to improve the customer experience, increase efficiency and gather data to enhance the purchasing processes (Grewal et al., 2020; Jayaram, 2017; Pantano & Timmermans, 2014; Reinartz et al., 2011; Sturari et al., 2016). The level of adoption of these technologies is still very low for all firms (Kambies et al., 2016; Kim et al., 2017) and they have not been sufficiently studied (Pantano et al., 2018).

For the purpose of our work, we have chosen three technologies that are making their way into the stores of big retail companies: Digital signage, social Wi-Fi and people counters. Digital Signage is a network of screens that can present information and videos based on a scheduled loop or specific real time data (Dennis et al., 2010; Kim, 2012). Social Wi-Fi is made available for customers to access the internet for free in the Stores, but at the same time it is used to deliver marketing campaigns and retrieve footfall data (Chung et al., 2017; Ojala et al., 2012). People counters allow us to measure the traffic in different areas of the store to take business decisions (Karaman, 2015).

3.3.2 Technology adoption models in Small and Medium Enterprises

Academics have made many attempts to determine why individuals and organisations take a decision or course of action. Technology adoption models were created many decades ago (Doob, 1947; Hill et al., 1977; Rosenberg & Hovland, 1960). Adoption models can be applied to individuals (Kim et al., 2017; Müller-Seitz et al., 2009) and to firms (Giotopoulos et al., 2017; Susanty et al., 2017), or address both together (Gangwar et al., 2015; Venkatesh et al., 2003). The main theories used for individuals are Diffusion of Innovation (DOI) (Rogers, 1983), Task Technology Fit (TTF) (Goodhue & Thompson, 1995), Theory of Reasonable Action (TRA) (Hill et al., 1977), Theory of Planned Behaviour (TPB) (Ajzen, 1991), the Value-Attitude-Behaviour framework (V-A-B) (Homer & Kahle, 1988), the Stimulus-Organism-Response (S-O-R) paradigm (Mehrabian & Russell, 1974) and the Technology Acceptance Model (TAM) (Davis, 1989). Most of these theories have been unified in a single model by Venkatesh et al. (2003), creating the Unified Theory of Acceptance and Use of Technology (UTAUT). As regards firms, the main theories are Diffusion of Innovation (Bhattacharya and Wamba, 2015; Rogers, 1983) and the Technology, Organization and Environment (TOE) framework (DePietro et al., 1990), and most of studies are derived from them (Chong et al., 2009; Tan et al., 2009).

None of the models applies without limitations to all technologies, and several studies have shown their limitations for specific innovations (Alzougool & Kurnia, 2008; Ukoha et al., 2011). We have chosen TOE for our research as it is the most extended framework used in predicting technology adoption for SMEs (Bollweg et al., 2016; Kevin et al., 2003; Lee & Cheung, 2004). Following the existing literature, we have chosen TAM constructs for the Technology Context (Awa et al., 2015). Although TAM is an individual level theory, this decision is appropriate in the environment of SMEs, as their decisions are frequently taken by a single person (Oliveira & Martins, 2010; Riemenschneider et al., 2018) and we expected most of the respondents in the survey to be decision-makers in their firms.

3.3.3 Brief literature review of CFIST adoption in SMEs

A growing corpus of literature has been analysing the SME technology adoption from multiple perspectives, as reflected in extensive reviews and meta-analysis (Bollweg et al., 2016; Consoli, 2012; Dincer & Dincer, 2016; Haddara & Zach, 2012; Oliveira & Martins, 2010). Most articles include new constructs associated with research topics inside or outside the three contexts of TOE, depending on the technology they are studying (for example, security for cloud services (Kim et al.,2017), trading partner pressure for eCommerce (Abed, 2020) or customer pressure for generic ICT adoption (Nguyen et al., 2015)). Although the references that justify our constructs are described in the research model, we can highlight the role that some scholars believe CEO characteristics have in decisions (Riemenschneider et al., 2003; Yadav & Mahara, 2018), which can lead to combined individual – organisational models (Awa et al., 2015; Ikumoro & Jawad, 2019).

In order to base our research model on similar works, we have conducted a brief literature review of CFIST technology adoption based on TOE and TAM. The organisation literature on CFIST related topics is scarce (Pantano et al., 2018) and we could not find papers simultaneously addressing SMEs and CFIST, or even CFIST for larger organisations[3]. In any case, Table 3.1 presents a list of relevant CFIST adoption papers published in the past years, highlighting the added value of our investigation. As it can be seen, they are all related with individual adoption and not organisational adoption.

[3] . To conduct our review, we have used Web of Science and Google Scholar: We have searched for different combinations of the following keywords: “TAM”, “TOE”, “SME”, “Technology adoption”, “Brick and mortar”, “Retail”, “Physical store”, “In-store technology” and “Customer-facing technology”. Out of the first 100 results of each keyword search, papers were selected based on title relevance, then a second review was carried out reading the abstract and the whole paper when needed. A final addition of papers was made based on the references of the most relevant ones.

Table 3.1: Review of selected literature on CFIST adoption in chronological order.

Author	Kind of technology	Research Model	Differences with our study
Wang (2012)	Self Service Technology	TAM inspired model	Individual theory.
Lee (2015)	Self Service Technology	Original	Individual theory.
Rashid et al. (2015)	Augmented Reality and RFID	N/A	No adoption model.
Hagberg et al. (2016)	Digitalization of Retail	N/A	No adoption model. Only some use cases are CFIST
Lee & Lyu (2016)	Self Service Technology in grocery	V-A-B framework	Individual theory
Margulis & Boeck (2016)	RFID	TRA/TAM/UTAUT	No empirical findings. Use cases not CFIST.
Nysveen & Pedersen (2016)	RFID enabled skiing service	Extended UTAUT	Individual theory Use cases not CFIST.
Thamm et al. (2016)	Beacons based services	N/A	No adoption model.
Inman & Nikolova (2017)	Shopper-facing retail technologies	Original	Individual theory.
Kim et al. (2017)	Smart In-Store Technologies (SIST)	TAM	Individual theory.
Jayaram (2017)	Generic CFIST technologies	N/A	No empirical findings.
Roy et al. (2017)	Smart Retail Technologies (SRT)	Original	Individual theory.
Balaji et al. (2018)	Customer-facing IoT technologies	TAM	Individual theory.
Bonetti et al. (2018)	Generic CFIST technologies	N/A	Organization perspective, but no adoption model.
Foroudi et al. (2018)	Smart technology, proximity marketing	TAM inspired model	Focus on shoppers, not on shop owners. No specified use cases.
Lecointre-Erickson et al. (2018)	Digital Signage	S-O-R paradigm	Individual theory.
Roy et al. (2018)	Smart Retail Technologies (SRT)	Expanded TAM	Individual theory.
Vojvodic (2019)	Self Service Technology in grocery	N/A	No adoption model.
Adapa et al. (2020)	Smart Retail Technologies (SRT)	Original	Individual theory.
Grewal et al. (2020)	Generic CFIST technologies	Original	No empirical findings.

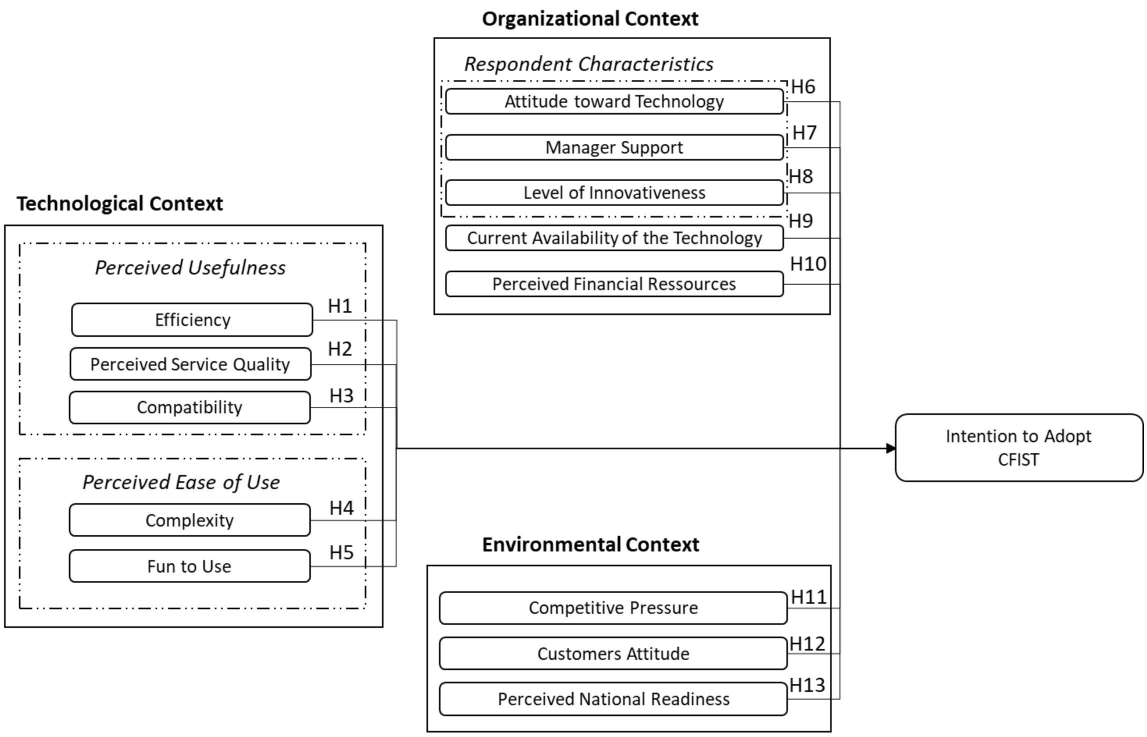
RFID – Radio Frequency Identification; N/A: Not applicable

3.4 Empirical analysis

3.4.1 Research Model

Due to the lack of previous CFIST works based on TOE, we have built our model on variables that are widely used in the SME literature for adoption of other technologies. The proposed model, shown in Figure 3.1, highlights the constructs that refer to the CEO as both a respondent and a user (technology context).

Figure 3.1: Theoretical Model.



3.4.1.1 Technological context

The role of personal perception in technology adoption in organisations has motivated the integration of the TAM model in TOE as part of the technological context (Awa et al. 2017; Gangwar et al., 2015). Three constructs related to perceived usefulness and two related to perceived ease of use have been selected. We define *efficiency* as the respondent's perception that adopting technology will make them more efficient, which is a key parameter for SME retailers due to their reduced margins. *Efficiency* has been broadly used in previous works and more specifically in the context of retail innovation (Cazier et al., 2008; Chiu et al., 2010). *Perceived service quality* is how the respondent perceives the improvement in service with the adoption of technology, and it has been included in previous studies about technology adoption (Awa et al., 2017; Çelik & Yilmaz, 2011) and more specifically in CFIST technologies (Kallweit et al., 2014; Lee, 2015; Lee & Yang, 2013). Quality is understudied in SMEs and only few studies address it (Rubio-Andrada et al., 2011). *Compatibility* refers to the extent to which the new technology is compatible with the company's values, information base, experience and technological infrastructure (Grover, 1993), and has been widely studied in the individual context by Karahanna et al. (2006); Awa et al. (Awa et al., 2017) include *Compatibility* in their integrated TAM-TOE model to study RFID. *Complexity* is broadly used in the literature and is related to the perception of how complex it is to implement, learn and use new technology (Adapa et al., 2020; Alismaili et al., 2016; Gangwar et al., 2015; Limthongchai & Speece, 2018). Finally, *fun to use* is similar to the construct of perceived enjoyment from some previous works (Ha & Im, 2014; Lee & Lyu, 2016) and is recognised as a natural extension of TAM (Pantano et al., 2018) with an important impact on shopping as other studies suggest (Babin et al., 1994; Kim & Forsythe, 2008).

3.4.1.2 Organisational context

We include five constructs within the organisational context. Three of them are related to the characteristics of the respondent, to delve into the individual influence of the CEO, as one of the most important factors for technology adoption in SMEs (Connon, 2007; Thong, 1999; Thong & Yap, 1995; Yadav & Mahara, 2018). *Attitude towards technology* measures the respondent's interest in technology innovation (Jeon et al., 2006). *Manager support* refers to the level of involvement of top management in the discussions that lead up to technology adoption decisions (Wang et al., 2010; Yap et al., 1994). Several studies have shown a positive impact of *manager support* in technology adoption decisions (Abed, 2020; Low et al., 2011). *Level of innovativeness* measures the respondent's inclination towards innovation (Ghobakhloo et al., 2011) and appears as a relevant factor for other technologies (Al-Qirim, 2007; Thong & Yap, 1995). As a fourth construct, *current availability of technology* measures the perception of the current technology (Connon, 2007; Guo & Xu, 2006; Thong & Yap, 1995; Yap et al., 1992). Finally, *perceived financial resources* refers to the way the decision-makers in the firm perceive their financial capability, which is not necessarily related to the actual return of investment in the technology (Guo & Xu, 2006; Nguyen, 2009; Yap et al., 1992).

3.4.1.3 Environmental Context

Environmental context relates to facilitating and inhibiting factors that influence the development of the firm's business (Awa et al., 2015). Three constructs were selected to delve into this context. *Competitive pressure* relates to what is being done by the competitors and how customers can easily switch to them (Alzougool & Kurnia, 2008; Awa et al., 2015; Bollweg et al., 2016; S. Chong, 2008). *Customer's attitude* measures the respondent's perception of customers' expectations regarding the technology (Connon, 2007; Reinartz et al., 2011), as customers are a major driver in technology adoption (Nguyen et al., 2015). *Perceived national readiness* is relevant in SMEs as their growth is often supported by government programmes (Alzougool & Kurnia, 2008).

3.4.2 Methodology and data

We decided to base our study on a survey as this is the most common approach in the literature for Technology Adoption research (Choudrie & Dwivedi, 2005). An online questionnaire with 48 questions was created with the Qualtrics tool according to the research model. Standard instruments were used as much as possible and most of the items were taken from previous research, adapted to CFIST and translated to Spanish. Nine questions were related to company and respondent demographics. For the other 39 a five-point Likert scale was used. Questions were presented in a different order to each respondent to avoid bias. An Exploratory Factor Analysis (EFA) was performed using the FACTOR software (Lorenzo-Seva & Ferrando, 2006) (Lorenzo-Seva & Ferrando, 2006), version: 10.10.03. Thirteen dimensions were extracted using the polychoric correlations matrix, Parallel Analysis (PA) method, Robust Unweighted Least Squares (RULS) with the oblique Promin rotation (Lorenzo-Seva, 2013) (Lorenzo-Seva 2013), instead of the fourteen factors expected. The Kaiser-Meyer-Olkin test value was .86, which indicated the matrix was well suited to factor analysis. The Bartlett test of sphericity, $\chi2$ (780) = 1679.0, $p < .001$, confirmed that the model was significant. Theoretical saturation was reached for all indicators, except for some within the Technological context. However, we kept them as separate dimensions due to theoretical concerns.

A two-phase approach was taken. First the survey was sent to ten SMEs that were asked to complete the survey and provide extra feedback. Modifications were made regarding the number of questions, the ordering, wording, and format.

Subsequently, the survey was distributed to potential SME participants. A research agreement was signed between a Spanish university and a company based in Spain delivering technology services to retailers. A Spanish SME trading association with more than 50,000 members also agreed to participate. The survey was sent by email to retailers from the company and the association. A small raffle was held among the respondents as an incentive to participate. A total of 387 answers were received, although 223 of them were not valid since the questionnaire was not fully completed. This is probably because SME CEOs are usually very busy and there was no personal interaction to encourage them to finish. The final number of useable responses was 164.

This number of responses is similar in size to other adoption studies involving business owners (Francioni et al., 2015; Karami et al., 2006; Thong & Yap, 1995).

Therefore, the sample of this study consisted of 164 participants (79.3% male, 20.7% female) with an average age of 48.3 years (*SD* = 8.1, 30–65). Most of the respondents were owners or managing directors (67.7%); the rest of the sample included managers and middle managers (23.8%) and employees (8.5%). A total of 45.1% of the respondents were solely responsible for deciding taking decisions regarding the acquisition of technologies in their company, while 45.7% shared this responsibility with others. Most participants held a university degree (56.1%) or had finished secondary studies (27.4%); 10.4% reported other studies and 6.1% primary studies. Descriptive, correlational, and regression data were calculated with the aid of the statistics software SPSS.

3.4.3 Results

3.4.3.1 Descriptive analysis

First, Cronbach's alphas and composite reliability coefficients were calculated for all the scales to assess the internal consistency (Table 3.2). All coefficients exceeded the recommended cut-off value of .70. Second, we calculated the Average Variance Extracted (AVE) values, which were above the critical threshold of 0.50, indicating good convergent validity. Furthermore, to assess the constructs' discriminant validity we applied the Fornell and Larcker (1981) criterion, that is, the square root of AVE value for each variable is greater than the correlations with the other variables, and we concluded that the measures in the model exhibit discriminant validity. Third, we calculated the descriptive statistics (means and standard deviations) and correlations of the study variables (Table 3.2). Interestingly, the dimensions of *complexity* (technological context), *competitive pressure* and *perceived national readiness* (environmental context) did not significantly correlate with the intention to adopt CFIST. However, they were positively correlated with other study variables. We compared the answers of early respondents (15% of the sample) with late respondents (15% of the sample) using non-parametric Mann-Whitney tests, and we found no statistical differences regarding the study variables, suggesting that there is no non-response bias in this study.

Table 3.2: Pearson Correlations between study variables.

Variables	*Items*	*M*	*SD*	α	ρ_c	$\sqrt{AVE}$	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intention to adopt CFIST	3	3.70	1.02	.89	.93	.90	1												
2. TC_Efficiency	3	4.46	0.78	.86	.91	.88	.17*	1											
3. TC_Perceived Service Quality	3	4.35	0.68	.79	.87	.84	.26**	.60***	1										
4. TC_Compatibility	2	4.09	0.91	.77	.90	.90	.23**	.49***	.65***	1									
5. TC_Complexity	3	3.34	0.88	.86	.91	.88	.14	.25**	.28***	.39***	1								
6. TC_Fun to Use	3	3.64	0.84	.85	.91	.88	.35***	.43***	.46***	.55***	.46***	1							
7. OC_Attitude towards Technology	4	4.16	0.92	.95	.96	.93	.59***	.20**	.29***	.45***	.22**	.45***	1						
8. OC_Manager Support	2	3.83	1.09	.74	.89	.90	.36***	.38***	.27***	.44***	.30***	.32***	.29***	1					
9. OC_Level of Innovativeness	3	3.74	0.80	.77	.87	.83	.21**	.33***	.22**	.14	.08	.30***	.18*	.26**	1				
10. OC_Current Availability of Technology	3	4.26	0.83	.75	.81	.77	.21**	.46***	.49***	.64***	.31***	.39***	.32***	.50***	.18*	1			
11. OC_Perceived Financial Resources	3	3.56	0.91	.74	.85	.81	.26**	.37***	.32***	.49***	.46***	.39***	.31***	.47***	.17*	.65***	1		
12. EC_Competitive Pressure	3	4.09	0.93	.82	.89	.85	.08	.28***	.26**	.15	-.01	.12	.07	.18*	.14	.19*	.08	1	
13. EC_Customer Attitude	2	3.84	0.91	.75	.88	.89	.27***	.47***	.47***	.51***	.24**	.35***	.32***	.42***	.23**	.44***	.29***	.31***	1
14. EC_Perceived National Readiness	3	2.55	0.98	.82	.88	.84	.14	.10	.03	.20**	.28***	.18*	.13	.22**	.06	.28***	.41***	.01	.20**

TC:technological context; OC:organizational context; EC:environmental context. α: Cronbach's alpha. AVE: average mean extracted. ρ_c: composite reliability.

*** $p < .001$, ** $p < .01$, * $p < .05$. Scores could range from 1 to 5.

Regarding the demographic profile and control variables (Table 3), we found no differences in *intention to adopt CFIST* between male (n = 130, M = 3.72, SD = 0.98) and female participants (n = 34, M = 3.61, SD = 1.17, t(162) = .586, p = .56), across ages (n = 141, r = -.06, p = .51), province of residence (F(34,163) = 0.777, p = .80), role in the company (F(3,163) = 1.255, p = .29), role in decision-making (F(3,163) = 1.628, p = .19), nor education level (F(3,163) = 0.180, p = .91). No differences were found for *intention to adopt CFIST* with respect to organisational characteristics, such as business sector (F(13,163) = 0.805, p = .65), number of PoSs (F(4,163) = 1.970, p = .10), or number of employees (F(4,163) = 2.200, p = .07).

Table 3.3: Demographic profile and control variables.

Variables		*Percentage*
Gender	Male	79.3
	Female	20.7
Age	30–65 (*M* = 48.3 years, *SD* = 8.1)	
Role in the company	Owner or managing director	67.7
	Manager	12.2
	Middle manager	11.6
	Employee	8.5
Role in decision making for the acquisition of technologies in their company	Sole responsible	45.1
	Shared responsibility with others	45.7
Education level	University degree	56.1
	Secondary studies	27.4
	Primary studies	6.1
	Other studies	10.4
Location	Madrid	13.4
	Barcelona	12.2
	Valencia	11.0
	Other cities in Spain	63.0
Sector	Retail trade	31.7
	Restaurant	25.0
	Other sectors	43.3
Number of points of sale (PoS) per business	A single PoS	69.5
	Two to five PoSs	18.9
	Six to 20 PoSs	3.6
	More than 20 PoSs	7.9
Business size	Microenterprises (less than five employees)	47.5
	Microenterprises (six to 10 employees)	22.0
	Small enterprises (11 to 49 employees)	16.5
	Medium enterprises (50 to 250 employees)	9.1
	Large enterprises (more than 250 employees)	4.9

3.4.4 Regression analyses

To test our hypotheses, we conducted successive regression analyses with *intention to adopt CFIST* as a dependent variable (Table 3.4). In addition to the main and complete research model (M4), we decided to do isolated regression analyses for each context to search for additional exploratory findings. First, only technological context variables were entered in Model 1. The most relevant variable was *fun to use* (β = .33, p < .01). Second, organisational context variables were entered (Model 2). Neither *company demographics* (e.g., business size) nor *respondent demographics* (e.g., gender, age) were significant. *Attitude toward technology* presented a high significant beta coefficient (β = .54, p < .001), as well as *manager support* (β = .22, p = .004). Third, as regards environmental context (Model 3), *customers attitude* was the unique significant variable (β = .26, p = .002). Finally, all variables were entered in Model 4. *Attitude toward technology* (β = .54, p < .001) presented the higher beta coefficient, followed by *compatibility* (negative, β = -.29, p = .007), *manager support* (β = .25, p = .001) and *perceived service quality* (β = .22, p = .018). Multicollinearity was not an issue as the maximum values of Variance Inflation Factors (VIF) remained under the recommended value of 5.

Table 3.4: Regression analyses. Dependent variable: intention to adopt CFIST.

	M1	M2	M3	M4
TECHNOLOGICAL CONTEXT				
Efficiency	-.05			-.09
Perceived Service Quality	.15			.22*
Compatibility	-.01			-.29**
Complexity	-.04			-.08
Fun to Use	.33**			.13
ORGANIZATIONAL CONTEXT				
Respondent characteristics				
Attitude towards technology		.54***		.54***
Manager Support		.22**		.25**
Level of Innovativeness		.07		.02
Other organizational context variables				
Current Availability of Technology		-.12		-.09
Perceived Financial Resources		.05		.08
ENVIRONMENTAL CONTEXT				
Competitive Pressure			.01	-.02
Customers Attitude			.26**	.06
Perceived National Readiness			.08	.05
F	5.09***	20.89***	4.73**	9.26***
R^2	.11	.38	.06	.40

Note. Standardized beta coefficients. *** $p < .001$, ** $p < .01$, * $p < .05$.

3.4.5 Discussion

Our results show that the respondent's *attitude towards technology* is the strongest predictor of the intention to adopt CFIST in SMEs ($\beta = .54$, $p < .001$). This factor, together with respondent *manager support* ($\beta = .25$, $p = .001$), shape the individual characteristics of our sample, where 90.8% of respondents stated that they make the technology decisions in the firm. Previous studies have highlighted the role of managers as individual factors in technology adoption (Consoli, 2012). They are in charge of taking most of the decisions, frequently by themselves. CEO characteristics influence any other argument as they are the final decision-maker for any strategy (Francioni et al., 2015). If the CEO's attitude is not shaped by the right information, an inappropriate decision can be made. Moreover, computer illiteracy can inhibit technology adoption (Chatzoglou & Chatzoudes, 2016). Since CEOs may not be technology experts and do not have time to conduct an in-depth analysis, simplified information about the technology options and the business impact is required. Our results are consistent with extant literature analysing the CEO role. Thong and Yap (1995) focused their work on CEO characteristics and found that one of the major predictors to adopt new technologies is the attitude towards technology innovation. In subsequent research, Thong (1999) came to the conclusion that innovativeness and the CEO's level of Information Systems (IS) knowledge are determining factors in the decision making process. The aforementioned studies focused on the CEO role, while our study includes other sources of constructs, increasing the consistency of our results. Our results encourage further research on the role of CEOs and how to educate them in technology to eliminate illiteracy bias and improve the quality of their decisions regarding the introduction of CFIST technologies.

The second significant predictor is *compatibility*. Contrary to expectations, *compatibility* has a negative influence in *intention to adopt CFIST* (β = -.29, p = .007). Although some studies find no relevance of compatibility for adoption (Hossain & Quaddus, 2011; Ramdani et al., 2009), we have not found evidence of negative influence in other studies. Compatibility includes not only technological infrastructure but also values, experience and needs (Rogers, 1983). In the context of the urgent transformation that the retail SMEs are experiencing (Bollweg et al., 2016; Helm et al., 2018), one possibility is that they feel the need for a sharp change in their current operations, and CFIST technologies can help them to accelerate such change, where technology is just one the elements (Pantano et al., 2018). The positive although small impact in the adoption of *perceived service quality* (β = .22, p = .018) strengthens our argument, as it highlights the perception of how CFIST technologies lead to improved service for customers at a time of disruption (Pantano & Timmermans, 2014). Interestingly, there is no significance beyond the constructs already mentioned. This finding supports and strengthens the role of the CEO in SMEs when it comes to digital transformation. The CEO's attitude towards technology can override other aspects that a different kind of organisation would not omit (Thong & Yap, 1995) and reinforces the need to focus and invest in the attitude, knowledge and experience of the CEO to make the right decisions for the company.

The partial models M1-M3, isolating each context of the TOE Model, provide some exploratory findings that may encourage further research. Regression model M3, which isolates the environmental context, shows a certain level of significance in *Customers attitude* (β = .26, p = .002), in line with previous work (Bollweg et al., 2016). Retailers have to react to the evolution of customers' attitude, as they become more technologically knowledgeable and demanding over time. Adapa et al. (2020) confirms the impact of consumer innovativeness in the perceived shopping value of smart retail technologies and proposes actions to be taken by retailers. Roy et al. (2018) also stress the need for retailers to adopt CFIST technologies that are easy to use. Retailers have to focus on the benefits of CFIST for customers: "Wider offer, reduction of queues and waiting time, access to customised services, more efficient delivery, rewards for loyal consumers, reinforcement of trust with sellers, and more satisfying shopping experiences.” (Pantano et al., 2018. p.5).

Finally, *fun to use* (β = .33, p < .01) appears as relevant in the partial technology regression model (M1). CFIST technologies are oriented towards customers and therefore they must also impact emotions (Dennis et al., 2010; Poncin & Ben Mimoun, 2014). This finding is consistent with previous works (Kim et al., 2007; Kim et al., 2017; Wang, 2012) but due to the partial level of relevance confirmatory studies will be required.

3.5 Conclusions

The objective of this study was to shed light on the reasons why retail SMEs can be inclined to adopt technologies to interact in the physical space with their customers. To the best of our knowledge, our study is the first that looks at CFIST technologies in SMEs. The literature on SME technology adoption focuses mainly on computer solutions or eCommerce. We can expect an organisation to decide on the adoption of its information systems based on similar factors; however, CFIST characteristics may stress other factors, as the customer experience component makes this category of technologies very different. Our study helps to fill this research gap and opens a new avenue of research that complements the extant literature.

Our findings have important managerial implications as CEO characteristics are more relevant than technological or environmental contexts, and as integrated TAM constructs inside the TOE model do not seem relevant enough to prevail over the former. Decisions are CEO-centric in SMEs. If CEOs do not have the knowledge or skills to correctly assess the potential of the technology, they can make the wrong decision (Pantano et al., 2018). The approach to solutions design must consider the CEOs' view even before customer experience. On the one hand, CFIST vendors must simplify business messages and technology functionalities to allow CEOs to understand all of the benefits without the need to devote too much time. Solutions cannot be the same as those adopted by larger organisations where a devoted team will probably analyse the decision and present it to the management. On the other hand, CEOs of SMEs must acknowledge the bias that they may introduce when taking decisions. They must move quickly to gather information about CFIST, as the disruption of the physical retail is accelerating.

Our paper also contributes to establish CFIST category as a field of study. Although these technologies appear more and more frequently in literature, the category is not fully established and has variations among researchers (Betzing et al., 2018; Bonetti et al., 2018; Grewal et al., 2017; Roy et al., 2017). Regardless of the name given, we forecast that the category will stay. Our findings should encourage researchers to delve into it, as one of the main drivers of the transformation and survival of brick and mortar retailers (Helm et al., 2018). Although the effort of governments and institutions for the digitalisation of retail SMEs is mainly devoted to eCommerce (Konstantinou, 2016), and internet presence is the more common way to measure their level of digitalisation, the reality is that physical commerce still accounts for the majority of sales and CFIST plays a prominent role in the evolution.

CFIST a s a category may overlap with other categories, like the Internet of Things (IoT) or ICT in general, but it has a specific effect on the customer experience, it is visible and it modifies the atmosphere of the store (Dennis et al., 2012; Grewal et al., 2020). Due to their visual impact, CFIST technologies also overlap with architectural elements. Although technology adoption studies focus exclusively on the technology, other elements do have an impact on the experience, like brand image, furniture or lighting. We agree with Pantano et al. (2018) considering that technology need to be integrated in a framework of the many elements of smart retail. An interesting line of future research is to analyse the relationship between all of the different elements of the experience, including the non-technical ones, with the adoption of CFIST technologies.

Despite the uniqueness of the scope and the relevant findings, this study is not free of limitations. First, our research studies a set of technologies (CFIST) rather than a single technology; this can blur the findings and confuse respondents. Although this approach is common in CFIST literature with scholars mixing up to twenty-two different use cases (Adapa et al., 2020; Grewal et al., 2020; Roy et al., 2018), further work should be undertaken selecting and isolating specific use cases. Second, the number of hypotheses of our model is high for the level of responses received. We have been able to confirm two hypotheses and explore a potential relationship in two others in the limited models M1-M3. Third, as our study was sent by email to addresses in a commercial database, the response ratio is low, although inside the average for email campaigns. A greater number of responses would have increased the validity of our study, but the profiles of respondents make it difficult to obtain relevant responses rates.

As the study of CFIST technologies is in the early stages, some scholars have proposed broad emerging research agendas (Grewal et al., 2020; Pantano et al., 2018), although none of them address the size of the organisations. Based on this work, we foresee five major lines of research. First, the profile of respondents and companies should be modified to search for variations in the different retail subsectors, as different businesses have different customer journeys. Second, the specific CFIST technologies must be analysed individually, as the category is heterogeneous both in technologies and use cases. Third, the adoption model should be modified to include new constructs to delve into the more significant drivers of adoption. Fourth, the simultaneous study of customers and managers of the same business would allow to compare the adoption model from user's perspective and firms perspective. Finally, non-technical elements must be included such as architecture, marketing, or brand values to study how the mix impacts adoption decisions.

3.6 References

Abed, S. S. (2020). Social commerce adoption using TOE framework: An empirical investigation of Saudi Arabian SMEs. *International Journal of Information Management*, *53*(October 2019), 102118. https://doi.org/10.1016/j.ijinfomgt.2020.102118

Adapa, S., Fazal-e-Hasan, S. M., Makam, S. B., Azeem, M. M., & Mortimer, G. (2020). Examining the antecedents and consequences of perceived shopping value through smart retail technology. *Journal of Retailing and Consumer Services*, *52*(August 2019), 101901. https://doi.org/10.1016/j.jretconser.2019.101901

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Al-Qirim, N. (2007). The adoption of eCommerce communications and applications technologies in small businesses in New Zealand. *Electronic Commerce Research and Applications*, *6*(4), 462–473. https://doi.org/10.1016/j.elerap.2007.02.012

Alismaili, S., Li, M., Shen, J., & He, Q. (2016, May 28). A Multi Perspective Approach for Understanding the Determinants of Cloud Computing Adoption among Australian SMEs. *ACIS 2015 Proceedings - 26th Australasian Conference on Information Systems*. http://arxiv.org/abs/1606.00745

Alzougool, B., & Kurnia, S. (2008). Electronic Commerce Technologies Adoption by SMEs: A Conceptual Study. *ACIS 2008 Proceedings*, *72*.

Arora, S., & Sahney, S. (2017). Webrooming behaviour: a conceptual framework. In *International Journal of Retail & Distribution Management* (Vol. 45, Issues 7–8). https://doi.org/10.1108/IJRDM-09-2016-0158

Awa, H. O., Ojiabo, O. U., & Emecheta, B. C. (2015). Integrating TAM, TPB and TOE frameworks and expanding their characteristic constructs for e-commerce adoption by SMEs. *Journal of Science and Technology Policy Management*, *6*(1), 76–94. https://doi.org/10.1108/JSTPM-04-2014-0012

Awa, H. O., Ojiabo, O. U., & Orokor, L. E. (2017). Integrated technology-organization-environment (T-O-E) taxonomies for technology adoption. *Journal of Enterprise Information Management*, *30*(6), 893–921. https://doi.org/10.1108/JEIM-03-2016-0079

Babin, B. J., Darden, W. R., & Griffin, M. (1994). Work and/or Fun: Measuring Hedonic and Utilitarian Shopping Value. *Journal of Consumer Research*, *20*(4), 644–656. https://doi.org/10.1086/209376

Balaji, M. S., Roy, S. K., Sengupta, A., & Chong, A. (2018). User Acceptance of IoT Applications in Retail Industry. In IGI Global (Ed.), *Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications* (pp. 1331–1352). https://doi.org/10.4018/978-1-5225-5201-7.ch061

Betzing, J. H., Hoang, A. Q. M., & Becker, J. (2018). In-store technologies in the retail servicescape. *MKWI 2018 - Multikonferenz Wirtschaftsinformatik*, *2018-March*, 1671–1682.

Bhattacharya, M., & Wamba, S. F. (2015). A Conceptual Framework of RFID Adoption in Retail Using TOE Framework. *Business Process Management Journal*, *21*(3), 517–540. https://doi.org/10.4018/ijtd.2015010101

Blazyte, A. (2019). *Alibaba: annual e-commerce revenue 2010-2019, by region*. Statista. https://www.statista.com/statistics/226793/e-commerce-revenue-of-alibabacom/

Bollweg, L., Lackes, R., Siepermann, M., Sutaj, A., & Weber, P. (2016). Digitalization of local owner operated retail outlets: The role of the perception of competition and customer expectations. *Pacific Asia Conference on Information Systems, PACIS 2016 - Proceedings*.

Bonetti, F., Perry, P., & Quinn, L. (2018). The Digital Revolution in Fashion Retailing : Examining Managerial Processes and Challenges in the Adoption of Consumer-

Facing In- Store Technology. *20th Annual Conference for the International Foundation of Fashion Technology Institutes*, 205–213.

Cazier, J. A., Jensen, A. S., & Dave, D. S. (2008). The Impact of Consumer Perceptions of Information Privacy and Security Risks on the Adoption of Residual RFID Technologies. *Communications of the Association for Information Systems*, *23*(September 2008), 235–256. https://doi.org/10.17705/1cais.02314

Celik, F. (2016). Internet of Things as a source of future marketing tools. *7th IBA Bachelor Thesis Conference*.

Çelik, H. E., & Yilmaz, V. (2011). Extending the technology acceptance model for adoption of e-shopping by consumers in Turkey. *Journal of Electronic Commerce Research*, *12*(2), 152–164.

Chatzoglou, P., & Chatzoudes, D. (2016). Factors affecting e-business adoption in SMEs: an empirical research. *Journal of Enterprise Information Management*, *29*(3), 327–358. https://doi.org/10.1108/JEIM-03-2014-0033

Chiu, Y. T. H., Fang, S. C., & Tseng, C. C. (2010). Early versus potential adopters: Exploring the antecedents of use intention in the context of retail service innovations. *International Journal of Retail & Distribution Management*, *38*(6), 443–459. https://doi.org/10.1108/09590551011045357

Chong, A. Y. L., Lin, B., Ooi, K. B., & Raman, M. (2009). Factors affecting the adoption level of c-commerce: An empirical study. *Journal of Computer Information Systems*, *50*(2), 13–22. https://doi.org/10.1080/08874417.2009.11645380

Chong, S. (2008). Success in electronic commerce implementation: A cross-country study of small and medium-sized enterprises. *Journal of Enterprise Information Management*, *21*(5), 468–492. https://doi.org/10.1108/17410390810904247

Choudrie, J., & Dwivedi, Y. K. (2005). Investigating the research approaches for examining technology adoption issues. *Journal of Research Practice*, *1*(1), 1–12.

Chung, C. K., Chung, I. Q., Wang, Y. H., & Chang, C. Ter. (2017). The integrated applications of WIFI and APP used in the shopping mall environment for menber card E-marketing. *Proceedings - International Conference on Machine Learning and Cybernetics*, *2*, 671–675. https://doi.org/10.1109/ICMLC.2016.7872968

Clement, J. (2019a). *Annual retail e-commerce sales growth worldwide from 2014 to 2023*. Statista. https://www.statista.com/statistics/288487/forecast-of-global-b2c-e-commerce-growt/

Clement, J. (2019b). *E-commerce share of total global retail sales from 2015 to 2023*. Statista. https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/

Connon, N. G. (2007). *Factors impacting on technology acceptance for the micro/sme electronics retailer*. Robert Gordon University.

Consoli, D. (2012). Literature Analysis on Determinant Factors and the Impact of ICT in SMEs. *Procedia - Social and Behavioral Sciences*, *62*, 93–97. https://doi.org/10.1016/j.sbspro.2012.09.016

Corkery, M. (2017). *Is American Retail at a Historic Tipping Point?* The New York Times. https://www.nytimes.com/2017/04/15/business/retail-industry.html

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Dennis, C., Michon, R., Brakus, J. J., Newman, A., & Alamanos, E. (2012). New insights into the impact of digital signage as a retail atmospheric tool. *Journal of Consumer Behaviour*, *11*(6), 454–466. https://doi.org/10.1002/cb.1394

Dennis, C., Newman, A., Michon, R., Josko Brakus, J., & Tiu Wright, L. (2010). The mediating effects of perception and emotion: Digital signage in mall atmospherics. *Journal of Retailing and Consumer Services*, *17*(3), 205–215. https://doi.org/10.1016/j.jretconser.2010.03.009

DePietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology and environment. In L. G. Tornatzky & M. Fleischer (Eds.), *The processes of technological innovation* (pp. 151–175). Lexington Books.

Dincer, B., & Dincer, C. (2016). Literature Review on the Use of Technology and Information Systems in SMEs. *International Journal of Academic Research in Business and Social Sciences*, *6*(12), 678–684. https://doi.org/10.6007/ijarbss/v6-i12/2528

Doob, L. W. (1947). The behavior of attitudes. *Psychological Review*, *54*(3), 135.

Euro Commerce. (2017). *Contribution of retail and wholesale SMEs to the EU economy*. https://www.eurocommerce.eu/media/135423/contribution_of_retail_and_wholesale_smes_to_the_eu_economy.pdf

European Commission. (2003). COMMISSION RECOMMENDATION of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. *Official*

Journal of the European Union, *46*, 36–41. https://doi.org/10.1093/nq/s10-I.5.88-c

European Commission. (2016). Fostering SMEs growth through digital transformation. In *European Commission*.

European Union Commission. (2016). *Europe's Digital Progress Report (EDPR) 2016*.

Eurostat. (2018). *Statistics on small and medium-sized enterprises*. https://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_small_and_medium-sized_enterprises

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Foroudi, P., Gupta, S., Sivarajah, U., & Broderick, A. (2018). Investigating the effects of smart technology on customer dynamics and customer experience. *Computers in Human Behavior*, *80*, 271–282. https://doi.org/10.1016/j.chb.2017.11.014

Francioni, B., Musso, F., & Cioppi, M. (2015). Decision-maker characteristics and international decisions for SMEs. *Management Decision*, *53*(10), 2226–2249. https://doi.org/10.1108/MD-03-2015-0094

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. *Journal of Enterprise Information Management*, *28*(1), 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

Gërguri-Rashiti, S., Ramadani, V., Abazi-Alili, H., Dana, L. P., & Ratten, V. (2017). ICT, Innovation and Firm Performance: The Transition Economies Context. *Thunderbird*

International Business Review, *59(1)*, 93–102. https://doi.org/10.1002/tie

Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management and Data Systems*, *111*(8), 1238–1269. https://doi.org/10.1108/02635571111170785

Giotopoulos, I., Kontolaimou, A., Korra, E., & Tsakanikas, A. (2017). What drives ICT adoption by SMEs? Evidence from a large-scale survey in Greece. *Journal of Business Research*, *81*(December 2016), 60–69. https://doi.org/10.1016/j.jbusres.2017.08.007

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly: Management Information Systems*, 213–236. https://doi.org/10.1093/bib/bbp020

Grewal, D., Noble, S. M., Roggeveen, A. L., & Nordfalt, J. (2020). The future of in-store technology. *Journal of the Academy of Marketing Science*, *48*(1), 96–113. https://doi.org/10.1007/s11747-019-00697-z

Grover, V. (1993). An Empirically Derived Model for the Adoption of Customer-based Interorganizational Systems. *Decision Sciences*, *24*(3), 603–640. https://doi.org/10.1111/j.1540-5915.1993.tb01295.x

Guo, R., & Xu, Y. (2006). The adoption of internet-based businessto- Business e-marketplaces among small and medium-sized enterprises in their international marketing practices. *Proceedings of the 14th European Conference on Information Systems, ECIS 2006*.

Ha, Y., & Im, H. (2014). Determinants of mobile coupon service adoption: Assessment of gender difference. *International Journal of Retail and Distribution Management*, *42*(5), 441–459. https://doi.org/10.1108/IJRDM-08-2012-0074

Haddara, M., & Zach, O. (2012). ERP Systems in SMEs: An Extended Literature Review. *International Journal of Information Science*, *2*(6), 106–116. https://doi.org/10.5923/j.ijis.20120206.06

Hagberg, J., Jonsson, A., & Egels-Zandén, N. (2017). Retail digitalization: Implications for physical stores. *Journal of Retailing and Consumer Services*, *39*, 264–269. https://doi.org/10.1016/j.jretconser.2017.08.005

Hagberg, J., Sundstrom, M., & Egels-Zandén, N. (2016). The digitalization of retailing: an exploratory framework. *International Journal of Retail & Distribution Management*, *44*(7), 694–712. https://doi.org/10.1108/IJRDM-09-2015-0140

Härtfelder, J., & Winkelmann, A. (2016). Opportunities and challenges for local retailing in an environment dominated by mobile internet devices - Literature review and gap analysis. In V. Nissen, D. Stelzer, S. Straßburger, & D. Fischer (Eds.), *Multikonferenz Wirtschaftsinformatik, MKWI 2016* (Vol. 1, Issue March, pp. 33–44).

Helm, S., Kim, S. H., & Van Riper, S. (2018). Navigating the ‘retail apocalypse’: A framework of consumer evaluations of the new retail landscape. *Journal of Retailing and Consumer Services*, *April*, 0–1. https://doi.org/10.1016/j.jretconser.2018.09.015

Hill, R. J., Fishbein, M., & Ajzen, I. (1977). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. *Contemporary Sociology*, *6*(2), 244. https://doi.org/10.2307/2065853

Homer, P. M., & Kahle, L. R. (1988). A Structural Equation Test of the Value-Attitude-Behavior Hierarchy. *Journal of Personality and Social Psychology*, *54*(4), 638–646. https://doi.org/10.1037/0022-3514.54.4.638

Hossain, M. A., & Quaddus, M. (2011). The adoption and continued usage intention of RFID: An integrated framework. *Information Technology and People*, *24*(3), 236–256. https://doi.org/10.1108/09593841111158365

Ikumoro, A. O., & Jawad, M. S. (2019). Intention to Use Intelligent Conversational Agents in e-Commerce among Malaysian SMEs: An Integrated Conceptual Framework Based on Tri-theories including Unified Theory of Acceptance, Use of Technology (UTAUT), and T-O-E. *International Journal of Academic Research in Business and Social Sciences*, *9*(11), 205–235. https://doi.org/10.6007/ijarbss/v9-i11/6544

Inman, J. J., & Nikolova, H. (2017). Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, *93*(1), 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Jayaram, A. (2017). Smart Retail 4 . 0 IoT Consumer Retailer Model for Retail Intelligence and Strategic Marketing of In-store Products. *Proceedings of the 17th International Business Horizon-INBUSH ERA-2017*, *February*.

Jeon, B. N., Han, K. S., & Lee, M. J. (2006). Determining factors for the adoption of e-business: The case of SMEs in Korea. *Applied Economics*, *38*(16), 1905–1916. https://doi.org/10.1080/00036840500427262

Kallweit, K., Spreer, P., & Toporowski, W. (2014). Why do customers use self-service information technologies in retail? The mediating effect of perceived service quality. *Journal of Retailing and Consumer Services*, *21*(3), 268–276. https://doi.org/10.1016/j.jretconser.2014.02.002

Kambies, T., Raynor, M. E., Pankratz, D. M., & Wadekar, G. (2016). Closing the digital divide. In *Deloitte University Press*. https://doi.org/10.1136/bmj.326.7397.1035

Karahanna, E., Agarwal, R., & Angst, C. M. (2006). Reconceptualizing compatibility beliefs in technology acceptance research. *MIS Quarterly*, *30*(4), 781–804.

Karaman, E. (2015). Integration of People Counter Systems to Decision Support Systems in Clothing Retail Industry: A Preliminary Analysis and Possible Applications. *Journal of Graduate School of Social Sciences*, *19*(2), 271–290.

Karami, A., Analoui, F., & Korak, N. K. (2006). The CEOs' characteristics and their strategy development in the UK SME sector: An empirical study. In *Journal of Management Development* (Vol. 25, Issue 4, pp. 316–324). https://doi.org/10.1108/02621710610655800

Kevin, Z., Kenneth, L. K., & Sean, X. (2003). Electronic Business Adoption by European Firms : A Cross- country Assessment of the Facilitators and Inhibitors. *European Journal of Information Systems*, *12*(4), 251–268.

Khaskheli, A., Jun, Y., & Ahmed Bhuiyan, M. (2017). M-Commerce and Mobile Apps: Opportunities for SMEs in Developing Countries. *Journal of International Business Research and Marketing*, *2*(2), 20–23. https://doi.org/10.18775/jibrm.1849-8558.2015.22.3003

Kim, J., & Forsythe, S. (2008). Adoption of Virtual Try-on technology for online apparel shopping. *Journal of Interactive Marketing*, *22*(2), 45–59. https://doi.org/10.1002/dir

Kim, J. S. (2012). A study of contact frequency and consumer preference for digital signage advertisement. *Communications in Computer and Information Science*, *338 CCIS*, 181–187. https://doi.org/10.1007/978-3-642-35251-5_25

Kim, Jihyun, Fiore, A. M., & Lee, H. H. (2007). Influences of online store perception, shopping enjoyment, and shopping involvement on consumer patronage behavior towards an online retailer. *Journal of Retailing and Consumer Services*, *14*(2), 95–107. https://doi.org/10.1016/j.jretconser.2006.05.001

Kim, Lee, J., Mun, J., & Johnson, K. (2017). Consumer adoption of smart in-store technology: assessing the predictive value of attitude versus beliefs in the technology acceptance model. *International Journal of Fashion Design, Technology and Education*, *10*(1), 26–36. https://doi.org/10.1080/17543266.2016.1177737

Kim, S. H., Jang, S. Y., & Yang, K. H. (2017). Analysis of the Determinants of Software-as-a-Service Adoption in Small Businesses: Risks, Benefits, and Organizational and Environmental Factors. *Journal of Small Business Management*, *55*(2), 303–325. https://doi.org/10.1111/jsbm.12304

Konstantinou, J. K. (2016). Digitization of European SMEs in Tourism and Hospitality: The Case of Greek Hoteliers. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, *10*(5), 1558–1562.

Lal, B., & Chavan, C. R. (2019). A Road Map: E-Commerce to World Wide Web Growth of Business World. *Global Journal of Management And Business Research*, *19*(11), 1–

11.

Lecointre-Erickson, D., Daucé, B., & Legohérel, P. (2018). The influence of interactive window displays on expected shopping experience. *International Journal of Retail & Distribution Management*, *46*(9). https://doi.org/10.1108/IJRDM-05-2017-0111

Lee, H. J. (2015). Consumer-to-store employee and consumer-to-self-service technology (SST) interactions in a retail setting. *International Journal of Retail & Distribution Management*, *43*(8), 676–692. https://doi.org/10.1108/IJRDM-04-2014-0049

Lee, H. J., & Lyu, J. (2016). Personal values as determinants of intentions to use self-service technology in retailing. *Computers in Human Behavior*, *60*, 322–332. https://doi.org/10.1016/j.chb.2016.02.051

Lee, H. J., & Yang, K. (2013). Interpersonal service quality, self-service technology (SST) service quality, and retail patronage. *Journal of Retailing and Consumer Services*, *20*(1), 51–57. https://doi.org/10.1016/j.jretconser.2012.10.005

Lee, M. K. O., & Cheung, C. M. K. (2004). Internet retailing adoption by small-to-medium sized Enterprises (SMEs): A multiple-case study. *Information Systems Frontiers*, *6*(4), 385–397. https://doi.org/10.1023/B:ISFI.0000046379.58029.54

Limthongchai, P., & Speece, M. (2018). The Effect of Perceived Characteristics of Innovation on E-Commerce Adoption by SMEs in Thailand. *SSRN Electronic Journal*, *February*. https://doi.org/10.2139/ssrn.2565392

Loonam, J., Eaves, S., Kumar, V., & Parry, G. (2018). Towards digital transformation: Lessons learned from traditional organizations. *Strategic Change*, *27*(2), 101–109. https://doi.org/10.1002/jsc.2185

Lorenzo-Seva, U. (2013). *Why rotate my data using Promin?* http://psico.fcep.urv.es/utilitats/factor/documentation/whypromin.pdf

Lorenzo-Seva, U., & Ferrando, P. J. (2006). FACTOR: A computer program to fit the exploratory factor analysis model. *Behavior Research Methods*, *38*(1), 88–91. https://doi.org/10.3758/BF03192753

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management and Data Systems*, *111*(7), 1006–1023. https://doi.org/10.1108/02635571111161262

Margulis, A., & Boeck, H. (2016). Toward Harmony and Respect : a Model of Consumer Reaction to RFID Technology Use in Retail. *Proceedings of 36th International Business Research Conference*, *July*, *14-16th*.

Mehrabian, A., & Russell, J. A. (1974). An approach to environmental psychology. In *The MIT Press*. https://doi.org/10.1049/ep.1972.0130

Mende, M., & Noble, S. M. (2019). Retail Apocalypse or Golden Opportunity for Retail Frontline Management? *Journal of Retailing*, *95*(2), 84–89. https://doi.org/10.1016/j.jretai.2019.06.002

Mitrofanoff, K. (2019). *Grandes surfaces, e-commerce: pourquoi de nombreux magasins sont condamnés à disparaître*. Challenges. https://www.challenges.fr/services-et-distribution/la-verite-sur-les-fermetures-de-magasins-en-centre-ville_635929

Müller-Seitz, G., Dautzenberg, K., Creusen, U., & Stromereder, C. (2009). Customer acceptance of RFID technology: Evidence from the German electronic retail sector. *Journal of Retailing and Consumer Services*, *16*(1), 31–39.

https://doi.org/10.1016/j.jretconser.2008.08.002

Nguyen, T. H. (2009). Information technology adoption in SMEs: an integrated framework. *International Journal of Entrepreneurial Behavior & Research*, *15*(2), 162–186. ???

Nguyen, T. H., Newby, M., & Macaulay, M. J. (2015). Information technology adoption in small business: Confirmation of a proposed framework. *Journal of Small Business Management*, *53*(1), 207–227. https://doi.org/10.1111/jsbm.12058

Nowodzinski, P., Łukasik, K., & Puto, A. (2016). Internet Of Things (Iot) In A Retail Environment. The New Strategy For Firm's Development. *European Scientific Journal, ESJ*, *12*(10), 332–341.

Nysveen, H., & Pedersen, P. E. (2016). Consumer adoption of RFID-enabled services. Applying an extended UTAUT model. *Information Systems Frontiers*, *18*(2), 293–314. https://doi.org/10.1007/s10796-014-9531-4

OECD. (2017). ENHANCING THE CONTRIBUTIONS OF SMEs IN A GLOBAL AND DIGITALISED ECONOMY. In *Meeting of the OECD Council at Ministerial Level* (Issue June). https://doi.org/10.1787/9789264064553-en

Ojala, T., Kruger, F., Kostakos, V., & Valkama, V. (2012). Two field trials on the efficiency of unsolicited bluetooth proximity marketing. *Proceedings of the 11th International Conference on Mobile and Ubiquitous Multimedia, MUM 2012*, *December 2012*. https://doi.org/10.1145/2406367.2406414

Oliveira, T., & Martins, M. F. (2010). Information technology adoption models at Firm Level: Review of literature. *4th European Conference on Information Management* *and Evaluation, ECIME 2010*, *14*(1), 312–322.

Pantano, E., & Di Pietro, L. (2012). Understanding consumer's acceptance of technology-based innovations in retailing. *Journal of Technology Management and Innovation*, *7*(4), 1–19. https://doi.org/10.4067/S0718-27242012000400001

Pantano, E., Priporas, C. V., & Dennis, C. (2018). A new approach to retailing for successful competition in the new smart scenario. *International Journal of Retail & Distribution Management*, *46*(3), 264–282. https://doi.org/10.1108/IJRDM-04-2017-0080

Pantano, E., & Timmermans, H. (2014). What is Smart for Retailing? *Procedia Environmental Sciences*, *22*, 101–107. https://doi.org/10.1016/j.proenv.2014.11.010

Poncin, I., & Ben Mimoun, M. S. (2014). The impact of "e-atmospherics" on physical stores. *Journal of Retailing and Consumer Services*, *21*(5), 851–859. https://doi.org/10.1016/j.jretconser.2014.02.013

Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management*, *22*, 10–24. https://doi.org/10.1108/17410390910922796

Rashid, Z., Peig, E., & Pous, R. (2015). Bringing online shopping experience to offline retail through augmented reality and RFID. *Proceedings - 2015 5th International Conference on the Internet of Things, IoT 2015*, *June 2017*, 45–51. https://doi.org/10.1109/IOT.2015.7356547

Reinartz, W., Dellaert, B., Krafft, M., Kumar, V., & Varadarajan, R. (2011). Retailing innovations in a globalizing retail market environment. *Journal of Retailing*, *87*(SUPPL. 1), S53–S66. https://doi.org/10.1016/j.jretai.2011.04.009

Riemenschneider, C. K., Harrison, D. A., & Mykytyn, P. P. (2003). Understanding it adoption decisions in small business: Integrating current theories. *Information and Management*, *40*(4), 269–285. https://doi.org/10.1016/S0378-7206(02)00010-1

Rogers, E. M. (1983). *Diffusion of Innovations* (Free Press of Glencoe (ed.); 3rd ed.).

Rosenberg, M. J., & Hovland, C. I. (1960). Cognitive, Affective and Behavioral Components of Attitudes. In N. H. Yale University Press (Ed.), *Attitude Organization and Change: An Analysis of Consistency among Attitude Components*.

Roy, S. K., Balaji, M. S., Quazi, A., & Quaddus, M. (2018). Predictors of customer acceptance of and resistance to smart technologies in the retail sector. *Journal of Retailing and Consumer Services*, *42*, 147–160. https://doi.org/10.1016/j.jretconser.2018.02.005

Roy, S. K., Balaji, M. S., Sadeque, S., Nguyen, B., & Melewar, T. C. (2017). Constituents and consequences of smart customer experience in retailing. *Technological Forecasting and Social Change*, *124*, 257–270. https://doi.org/10.1016/j.techfore.2016.09.022

Rubio-Andrada, L., Del Mar Alonso-Almeida, M., & Rodríguez-Antón, J. M. (2011). Motivations and impacts in the firm and stakeholders of quality certification: Evidence from small- and medium-sized service enterprises. *Total Quality Management and Business Excellence*, *22*(8), 833–852. https://doi.org/10.1080/14783363.2011.593858

Stanton, T. (2019). *Millenials help Amazon own 43% of the online holiday market*. The Brief Blog. https://www.rakutenintelligence.com/blog/2016/millennials-help-amazon-own-43-percent-of-the-online-holiday-market

Sturari, M., Liciotti, D., Pierdicca, R., Frontoni, E., Mancini, A., Contigiani, M., & Zingaretti, P. (2016). Robust and affordable retail customer profiling by vision and radio beacon sensor fusion. *Pattern Recognition Letters*, *81*, 30–40. https://doi.org/10.1016/j.patrec.2016.02.010

Susanty, A., Sari, D. P., & Anastasia, D. (2017). Critical success factors for the internet technology adoption by SMEs and its impact for the performance. *Proceeding - 2016 2nd International Conference on Science in Information Technology, ICSITech 2016: Information Science for Green Society and Environment*, 35–40. https://doi.org/10.1109/ICSITech.2016.7852604

Tan, K. S., Chong, S. C., Lin, B., & Eze, U. C. (2009). Internet-based ICT adoption: Evidence from Malaysian SMEs. *Industrial Management and Data Systems*, *109*(2), 224–244. https://doi.org/10.1108/02635570910930118

Thamm, A., Anke, J., Haugk, S., & Radic, D. (2016). Towards the Omni-Channel: Beacon-Based Services in Retail. *International Conference on Business Information Systems*, *255*, 181–192. https://doi.org/10.1007/978-3-319-39426-8

Thong, J. Y. L. (1999). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems*, *15*(4), 187–214. https://doi.org/10.1080/07421222.1999.11518227

Thong, J. Y. L., & Yap, C. (1995). CEO characteristics, organizational characteristics and information technology adoption in small businesses. *Omega*, *23*(4), 429–442. https://doi.org/10.1016/0305-0483(95)00017-I

Ukoha, O., Awa, H. O., Nwuche, C. A., & Asiegbu, I. F. (2011). Analysis of Explanatory and Predictive Architectures and the Relevance in Explaining the Adoption of IT in SMEs. In *Interdisciplinary Journal of Information, Knowledge, and Management* (Vol. 6).

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Vojvodić, K. (2019). Brick-and-mortar retailers: Becoming smarter with innovative technologies. *Strategic Management*, *24*(2), 3–11. https://doi.org/10.5937/straman1902003v

Wang, M. (2012). Determinants and consequences of consumer satisfaction with self-service technology in a retail setting. *Managing Service Quality*, *22*(2), 128–144. https://doi.org/10.1108/09604521211218945

Wang, Y. M., Wang, Y. S., & Yang, Y. F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change*, *77*(5), 803–815. https://doi.org/10.1016/j.techfore.2010.03.006

Yadav, R., & Mahara, T. (2018). Preliminary study of E-commerce adoption in Indian handicraft SME: A case study. *Advances in Intelligent Systems and Computing*, *584*, 515–523. https://doi.org/10.1007/978-981-10-5699-4_48

Yap, C. S., Thong, J. Y. L., & Raman, K. S. (1994). Effect of government incentives on computerisation in small business. *European Journal of Information Systems*, *3*(3), 191–206. https://doi.org/10.1057/ejis.1994.20

Yap, C., Soh, C., & Raman, K. (1992). Information systems success factors in small business. *Omega*, *20*(5–6), 597–609. https://doi.org/10.1016/0305-0483(92)90005-R

4. RESTAURANTS ADOPTION OF CUSTOMER FACING TECHNOLOGIES. AN EXPLORATORY STUDY

4 RESTAURANTS ADOPTION OF CUSTOMER FACING TECHNOLOGIES. AN EXPLORATORY STUDY

4.1 Abstract

Restaurants are a very specific type of retail that is undertaking the digital transformation changes with its own specificities. The objective of the paper is to offer a preliminary research on adoption of Customer Facing In Store Technologies (CFIST) in restaurants. Based in the Technology-Environment-Organization model (TOE) we propose a simplified adoption model to conduct the field research. A questionnaire based on the research model has been developed and its answers analysed by PLS-SEM method. Our findings show that perception of technology is a predictor of the intention to adopt CFIST technologies. This preliminary work, done with 41 restaurant owners, is the first of its kind and open the path for future research in this field.

4.2 Introduction

One of the sectors most impacted by digital transformation is retail (Helm et al., 2018). The advantages and possibilities of internet are pushing a growing percentage of the overall business to be online (Chiang and Dholakia, 2003; Clement, 2019), where customers can request their goods without leaving their homes. This is dramatically impacting in brick and mortar stores, that are closing or reinventing themselves (Helm et al., 2018). This reinvention seeks to keep attracting customers to the physical space, and retailers are looking for different ways to make physical stores more meaningful to customers. Improved customer services, interactivity, personalization, efficiency or experience are helping to create environments where customers keep going even in the internet era (Dennis et al, 2010; Jeon et al, 2019). In any business transformation technology and innovation play a major role (European Commission, 2016; Loonam et al., 2018), but this becomes even more crucial in the digital transformation of retail (Reinartz et al., 2011).

As a subsector of retail, restaurants are fully involved in this situation. Their customers are now technology and internet users and therefore they expect online options as well as digital interaction in the dining room. This forces restaurants to put technology innovation as a priority and, despite their tight margins, their technology budgets are increasing (Lorden, 2019). More and more technology companies are entering the dining technology space (CB Insights, 2017). Some technologies, such as kiosks and data analytics are dramatically increasing their penetration rates (Lorden, 2019, 2018).

Restaurants are undergoing this process with their own specificities. Customers do not go to a restaurant just to be fed, but to enjoy an experience related with the food, the environment or the people who they go with (Harrington et al. 2012). Although part of their business is moving online through home delivery, this is just starting and there is uncertainty about the value of online food aggregators (OFAs) and how they will impact restaurant business in the long term (Furunes and Mkono, 2019). If the physical relationship is important for fashion or beauty retail, it is paramount for restaurants. Several meal preparations do not stand a thirty minutes trip to customer's homes before their consumption. Restaurant plating cannot be replicated in cardboard and plastic boxes. Several elements of the overall brand value of the restaurants are at risk in the shift to online delivery and the intermediation of OFAs, even the choice of the menu (Kapoor and Vij, 2018; Monty, 2018). Therefore, taking care of the evolution of the physical experience is a relevant topic for this kind of business. Customer facing in store technologies (CFIST) are a major asset to impact experiences that restaurants owners must decide what to do with it. There is still scarce research that specifically addresses the role of CFIST in restaurants, despite the importance of this sector that accounts around 5% of GDP in USA or European countries such as Spain (González, 2019; Long, 2018). Restaurants play also an important role of attraction for the rest of the retail, for example in malls (Euro Commerce, 2017; Pantano and Naccarato, 2010).

The present study is aimed at exploring the intention to adopt CFIST in a sample of restaurants located in Spain. Applying an adapted TOE framework, we investigate through a questionnaire survey which are the factors that affect a restaurant owner to install in their premises technology elements to improve customer's experience. The contribution of the paper is twofold. On one side we present a first step in an unexplored line of research: the reasons that motivate restaurant owners to invest in customer facing technologies. On the other our findings show that the perception of the technology is the main factor for its adoption

In the next sections we develop our research. We start presenting the concept of CFIST technologies for restaurants and what are the functionalities they have. Then we perform a literature review of previous works that tackle the impact of CFIST in restaurants. We then conduct the empirical analysis, presenting the theoretical framework that supports our model, and its research origin, followed by explanation of field research survey and its results. We analyse this results in the following section. Finally, we present the conclusions and suggest further lines of research.

4.3 Customer Facing In Store Technologies (CFIST)

Customer facing in store technologies (CFIST) is a heterogeneous category of technologies, as they are defined by their usage rather than by their technology background. We can define the category stating that CFIST include the technologies that directly impact in customer experience, creating interactivity and digital atmospherics across the customer journey in the store. They can pursue different goals, like giving information to customers, executing actions, impacting the feeling of the customer and obtaining data of the overall interaction. The term CFIST is not an established one in the literature (Betzing et al., 2018) but is similar in meaning to other description of customer facing technologies (Balaji et al., 2018; Inman and Nikolova, 2017). CFIST technologies like tabletop systems are becoming a priority to industry executives over other technology to improve business efficiency and customer experience (Lee et al., 2015).

In a restaurant, the most common CFIST technologies are digital signage, Wi-Fi, and self-service technology. Digital signage can create advanced experiences like immersive dining (Dionísio et al., 2013) or provide information of menus and promotions, influencing the choices of patrons (Peters and Mennecke, 2011). Social Wi-Fi allows the connection to the restaurant Wi-Fi instead of spending personal mobile data. Some studies have shown that the availability of free Wi-fi can influence positively the decision to come back to the restaurant (Cobanoglu et al., 2012; Jeon et al., 2019). Finally, the self-service technology can take the form of kiosks (Kim et al., 2013) or tabletop devices that can include other kind of amenities and information (Lee et al., 2015; Susskind and Curry, 2016).

4.4 Brief literature review of CFIST Adoption in Restaurants

Most of the literature about restaurants and technology focuses on the impact of back-offices technologies or SW systems to be used by managers or staff. In an early review of IT technologies for restaurants (Ansel and Dyer, 1999), it was found that IT technologies were mainly dedicated to improving the performance of the business but no presence of CFIST technologies was detected. That review concluded that the four main benefits of IT in restaurants are reduced costs, improved staff management, management of the revenues and adaptation of menus based on data, without any mention to customer experience (Ansel and Dyer, 1999). More recently, Dixo, Kimes and Verma (2009) analyse the reasons to adopt technology in restaurants from a heuristic point of view, showing that office packages and back office IT are the most used technologies. Interestingly, the use of pagers as a dining room technology was only 3.6% at the time of the study. Oronsky and Chathoth (2007) get to similar conclusion through a qualitative study, without any reference to CFIST technology. Information and communication technology (ICT) has been also studied to examine adoption by type of restaurants (Ruiz-Molina et al., 2014) or employee adoption (Ham et al., 2008). According to Koutroumanis (2011) technology cannot be seen in isolation in the restaurant strategy, but he only highlights Point of Sale (PoS) technology, digital marketing and online reservations as main elements to be taken into account, none of them inside CFIST category (Koutroumanis, 2011). Online reservations is also addressed in some works (Dixon et al., 2009) as the number of online reservations is growing exponentially, and according to the study conducted by Shankar, Smith and Rangaswamy (2003), even in a pure off-line business, online reservations and other services can improve the customer relationship of the dining room.

If we narrow down to CFIST technology, and divide the literature following the three technologies defined in the previous section, we find an uneven amount of work for each of them. Although there is some literature about how digital signage impacts in mall atmospherics (Dennis et al., 2010; Newman et al., 2010), only Peters and Mennecke (2011) explain how digital signage influence the choice of customer and drive more attention to menu boards even for common consumers, thanks to its video capabilities. Another practitioner expose a solution to create immersive experiences based in projections but without any analysis of the impact of such technology (Dionísio et al., 2013). If we consider tablet menus as a specific kind of digital signage, the works of Beldona, Buchanan and Miller (2014) and Hsu and Wu (2013) show the positive impact in the experience, as they allow more dynamic information and more attractive presentation. Both highlight the importance of the content when the media has more potential, showing that interactive tablet menus are superior to traditional paper-based menus.

Regarding social Wi-fi in restaurants, customers expect Wi-Fi to be free (Cobanoglu et al., 2012). Moreover, free Wi-Fi has been found to be key to increase the probability to visit again the restaurant. This evidence has been further supported in the case of millennial customers and regardless of the kind of restaurant (Jeon et al., 2019).

Probably the most studied CFIST technology to date is the self-service technology (SST). The research conducted by Meuter (2000) gathers users view of SST for different services and sectors. Easiness to use, time saving, independence, control, and money saving are the benefits that users find in successful SST experiences. Poor experiences are based on poor design of the interface, malfunction of the solution or lack of skills from the customer. In the case of restaurants, convenience, easy to use and fast service are the main drivers of the usage (Kincaid and Baloglu, 2006). In addition, table top SST technology can increase the check size by 2.9% and, more interestingly, reduce meal time by 9.7%, increasing the productivity of the restaurant and improving customer satisfaction by reducing unwanted waiting times (Tan and Netessine, 2018). This technology, that allows the customer to place an order, pay or experience with some information or games, even make donations (Hanks et al., 2016), can also increase the probability to return to the restaurant (Susskind and Curry, 2016). Quick service restaurants (QSR) tend to use self-service kiosks to order food instead of top table devices. The usage of such kiosks is affected by the previous experience, the external benefits obtained when using the technology and the understanding of what is the expected role of the customer in such technology (Kim et al., 2013). Such kiosks do not only impact customer experience, but also impact the efficiency of the QSR (Smith and Gregory, 1996). We can find also in the literature functional descriptions on how to build an SST system, based on Android or integrated with the PoS system of the restaurant (Bhargave et al., 2013; E.Abel & Obeten, 2015; Sarkar el al, 2014).

Finally, some studies address unique technologies with some interesting findings. Adoption of biometric systems in restaurants will be related to security perception of the system (Morosan, 2011). Chang el al. (2008) propose a PDA system for waiters based on a PDA and interacting with the customer through an RFID loyalty card, enabling the 'check-in' of the customer during the experience and therefore being able to recommend previous menus or use preconfigured payment methods. Smartphone usage inside the dining room is also understudied and only the mobile payment has been addressed, concluding that the strongest predictor of usage was related with the user lifestyle (Cobanoglu et al., 2015).

To the best of our knowledge, only one work reviews different CFIST technologies in the restaurant environment (Lee et al., 2015).That study generates clusters of customers according to their technology value perception. Such clusters can then be addressed with the appropriate user experience for each of them. The paper differs from our study as it is focused on the customer value of the technology and not in the restaurant's owner view of it.

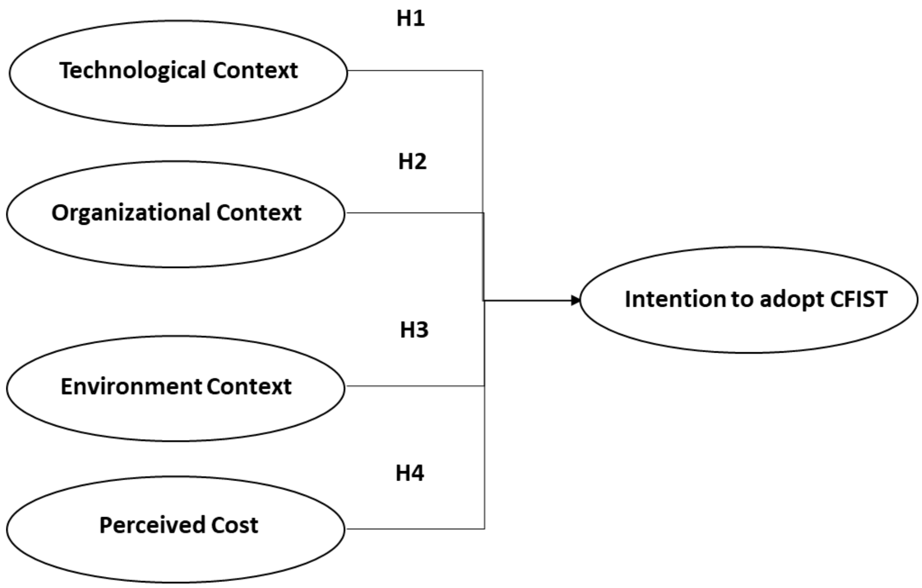
4.5 Empirical Analysis

4.5.1 Research Model

Finding the reason why individuals and organizations adopt technology has been profusely addressed in the literature, especially since mid of last century (Doob, 1947; Hill et al., 1977; Rosenberg and Hovland, 1960). Some models apply to individuals (Balaji et al., 2018; Kim et al., 2017) and others to firms (Alismaili et al., 2016; Susanty et al., 2017), and they can be found mixed in the literature (Gangwar et al., 2015; Lai, 2017). At a firm level, two theories stand out from the rest: The Diffusion of Innovation (DOI) (Bhattacharya and Wamba, 2015; Rogers, 1983) and the Technology, Organization and Environment (TOE) framework (DePietro et al., 1990). A majority of works use them as theoretical basis (Oliveira and Martins, 2010). For the purpose of our study, we will base our research on TOE as it the most extended theory for predicting adoption in small and medium enterprises (Guo and Xu, 2006; Haddara and Zach, 2012).

A simplified TOE model is used for our study. Figure 4.1 presents the four dimensions we have chosen for the study. We have decided to take the perceived cost dimension outside the TOE standard model for two reasons. First, because in the standard TOE model there is a split of such dimension between Technology and Organization but with similar objective: Perceived cost inside Technology (Sharma and Citurs, 2005) and Perceived financial resources inside Organization (Boumediene and Peter, 2008) are two variants of the same reality. Second, because we expect perceived cost to be an important factor for the intention to adopt, as the restaurant business has very low margins, ranging from 1% to 7% (Tan and Netessine, 2018).

Figure 4.1: Theoretical Model.



Different studies include in technology dimension several constructs that impact the intention to adopt as variants of TOE. As inside the SMEs the decisions are frequently taken by one person, scholars use TAM constructs like Perceived Usefulness and Perceived Ease of Use (Awa et al., 2015), more appropriate to individual decisions. The components in our study are related with control, complexity, compatibility, resources, and staff motivation, all of them profusely used in previous studies (Riemenschneider et al., 2003).

Inside organizational context, we have decided to focus solely on the decision makers of the firm. Several studies have shown that the person that decides new technology is relevant to the level of adoption (Connon, 2007; Thong, 1999; Thong and Yap, 1995).

Finally, inside environment context we chose to focus on the perceived support that restaurants have to undertake the digital transformation (Alzougool and Kurnia, 2008). Most of the institutions support is devoted to have SMEs online (Morgan et al., 2006) and there is no specific push for CFIST technologies.

According to the research model, we formulate the following four hypotheses:

- H1: Perception of the technology is a predictor of the intention to adopt CFIST technologies.
- H2: CEO support (organization) is a predictor of the intention to adopt CFIST technologies.
- H3: Perception of the institutions support (environment) is a predictor of the intention to adopt CFIST technologies.
- H4: Perceived cost is a predictor of the intention to adopt CFIST technologies.

4.5.2 4.2. Methodology and data

We decided to base our study on a survey as this is the most common approach in the literature for Technology Adoption research (Choudrie and Dwivedi, 2005). An online questionnaire was generated according to the simplified model presented. On top of demographic questions, 15 model questions were presented using as much as possible items from previous studies (Table 4.1). In so doing, we selected a set of items in our literature review. These items were then adapted to CFIST and, as most papers are published in English, translated into Spanish. A five-point Likert scale was used. Questions were presented in a different order to each respondent to avoid bias.

Table 4.1. Measurement models: reliability and convergent validity.

Latent variable	Item	λ	ρ_c	AVE
Intention			.90	.75
	I plan to have more information about these technologies	.87		
	I want to try these technologies in a near future	.85		
	In my business we will invest more resources in these technologies in the future	.88		
Technological context			.86	.50
	Digital technologies allow a tighter control over the business	.67		
	Digital technologies will make it easier for employees to do their jobs	.87		
	The other technologies in my business are compatible with digital technologies	.66		
	We have enough internal skills to run digital technologies	.66		
	Digital technologies generate / will generate more motivation among the staff	.69		
	Staff is / will be proud to work in a business with digital technologies	.67		
Perceived Cost	I cannot afford digital technologies in my business	.89	.87	.77
	Digital technologies are too expensive for the purpose and benefit they bring	.87		
Organizational context			.83	.71
	The manager of the company attends new technologies meetings	.88		
	The manager of the company supports the deployment of new technologies	.87		
Environment context			.72	.57
	I received appropriate information from Government and public institutions about Digital Transformation	.72		
	I know the norms and regulation that apply to digital technologies	.79		

Note. N = 41. λ = outer loading. ρc = composite reliability. AVE = Average Mean Extracted.

The survey was piloted with one restaurant to ensure that all the questions were easily understood through an interview with the respondent. Slight modifications were made and then the survey was distributed. El Tenedor (The Fork, https://www.eltenedor.es/), an online restaurants reservation company, sent to a selected number of restaurants of their Spanish database the offer to participate. El Tenedor is part of TripAdvisor group and manages reservations for more than 40.000 restaurants in 12 countries. Due to data privacy policies, we do not have information about how many restaurants the email was sent to and we can only refer the number of valid answers.

The sample of this study consisted of 41 participants (85.4% male, 14.6% female) with an average age of 47.97 years (SD = 9.20, 32–61). Respondents were all owners / managing directors (90.2%) or managers (9.8%). More than half of them (58.5%) were the sole responsible for deciding the acquisition of technologies in their business, while 41.5% shared this responsibility with others. Most participants held a university degree (48.8%) or had finished secondary studies (29.4%). The rest reported primary studies (12.4%) or other situations (9.4%).

Businesses were mainly located in Madrid (22.0%), Barcelona (17.1%), Canary Islands (9.8%), Andalusia (9.7%) and Valencian Community (7.3%). Although most of participants belonged to microenterprises (less than five employees, 36.6%; six to 10 employees, 43.9%), small (11 to 49 employees; 14.6%) and medium enterprises (50 to 250 employees; 4.9%) were also represented.

Data were analysed using Partial Least Squares Structural Equation Modeling (PLS-SEM). This technique is recommended when the main objective is the exploration and development of new theories, rather than the confirmation of already proposed models. SmartPLS v3.0 software was used (Ringle et al., n.d.) Descriptive statistics (mean values, standard deviations) were calculated using SPSS (Statistical Package for Social Science) software.

4.5.3 Results

4.5.3.1 PLS modelling

In evaluating and reporting the results, a two-step analysis was accomplished following the guidelines on partial least squares structural modelling (PLS-SEM) given by Hair et al. (2017). First, we assessed the measurement models (tests of validity and reliability of the measures). Second, we evaluated the structural model (i.e., to what extent variables allowed predicting intention to adopt technology). We used the bootstrapping procedure and selected 5,000 samples and pairwise deletion for missing data.

4.5.3.2 Measurement Models

All the relationships between the indicators and their constructs were significant ($p < .001$) and all their outer loadings were above the recommended value of .60. AVE and composite reliability values achieved the critical thresholds, .50 and .60, respectively (Bagozzi and Yi, 1988). These results provide evidence of the internal consistency and convergent validity of the constructs.

In order to assess the constructs' discriminant validity, we examined the indicators' cross loadings and applied the Fornell and Larcker (1981) criterion. Table 4.2 provides the correlations between constructs and, on the diagonal, the AVE root square value of reflective constructs. The measurement models exhibit discriminant validity.

Table 4.2: Pearson correlations between study variables.

Variables	*M*	*SD*	1	2	3	4	5
1. Intention to adopt CFIST	3.64	0.88	*.86*				
2. Technological context	3.80	0.70	.48**	*.71*			
3. Perceived Cost	2.48	0.94	-.48**	-.30	*.88*		
4. Organizational context	3.73	0.98	.40*	.54***	-.34*	*.84*	
5. Environmental context	2.49	0.88	.33*	.17	-.32*	.32*	*.75*

Note. On the diagonal, the AVE root square value of constructs

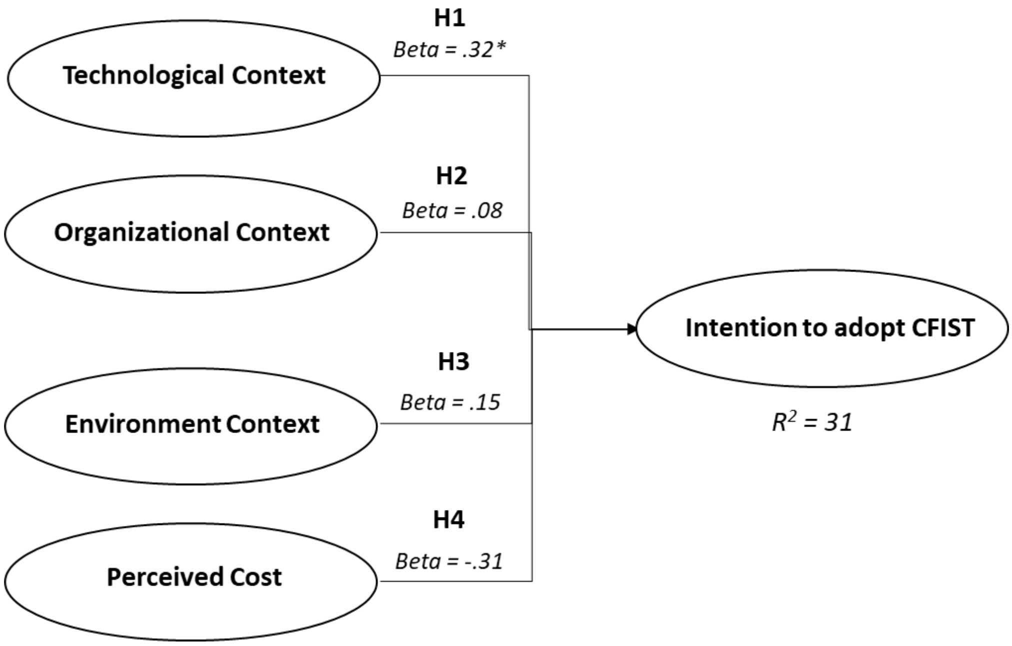
*** $p < .001$, ** $p < .01$, * $p < .05$. Scores could range from 1 to 5.

To determine the significance of the relationship between each formative indicator and its latent construct, a bootstrapping analysis with 5,000 subsamples was used. Regarding multicollinearity, the maximum values of Variance Inflation Factors (VIF) kept under the recommended value of 5 (Hair et al., 2017). Hence, there were no concerns about multicollinearity in this study. We can also highlight that all variables correlate positively with the intention to adopt CFIST, except perceived cost, that correlates negatively with the all the variables. This is consistent with the proposed model and previous findings (Kuan and Chau, 2001).

4.5.3.3 Hypothesis testing: structural model assessment

Figure 4.2 depicts the influence of the different variables considered on intention to adopt CFIST. The variance inflation factor (VIF) values for each construct ranged from 1.22 to 1.54 which are lower than the recommended cut-off value of 5 (Hair et al., 2017). Thus, collinearity of the inner model is not a concern. This model allowed to explain 31.1% of the variance of intentions to adopt CFIST. Only the coefficient of technological context was significant ($p = .02$) while the coefficient of perceived cost was marginally significant ($p = .07$), supporting the hypothesis formulated. However, the path coefficients of organizational context and environment context were not significant.

Figure 4.2: Assessment of path coefficients: structural model.



Note. $N = 41$. * $p < .05$

4.6 Discussion

This study was set out to explore the intention to adopt CFIST in a sample of restaurants located in Spain and the factors that affect a restaurant owner to install in their premises technology elements to improve customers experience using an adapted TOE framework. The results show technology context as the factor most positively related to intention to adopt CFIST, while organization and environment context did not achieve a significant path to intention. The non-significance of the decision makers (organization) and the support of institutions (environmental) could be explained by the profile of the respondents: Being themselves the final decision makers in at least half of the cases to take decisions, they don't expect any help from others to take actions (Thong and Yap, 1995). As expected, our findings reveal that perceived cost is negatively (although marginally) related to intention. The fact that this relationship was only marginally significant require further research with a bigger sample. Non-significance could be explained by two hypotheses. First, respondents are familiar with existing cost of CFIST technologies and know that their cost is reduced compared to other technologies to be deployed in their restaurants. Second, respondents are self-aware of the evolution of the market and don't see as a choice to integrate the technology, regardless of their perception of cost or internal financial resources.

The main contribution of our study is the originality in exploring the CFIST adoption at a firm level in the restaurant space, a complex and specialized sector with a series of particularities. As, to the best of our knowledge, there is no literature that investigates the reasons why restaurants decide to install different CFIST, our results cast some light and open questions for future research. Even at a retail only one study bases on TOE framework to analyse CFIST, specifically the adoption of RFID in retail (Bhattacharya and Wamba, 2015), where 74 surveys were conducted, and only 16 were actual retailers. In that RFID work, and contrary to our study, most of the technology context items are non-significant, including perceived cost. These differences can arise from the totally different technology that we are analysing and the profile of the respondents. Digital signage, social Wi-Fi or SST are simpler to understand than RFID and overall cost of ownership is more straightforward. Regarding profiles, our study includes only managers of restaurants that have relationship with El Tenedor, and therefore are already taking online reservations. This makes them much more familiar with the technology evolution. Although this entails a bias in the sample, it also shows that the usage of new technology has had a positive impact in their perception of what can be done in their dining rooms.

4.7 Conclusions

This research was designed to explore relationships between technology perception, organization, environment, perceived cost, and the intention to adopt CFIST technologies in SME restaurants. Among these factors, technology perception showed the highest impact in the intention to adopt, followed by the negative impact of perceived cost. There was no significance of the rest of the constructs of the model, and further research could focus on more specific work to include or discard the rest of the elements of the model. Most of the respondent were restaurant owners that have to cope with a dramatic rate of change in their sector: New customer requirements of several kinds, online food ordering, or the development of franchising. The way they see technology in the relationship with customers becomes relevant as they lack time and resources to undertake thorough analysis of the different decisions to transform their business. Also, their business has nothing to do with technology and generally they don't have an IT department. They trust their knowledge and guide their decisions rather in intuition than data. Restaurant owners are a very specific subset of SMEs CEOs and require therefore to stablish a line of research to confirm the findings that apply to general SMEs around technology. At the same time, CFIST technology is a very specific kind of technology among all the back end and front-end technologies that can be used and installed in a restaurant environment. The view of the restaurant owner of CFIST can have nuances with the rest of technologies that have to be further study.

Due to the characteristics of the sample, this study has limitations. These limitations come fundamentally from the size of the sample and the target respondents. First, the sample size only allows for an exploratory analysis. Considering the particularities of the target businesses, owners are difficult to contact and get involved in this kind of studies. Thus, sample sizes in similar studies tend to be small. Second, our sample is restricted to restaurants with experience in online reservations. Future research should increase the sample and choose restaurants that are not already users of a specific online technology. Also, the number of questions was kept low in order to improve the answer ratio. In future studies the number of questions should increase to improve the accuracy of the instrument. The sample should also be increased to ensure an acceptable number of answers even with a longer survey. Finally, a cross-sectional study does not enable inferences of causation. More longitudinal studies in this sector are encouraged to investigate how intention to adopt CFIST relates to the effective adoption behaviour.

Despite its limitations, our study has strong implications for theory and practice. First, it supports the adequacy of the TOE framework to explore CFIST adoption in the restauration sector. Moreover, it provides hints to incentivize technology adoption in restaurants to improve their competitivity. The value of this study is to be the first to address this topic and to show the relevance of these relationship between the TOE framework and intention to adopt.

4.8 References

Alismaili, S., Li, M., Shen, J., He, Q., 2016. A Multi Perspective Approach for Understanding the Determinants of Cloud Computing Adoption among Australian SMEs, in: ACIS 2015 Proceedings - 26th Australasian Conference on Information Systems.

Alzougool, B., Kurnia, S., 2008. Electronic Commerce Technologies Adoption by SMEs: A Conceptual Study, in: ACIS 2008 Proceedings.

Ansel, D., Dyer, C., 1999. A Framework for Restaurant Information Technology. Cornell Hotel Restaur. Adm. Q. 40, 74–84. https://doi.org/10.1177/001088049904000322

Awa, H.O., Ojiabo, O.U., Emecheta, B.C., 2015. Integrating TAM, TPB and TOE frameworks and expanding their characteristic constructs for e-commerce adoption by SMEs. J. Sci. Technol. Policy Manag. 6, 76–94. https://doi.org/10.1108/JSTPM-04-2014-0012

Bagozzi, R., Yi, Y., 1988. On the Evaluation of Structure Equation Models Reshoring from a demand-side perspective View project household food waste minimization View project. Artic. J. Acad. Mark. Sci. https://doi.org/10.1007/BF02723327

Balaji, M.S., Roy, S.K., Sengupta, A., Chong, A., 2018. User Acceptance of IoT Applications in Retail Industry, in: IGI Global (Ed.), Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications. pp. 1331–1352. https://doi.org/10.4018/978-1-5225-5201-7.ch061

Beldona, S., Buchanan, N., Miller, B.L., 2014. Exploring the promise of e-tablet restaurant menus. Int. J. Contemp. Hosp. Manag. 26, 367–382. https://doi.org/10.1108/IJCHM-01-2013-0039

Betzing, J.H., Hoang, A.Q.M., Becker, J., 2018. In-store technologies in the retail servicescape, in: MKWI 2018 - Multikonferenz Wirtschaftsinformatik. pp. 1671–1682.

Bhargave, A., Jadhav, N., Joshi, A., Oke, P., Lahane, P.S.R., 2013. Digital Ordering System for Restaurant Using Android. Int. J. Sci. Res. Publ. 3, 1–7.

Bhattacharya, M., Wamba, S.F., 2015. A Conceptual Framework of RFID Adoption in Retail Using TOE Framework. Bus. Process Manag. J. 21, 517–540. https://doi.org/10.4018/ijtd.2015010101

Boumediene, R., Peter, K., 2008. Predicting SMEs willingness to adopt ERP, CRM, SCM & E-Procurement systems, in: 16th European Conference on Information Systems, ECIS 2008.

CB Insights, 2017. The Future of Dining: 89+ Startups Reinventing The Restaurant In One Infographic [WWW Document]. CB Insights – Blog. URL https://www.cbinsights.com/research/restaurant-tech-market-map-company-list/ (accessed 12.6.19).

Chang, C.S., Kung, C.C., Tan, T.H., 2008. Development and implementation of an e-restaurant for customer-centric service using WLAN and RFID technologies, in: Proceedings of the 7th International Conference on Machine Learning and

Cybernetics, ICMLC. pp. 3230–3235. https://doi.org/10.1109/ICMLC.2008.4620963

Chiang, K.P., Dholakia, R.R., 2003. Factors driving consumer intention to shop online: An empirical investigation. J. Consum. Psychol. 13, 177–183. https://doi.org/10.1207/s15327663jcp13-1&2_16

Choudrie, J., Dwivedi, Y.K., 2005. Investigating the research approaches for examining technology adoption issues. J. Res. Pract. 1, 1–12.

Clement, J., 2019. Annual retail e-commerce sales growth worldwide from 2014 to 2023 [WWW Document]. Statista. URL https://www.statista.com/statistics/288487/forecast-of-global-b2c-e-commerce-growt/ (accessed 10.20.19).

Cobanoglu, C., Bilgihan, A., Nusair, K.K., Berezina, K., 2012. The Impact of Wi-Fi Service in Restaurants on Customers’ Likelihood of Return to a Restaurant. J. Foodserv. Bus. Res. 15, 285–299. https://doi.org/10.1080/15378020.2012.706194

Cobanoglu, C., Yang, W., Shatskikh, A., Agarwal, A., 2015. Are Consumers Ready for Mobile Payment? An Examination of Consumer Acceptance of Mobile Payment Technology in Restaurant Industry. Hosp. Rev. 31, 6.

Connon, N.G., 2007. Factors impacting on technology acceptance for the micro/sme electronics retailer. Robert Gordon University.

Dennis, C., Newman, A., Michon, R., Josko Brakus, J., Tiu Wright, L., 2010. The mediating effects of perception and emotion: Digital signage in mall atmospherics. J. Retail. Consum. Serv. 17, 205–215. https://doi.org/10.1016/j.jretconser.2010.03.009

DePietro, R., Wiarda, E., Fleischer, M., 1990. The context for change: Organization, technology and environment, in: Tornatzky, L.G., Fleischer, M. (Eds.), The Processes of Technological Innovation. Lexington Books, Lexington, MA., pp. 151–175.

Dionísio, M., Teixeira, D., Shen, P., Dinis, M., Chen, M., Nunes, N., Nisi, V., Paiva, J., 2013. Eat&Travel: A new immersive dining experience for restaurants, in: Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics). pp. 532–535. https://doi.org/10.1007/978-3-319-03161-3_46

Dixon, M., Kimes, S.E., Verma, R., 2009. Customer Preferences for Restaurant Technology Innovations. Cornell Hosp. Rep. 9, 6–16.

Doob, L.W., 1947. The behavior of attitudes. Psychol. Rev. 54, 135.

E.Abel, E., Obeten, E., 2015. Restaurant Customer Self-ordering System: A Solution to Reduce Customer/Guest Waiting Time at the Point of Sale. Int. J. Comput. Appl. 111, 19–22. https://doi.org/10.5120/19583-1332

Euro Commerce, 2017. Retail and wholesale SMEs working for growth.

European Commission, 2016. Fostering SMEs growth through digital transformation, European Commission.

Fornell, C., Larcker, D., 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. J. Mark. Res. 18, 39–50. https://doi.org/10.1177/002224378101800104

Furunes, T., Mkono, M., 2019. Service-delivery success and failure under the sharing economy. Int. J. Contemp. Hosp. Manag. 31, 3352–3370. https://doi.org/10.1108/IJCHM-06-2018-0532

Gangwar, H., Date, H., Ramaswamy, R., 2015. Understanding determinants of cloud computing adoption using an integrated TAM-TOE model. J. Enterp. Inf. Manag. 28, 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

Guo, R., Xu, Y., 2006. The adoption of internet-based businessto- Business e-marketplaces among small and medium-sized enterprises in their international marketing practices, in: Proceedings of the 14th European Conference on Information Systems, ECIS 2006.

Haddara, M., Zach, O., 2012. ERP Systems in SMEs: An Extended Literature Review. Int. J. Inf. Sci. 2, 106–116. https://doi.org/10.5923/j.ijis.20120206.06

Hair, J.F., Hult, G.T.M., Ringle, C.M., Sarstedt, M., 2017. A primer on partial least squares structural equation modeling (PLS-SEM), 2nd ed. Los Angeles, CA, USA. https://doi.org/10.1080/1743727x.2015.1005806

Ham, S., Kim, W.G., Forsythe, H.W., 2008. Determinants of Restaurant Employees' Technology Use Intention: Validating Technology Acceptance Model with External Factors via Structural Equation Model, in: Information and Communication Technologies in Tourism 2008. Springer Vienna, pp. 441–452. https://doi.org/10.1007/978-3-211-77280-5_39

Hanks, L., Line, N.D., Mattila, A.S., 2016. The Impact of Self-Service Technology and the Presence of Others on Cause-Related Marketing Programs in Restaurants. J. Hosp.

Mark. Manag. 25, 547–562. https://doi.org/10.1080/19368623.2015.1046536

Harrington, R.J., Ottenbacher, M.C., Staggs, A., Powell, F.A., 2012. Generation Y Consumers: Key Restaurant Attributes Affecting Positive and Negative Experiences. J. Hosp. Tour. Res. 36, 431–449. https://doi.org/10.1177/1096348011400744

Helm, S., Kim, S.H., Van Riper, S., 2018. Navigating the 'retail apocalypse': A framework of consumer evaluations of the new retail landscape. J. Retail. Consum. Serv. 0–1. https://doi.org/10.1016/j.jretconser.2018.09.015

Hill, R.J., Fishbein, M., Ajzen, I., 1977. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Contemp. Sociol. 6, 244. https://doi.org/10.2307/2065853

Hsu, L., Wu, P., 2013. Electronic-Tablet-Based Menu in a Full Service Restaurant and Customer Satisfaction -- A Structural Equation Model. Int. J. Business, Humanit. Technol. 3, 61–71.

Inman, J.J., Nikolova, H., 2017. Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. J. Retail. 93, 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Jeon, J., Yoo, M., Christodoulidou, N., 2019. The impact of Wi-Fi service on millennial diners. J. Hosp. Tour. Technol. 10, 413–430. https://doi.org/10.1108/JHTT-11-2017-0133

Kapoor, A.P., Vij, M., 2018. Technology at the dinner table: Ordering food online through mobile apps. J. Retail. Consum. Serv. 43, 342–351.

https://doi.org/10.1016/j.jretconser.2018.04.001

Kim, J., Christodoulidou, N., Choo, Y.C., 2013. Factors influencing customer acceptance of kiosks at quick service restaurants. J. Hosp. Tour. Technol. 4, 40–63. https://doi.org/10.1108/17579881311302347

Kim, Lee, J., Mun, J., Johnson, K., 2017. Consumer adoption of smart in-store technology: assessing the predictive value of attitude versus beliefs in the technology acceptance model. Int. J. Fash. Des. Technol. Educ. 10, 26–36. https://doi.org/10.1080/17543266.2016.1177737

Kincaid, C.S., Baloglu, S., 2006. An exploratory study on the impact of self-service technology on restaurant operations. J. Foodserv. Bus. Res. 8, 55–65. https://doi.org/10.1300/J369v08n03_05

Koutroumanis, D., 2011. Technology's Effect on Hotels and Restaurants: Building a Strategic Competitive Advantage. J. Appl. Bus. Econ. 12, 72–80.

Kuan, K.K.Y., Chau, P.Y.K., 2001. A perception-based model for EDI adoption in small businesses using a technology-organization-environment framework. Inf. Manag. 38, 507–521. https://doi.org/10.1016/S0378-7206(01)00073-8

Lai, P., 2017. the Literature Review of Technology Adoption Models and Theories for the Novelty Technology. J. Inf. Syst. Technol. Manag. 14, 21–38. https://doi.org/10.4301/s1807-17752017000100002

Lee, M.K., Verma, R., Roth, A., 2015. Understanding customer value in technology-enabled services: A numerical taxonomy based on usage and utility. Serv. Sci. 7, 227–248. https://doi.org/10.1287/serv.2015.0105

Loonam, J., Eaves, S., Kumar, V., Parry, G., 2018. Towards digital transformation: Lessons learned from traditional organizations. Strateg. Chang. 27, 101–109. https://doi.org/10.1002/jsc.2185

Lorden, A., 2019. 21st Annual restaurant technology study.

Lorden, A., 2018. 20th Annual restaurant technology study.

Meuter, M.L., Ostrom, A.L., Roundtree, R.I., Bitner, M.J., 2000. Self-service technologies: Understanding customer satisfaction with technology-based service encounters. J. Mark. 64, 50–64. https://doi.org/10.1509/jmkg.64.3.50.18024

Monty, R.C. da S., 2018. Creative Economy: how the interface of Uber Eats and iFood could change your menu. Brazilian J. Oper. Prod. Manag. 15, 413–419. https://doi.org/10.14488/bjopm.2018.v15.n3.a8

Morgan, A., Colebourne, D., Thomas, B., 2006. The development of ICT advisors for SME businesses: An innovative approach. Technovation 26, 980–987. https://doi.org/10.1016/j.technovation.2005.09.001

Morosan, C., 2011. Customers' adoption of biometric systems in restaurants: An extension of the technology acceptance model. J. Hosp. Mark. Manag. 20, 661–690. https://doi.org/10.1080/19368623.2011.570645

Newman, A., Dennis, C., Wright, L.T., King, T., 2010. Shoppers' experiences of digital signage-a cross-national qualitative study. Int. J. Digit. Content Technol. its Appl. 4. https://doi.org/10.4156/jdcta.vol4.issue7.5

Oliveira, T., Martins, M.F., 2010. Information technology adoption models at Firm Level: Review of literature, in: 4th European Conference on Information Management and Evaluation, ECIME 2010. pp. 312–322.

Oronsky, C.R., Chathoth, P.K., 2007. An exploratory study examining information technology adoption and implementation in full-service restaurant firms. Int. J. Hosp. Manag. 26, 941–956. https://doi.org/10.1016/j.ijhm.2006.04.001

Pantano, E., Naccarato, G., 2010. Entertainment in retailing: The influences of advanced technologies. J. Retail. Consum. Serv. 17, 200–204. https://doi.org/10.1016/j.jretconser.2010.03.010

Peters, A., Mennecke, B., 2011. The role of dynamic digital menu boards in consumer decision making, in: Conference on Human Factors in Computing Systems - Proceedings. pp. 1693–1698. https://doi.org/10.1145/1979742.1979830

Reinartz, W., Dellaert, B., Krafft, M., Kumar, V., Varadarajan, R., 2011. Retailing innovations in a globalizing retail market environment. J. Retail. 87, S53–S66. https://doi.org/10.1016/j.jretai.2011.04.009

Riemenschneider, C.K., Harrison, D.A., Mykytyn, P.P., 2003. Understanding it adoption decisions in small business: Integrating current theories. Inf. Manag. 40, 269–285. https://doi.org/10.1016/S0378-7206(02)00010-1

Ringle, C., Wende, S., July, J.B.-R., 2015, U., n.d. SmartPLS 3. Bönningstedt: SmartPLS.

Rogers, E.M., 1983. Diffusion of Innovations, 3rd ed. New York.

Rosenberg, M.J., Hovland, C.I., 1960. Cognitive, Affective and Behavioral Components of

Attitudes, in: Yale University Press, N.H. (Ed.), Attitude Organization and Change: An Analysis of Consistency among Attitude Components.

Ruiz-Molina, M.E., Gil-Saura, I., Berenguer-Contrí, G., 2014. Information and Communication Technology as a Differentiation Tool in Restaurants. J. Foodserv. Bus. Res. 17, 410–428. https://doi.org/10.1080/15378020.2014.967639

Sarkar, S., Shinde, R., Thakare, P., Dhomne, N., Bhakare, K., 2014. Integration of Touch Technology in Restaurants using Android. Int. J. Comput. Sci. Mob. Comput. 3, 721–728.

Shankar, V., Smith, A.K., Rangaswamy, A., 2003. Customer satisfaction and loyalty in online and offline environments. Int. J. Res. Mark. 20, 153–175. https://doi.org/10.1109/61.127100

Sharma, A., Citurs, A., 2005. Radio frequency identification (RFID) adoption drivers: A radical innovation adoption perspective, in: Association for Information Systems - 11th Americas Conference on Information Systems, AMCIS 2005: A Conference on a Human Scale. pp. 1273–1278.

Smith, K., Gregory, S., 1996. Customer Activated Terminals. J. Restaur. Foodserv. Mark. 1, 107–120. https://doi.org/10.1300/j061v01n03_07

Susanty, A., Sari, D.P., Anastasia, D., 2017. Critical success factors for the internet technology adoption by SMEs and its impact for the performance. Proceeding - 2016 2nd Int. Conf. Sci. Inf. Technol. ICSITech 2016 Inf. Sci. Green Soc. Environ. 35–40. https://doi.org/10.1109/ICSITech.2016.7852604

Susskind, A.M., Curry, B., 2016. An examination of customers' attitudes about tabletop technology in full-Service restaurants, in: Service Science. INFORMS Inst.for Operations Res.and the Management Sciences, pp. 203–217. https://doi.org/10.1287/serv.2016.0132

Tan, T., Netessine, S., 2018. At Your Service on the Table: Impact of Tabletop Technology on Restaurant Performance. SSRN Electron. J. 1–42. https://doi.org/10.2139/ssrn.3037012

Thong, J.Y.L., 1999. An integrated model of information systems adoption in small businesses. J. Manag. Inf. Syst. 15, 187–214. https://doi.org/10.1080/07421222.1999.11518227

Thong, J.Y.L., Yap, C., 1995. CEO characteristics, organizational characteristics and information technology adoption in small businesses. Omega 23, 429–442. https://doi.org/10.1016/0305-0483(95)00017-I

5. ARE RETAILERS LEVERAGING IN-STORE ANALYTICS? AN EXPLORATORY STUDY

5 ARE RETAILERS LEVERAGING IN-STORE ANALYTICS? AN EXPLORATORY STUDY

5.1 Abstract

The purpose of this study is to analyse the level of adoption of customer tracking solutions by brick-and-mortar retailers. Customer analytics technology has been widely adopted by online retailers, and the technology to gather similar information in physical stores is already available. This study explores how such technology is valued and adopted by retailers and is the first to analyse the level of adoption of in-store analytics from the perspective of retailers. It is based on interviews and a focus group of 21 retail executives using semi-structured interview methodology. An in-store analytics service was defined, along with specific key point indicators (KPIs) and use cases to structure respondents' feedback. Although noteworthy differences in the value of KPIs and use cases by the business sector have been found, the main finding is that none of the respondents reached the stage of a brick-and-mortar data-driven organisation, and all remain in the first stages of Rogers's (1983) model of adoption of innovation. The results should encourage scholars to further investigate the drivers that accelerate the adoption of these technologies. Practitioners and solution providers should strive for improvement in the deployment plans and simplicity of their solutions.

5.2 Introduction

The retail sector is going through a period of transformation and disruption (Hagberg *et al.*, 2016). Although physical retail still accounts for most of the revenue in the sector (Clement, 2019), and customers show a preference for an improved brick-and-mortar experience over online shopping (Spanke, 2020; Wilson, 2013), thousands of stores worldwide are closing down. The remaining stores are going through a transformation process that some scholars have called the retail apocalypse (Childs *et al.*, 2020; Mende and Noble, 2019) due to the growth of e-commerce (Chiang and Dholakia, 2003).

Indeed, e-commerce has several benefits for shoppers, such as product range, product information, and convenience (Somani, 2015). For retailers, e-commerce brings full information on customer behaviour and traffic. Customer traffic measurement is key to the business, and has been positively correlated with sales in previous research (Anic *et al.*, 2010; Yiu and Ng, 2010). Websites are often organised like traditional shops, with virtual departments, aisles, shopping carts, and counter lanes (Huotari, 2015). In each click, all of a customer's interactions and movements are collected and digitally stored, generating a large amount of data that can be processed to increase customer knowledge and identify actions for the business, such as customer recommendations or website restructuring (Bilgic and Duan, 2019; Ramzan *et al.*, 2019).

Although brick-and-mortar store transactions are not genuinely digital, different kinds of technologies are available to record and measure what is happening inside. The evolution of the internet of things brings increasingly more hardware and software that allow registration of information of the real world for processing to create valuable information for businesses (Weinswig, 2017). Having access to internet-like analytics in physical stores is a key asset that enables them to make more fact-based decisions, and to apply them dynamically and automatically (Huotari, 2015). Key data with the potential to raise the interest of any business comes from customer tracking, as the number of customers and their path in the store directly impacts sales volume (Perdikaki *et al.*, 2012).

This research focuses on the perception and level of adoption by retailers of in-store customer tracking services based on a proposed service definition that delivers customer tracking insights for physical stores. The aim of this study is to answer the following question: Are brick-and-mortar retailers leveraging in-store analytics? For this purpose, we conduct field work based on interviews and a focus group of retailer representatives; respondents explain their needs, current level of digitalisation, and their views on the benefits and value of in-store analytics. The contribution of the study is threefold. First, it shows that physical retailing remains in the early stages of customer tracking adoption. Second, the findings show that there is no mature digital plan in organisations in respect of brick-and-mortar technologies. Third, our results show that there is an underlying interest in data-driven organisations, although no clear actions are taken. These findings will allow practitioners to improve technology and services. Furthermore, our results will encourage researchers to analyse the value of brick-and-mortar analytics and related technologies.

The remainder of the paper is structured as follows. Section 2 sets the theoretical background for this research, explains the value of measuring customer behaviour in brick-and-mortar retailing and the related technologies, and addresses privacy concerns. In Section 3, we develop the empirical analysis, explain the research objectives, the survey model, and the composition of the sample and the data obtained, and close with a discussion of the results. Finally, in Section 4, we state our conclusions, limitations of the study, and proposals for future research.

5.3 Theoretical background. The business value of customer tracking data

One of the most accepted characteristics of e-commerce, since its beginning, has been the digital recording of interactions (Huotari, 2015). Through an analysis of such information, accurate business decisions can be made (Chaffey and Patron, 2012; Phippen *et al.*, 2004). Bilgic and Duan (2019, p. 175) identified, through a systematic literature review, the business value of e-commerce data analytics, and highlighted several usages, such as '… pricing a product/service, designing or improving a product/service and recommending a product/service, measuring service quality, etc.'. The ultimate goal is to increase sales through conversion rate optimisation (CRO) (Beri and Parminder, 2013; Chaffey and Patron, 2012; Saleem *et al.*, 2019). In CRO, practitioners group the techniques to improve conversion rates, which generally refer to sales per visitor (Saleem *et al.*, 2019).

The logging of transactions and interactions in the physical world requires recording technology. Cheaper sensors, improved software algorithms, and mobile devices (Härtfelder and Winkelmann, 2016) narrow the differences between brick-and-mortar retailers and e-commerce merchants with regard to customer tracking data (Mavroudis and Veale, 2018); this leads to a better understanding of the shopping process, with important findings for the business (Perdikaki *et al.*, 2012; Karaman, 2015). The key point indicators (KPIs) for the physical world tend to match those of the online world, although they are limited by the kind of interactions that are possible or cost efficient to measure. For example, it is easy, in the online world, to register that a customer is viewing a product page, whereas for a brick-and-mortar store it would be difficult to track a customer's interest in specific products in the aisles through the IoT technology. Despite such restrictions, however, the incremental value is colossal. Based only on customer traffic and sales, Perdikaki *et al.* (2012) defined relevant KPIs, such as conversion rate and basket value, and obtained business insights that affected store labour and location decisions. Traffic tracking can also apply to larger areas, such as an entire high street, and provide information on customer preferences, specific shopping times for different items, or the propensity to react to promotions (Betzing, 2018). Huotari (2015) conducted a literature review of non-financial retail KPIs and found that 42.2% of non-financial KPIs were related to customer behaviour, e.g. traffic (visits), customer flow, mobility, time spent in an area, and loyalty. Ratios with financial KPIs, especially sales, offer important insights into the performance of a business, such as the conversion rate.

Initially, traditional methods were used to register these data, including questionnaires, surveys, and interviews (Das and Varshneya, 2017; Hu and Jasper, 2004; Kesari and Atulkar, 2016). Although these methods could retrieve in-depth information on preferences and opinions, they suffered from a bias in the trustworthiness of the answers (Newman et al., 2002). In some cases, they were complemented by direct observations that were labour intensive (Yiu and Ng, 2010). Although these methods have been broadly used in the past, there is no possibility of real-time usage and continuous measurement as they require human interaction to register the results (Dogan et al., 2019).

Technology helps to avoid these limitations. Since the objective is to track the movements of customers in physical stores, the technology must detect target individuals in the space. Different technologies and methodologies can be used for such a purpose. Table 5.1 presents a summary of the main technologies that can be used for customer tracking and the related literature.

Table 5.1: Technology used for customer tracking.

Technology	Description	Use cases presented in previous works	Limitations	References
RFID (Radio Frequency Identification)	Short range radio technology frequently used for supply chain control and goods tracking. Implemented inside trolleys and shopping baskets that are tracked thanks to layout antennas.	Analyse shopping paths. Improve fitting room interaction. Analyse purchase probability based on dwell time. Analyse dwell time. Modify paths to draw attention to less visited areas of the store	Only measures people with basket or trolleys. No customer opt-in, only anonymous data can be used.	Fujino *et al.*, 2014; Landmark and Sjøbakk, 2017; Larson *et al.*, 2005; Takai and Yada, 2010; Vukovic *et al.*, 2012
Bluetooth Sensors	Radio technology available in most mobile devices. The tracking solution track bluetooth signals from customers phones	Analyse customer behaviour inside a shopping mall.	No customer opt-in, only anonymous data. Only Bluetooth enabled phones are detected.	Oosterlinck *et al.*, 2017
Beacons	Battery powers devices emitting a Bluetooth Low Energy (BLE) unique identifier. A mobile application can read this signal and check on a cloud database the position of the beacon	Analyse shopping paths. Improve user interactions. Analyse customer behaviour. Attitude towards beacons from consumers. Indoor positioning system.	Customers must have the appropriate App and Bluetooth enabled in their phones. Expensive installations for customer tracking, as the accuracy of beacons is limited and requires a dense network of sensors.	Betzing, 2018; Dogan *et al.*, 2019; Pierdicca *et al.*, 2015; Sturari *et al.*, 2016; Thamm *et al.*, 2016; Triantafyllou *et al.*, 2017
Audio and visual Beacons	Instead of using radio, audio beacons use sound waves beyond the hearing threshold to trigger the mobile application logic, based on microphone of Bluetooth. Visual beacons are camera based and use imperceptible changes of light.	Technical and regulatory analysis.		Mavroudis and Veale, 2018
Wi-Fi	Scanning from Wi-Fi Access Points (APs) of the customer devices.	Pedestrian and cyclists monitoring. Customer tracking inside a mall. Indoor positioning system. Optimizing Store Layout. Detecting visited areas.	No customer opt-in, only anonymous data. Limitations of accuracy.	Abedi *et al.*, 2015; Bai *et al.*, 2014; Carrera *et al.*, 2018; Fukuzaki *et al.*, 2015; Hwangbo *et al.*, 2017; Zeng *et al.*, 2015
Computer Vision	Usage of image processing to detect customer movements.	Detecting potentially suspicious behaviours in shopping malls. Customer instore tracking. Analyse purchasing behaviour.	Complex algorithms or manual work to be done. No customer opt-in, only anonymous data.	Arroyo *et al.*, 2015; Celikkan *et al.*, 2011; Merad *et al.*, 2016; Oosterlinck *et al.*, 2017; Quintana et al, 2016; Wu *et al.*, 2015

Source: Prepared by authors

A major line of work in tracking and profiling solutions is privacy. Although scholars highlight the current privacy concerns (Farshidi, 2016; Groß, 2015; Nguyen, 2019; Turri et al., 2017) and laws are evolving towards the need for explicit approvals to use any kind of personal data (Betzing, 2018; Weinswig, 2017), customers, in general, are willing to receive targeted information that represents their needs more accurately (Infosys, 2013; Kerem and Ulla, 2018). Furthermore, some data can be anonymised and aggregated, giving powerful insights and avoiding the personal data privacy issue. Companies that develop solutions must therefore choose between explicit user acceptance of the use of personal data or an anonymisation process. An example of such use of anonymised information is the Smart Steps service from Telefónica (Hong et al., 2020; Telefonica, 2020). Based on a mixture of mobile network and web browsing information, it delivers aggregated information on the demographics and preferences of visitors that were present in a specific area at a specific time, where they had visited previously, and where they went afterwards.

5.4 Methodology and data

5.4.1 Design and sample

We employed an interview-based methodology (Rowley, 2012), as it is the most widely used in the organisational information systems and technology adoption literature (Choudrie and Dwivedi, 2005; Mingers, 2003). We chose to do semi-structured interviews (Louise and Alison, 1994), individual sessions, dual sessions, and a focus group, as the interview methodology allows different options (Mingers, 2003).

To standardise the sample and ensure valuable answers from all respondents, participating businesses had to have at least 10 brick-and-mortar retail stores, and use at least two of the following five technologies: digital signage, mobile app for customers, online analytics, Wi-Fi for customers, and people counters. Furthermore, interviewees had to occupy a specific rank in the company: chief executive officer (CEO), chief financial officer (CFO), chief marketing officer (CMO), or chief digital officer (CDO). Technical roles (operations and IT) were selected for the group session. Companies could be from different retail sectors.

The final composition of the sample by sector is shown in Table 5.2.

Table 5.2: Composition of the sample by sector.

Sector	Number of interviewees	Participants in the group session
Specialized retail	3	1
Bank and financial services (branches)	2	1
Hotels	2	
Restaurants	2	1
Fashion	1	1
Car dealer	1	1
Telecommunications Retail	1	1
Health and wellness	3	
TOTAL	**15**	**6**

Source: Prepared by authors

A total of seven individual interviews, four dual interviews, and one focus group with six participants were conducted from 17 July to 31 July 2019. All sessions were face-to-face. A semi-structured script was used, with the following five-point agenda:

introduction, brick-and-mortar digitalisation, company and role challenges, relevant business KPIs, and service feedback. The first questions allowed us to characterise the sample (Is there a plan in place to digitally transform your company? What level of maturity do you have towards digital transformation?), while the main questions were directly related to the research (What are your day-to-day challenges? How useful would a customer tracking service be? How would you use it?).

We also established a specific service definition for a customer tracking solution to receive the respondents' feedback homogeneously. The service, named In-store Insights, can use different sources of data from three technologies: Wi-Fi, beacons, and cameras. The software gathers all the data from sensors and converts them into a set of KPIs, which are then presented on a dashboard where a user can review the insights, export them, or mix them with other sources to obtain information for making decisions. Participants were informed that all the collected data would be anonymised to comply with current regulations on data protection and privacy. During the sessions, the service was described to the participants, and they were requested to assess the value of two sets of information: first, a list of KPIs that could be obtained, and second, cases where such information would eventually be used in their businesses. KPIs and use cases were taken from existing service definitions and success stories from the industry (Ipsos, 2017; Luenendonk, 2015; SightCorp, 2020; Telefonica, 2020; Walkbase, 2020).

To characterise the sample, Table 5.3 shows the respondents' key declarative statements on their market situation. We observe very different perceptions. E-commerce has disrupted each sector differently, and retailers focus on improved experience and bring value with specialised shop assistants and personalised and segmented customer attention (Kamaladevi, 2010). The answers show that price competition and product catalogues are not major concerns for the respondents; instead, they seek to move away from transactional sales and to add extra value to the customer experience.

Table 5.3: Business situation.

Sector	Company Business	Market Situation (declarative)
Specialized retail	Travel agency	Mature Market, most of it gone online, requires advanced experiences in the store
	Cosmetics	Testing is key, requires specialized shop assistants
	Household goods	Too broad catalogue, attraction to the store is key
Banking	Bank	Reduction of branches, online, reputation of banks
	Financial Services	Requires skilled financial advisors
Hotels	Hotel	Digital platforms make more important customer experience
Restaurants	Restaurant	Home delivery is changing the market
Fashion	Fashion	Mature and segmented marketed, need to address perfectly target segment needs
Car dealers	Car dealer	Brands fix the layout and technology, difference in the human interaction (sales specialist)
Retail Telco	Retail Telco	Very mature market. Price driven. Waiting times and product rotation are key
Health and wellness	Dental Clinic	Key elements: Price competition and omnichannel
	Parapharmacy	Growing sector, requires expert sales attendants
	Hairdressing	Highly competitive, word of mouth marketing

Source: Prepared by authors

5.4.2 Results

The respondents provided structured feedback on the technologies currently in use and the value of the In-store Insights service. Table 5.4 presents the respondents' perceptions of the level of digital maturity in their companies and the technologies that are already installed in their businesses. There are three main findings shown in this table. First, there is no relationship between the perception of maturity and the number of technologies, which shows how abstract the concept of digital transformation is for the respondents. In general, the respondents recognise that they are in the early stage of digital transformation. ‘We have just started a digital unit’, (operations manager, restaurant); ‘I am more a marketing guy than a digital guy’, (CMO, dental clinic); ‘We don’t have a specific department, there is no budget or strategy’, (CMO, cosmetics). Secondly, the only technology that is present in all businesses is web analytics. Most of the companies have somebody devoted to obtaining and distributing the data. ‘There’s a person in the web department’, (CMO, travel agency); ‘The people that did our Web send us the report’, (CFO, hairdresser). This finding underscores the value of customer tracking for retailers when it is simple, available, and established in an organisation. For example, a simple tool, Google Analytics, is used by more than 29 million websites (BuiltWith, 2020). Interestingly, there is no similar penetration of brick-and-mortar analytics; only a few of the respondents measure customer flows with people counters and perceive the data obtained (visits) to be of limited value for their businesses compared to the cost of installation. ‘We would only need this data in special events’, (CEO, car dealer); ‘We do have the technology, but we don’t use it, we don’t check the data’, (operations manager, household goods). Third, the second most used technology is Wi-Fi for customers. ‘No matter the origin of the customer, the first thing they want is the Wi-Fi password and then the room’, (CMO, hotel). Despite the evolution of mobile data plans, some businesses see this functionality as necessary although they derive no analytics value from it. ‘A coffee and the Wi-Fi while the customers wait is a completely different experience’, (CFO, hairdresser). None of them uses it as a proximity marketing tool or a customer tracking data source yet, probably due to a lack of information on how they can convert the internet access into a source of data and interaction.

Table 5.4: Technology maturity

Sector	Company Business	Level of Digital Maturity (Declarative)	Technologies: Digital Signage	Mobile App	Web Analytics	Wi-Fi for customers	People counters
Specialized retail	Travel agency	Average	✓	✓	✓		✓
	Cosmetics	Average	✓	✓	✓		
	Household goods	Below average			✓	✓	
Banking	Bank	Above average	✓	✓	✓	✓	✓
	Financial Services	Average	✓		✓		
Hotels	Hotel	Above average	✓	✓	✓	✓	
Restaurants	Restaurant	Average			✓	✓	
Fashion	Fashion	Below average	✓		✓	✓	✓
Car dealers	Car dealer	Above average	✓		✓	✓	
Retail Telco	Retail Telco	Below average		✓	✓	✓	
Health and wellness	Dental Clinic	Above average	✓	✓	✓	✓	
	Parapharmacy	Average	✓		✓	✓	
	Hairdressing	Average			✓	✓	

Source: Prepared by authors

Table 5.5 presents the feedback from the interviewees on the KPIs. Two types of KPIs were discussed with the respondents: five KPIs, which were obtained directly from the sensors of the service (named simple KPIs) and three KPIs that included sales information, other external sources (like the weather), or comparisons among stores (named composite KPIs). The results show distinct differences among the different kinds of businesses. By sector, the first finding is that the number of visitors is more relevant for businesses where there are no previous appointments and visitors can leave without a purchase, such as cosmetics or household goods (‘It would be great. I could plan and focus my sales attendants', CMO, cosmetics). Hairdressers or restaurants do not see the value of such information, as they convert almost every visit into a sale ('We don't need it as most visits have an appointment', CFO, hairdresser).

There are three that stand out from the rest in respondents' preferences: street attraction, dwell time, and comparison among stores:

1) Street attraction represents the ratio of the people that enter the store to those that pass by the store. The reasons for this preference vary among the respondents, depending on the type of business: 'It would allow for a comparison of the performance of our restaurants', (operations manager, restaurant); 'It is really relevant when there is a new launch', (CEO, car dealer); 'It is useful in looking for a new store location', (CEO, parapharmacy). The respondents' interest in this measure is consistent with Graham's work (2016): Although retailers cannot impact the density of shoppers, different attributes of the brands and spaces can influence their attraction (Calvo-Porral and Lévy-Mangín, 2018; Mohd-Ramly and Omar, 2017).

2) Dwell time is relevant for all the respondents, although the reasons for the interest vary by business type: 'It would allow us to optimise the services', (CMO, dental clinic); 'We could change the layout of the tables to serve more meals', (CFO, restaurant); 'I could decide to set make-up artists depending on this', (CMO, cosmetics). This finding is consistent with previous works that found sales conversion and dwell time to be positively related in retail stores (Hui *et al.*, 2009), but negatively related to customer satisfaction in services such as hotels and restaurants (Jones and Dent, 1994; De Vries *et al.*, 2018). Interestingly, a respondent

from the restaurant business stated the opposite, in relation to their bar area: 'The longer people stay, the more they spend', (operations manager, restaurant).

3) Comparison among stores is relevant as insights can be obtained about area performance. 'I compare today by calling and asking the sales manager. This is not reliable', (operations manager, household goods); 'Paramount' (CMO, cosmetics). This is one of the main topics in the physical retail business (Li *et al.*, 2019), as location is the main factor in customer traffic outside stores (Graham, 2016).

Table 5.5: Interest in customer tracking data (declarative).

		Customer tracking data							
		Simple KPIs					Composite KPIs		
Sector	Company Business	Number of Visitors	Street Attraction	Frequency of visits	Dwell time	In Store Flows	Sales Conversion	Other External Sources	Comparison among stores
Specialized retail	Travel agency	✓	✓	✓	✓	×	✓	✓	✓
	Cosmetics	✓	✓	✓	✓	✓	✓	✓	✓
	Household goods	✓	✓	✓	=	✓	✓	✓	✓
Banking	Bank	×	×	×	✓	✓	×	×	✓
	Financial Services	×	=	×	×	×	×	=	×
Hotels	Hotel	×	✓	✓	✓	=	✓	✓	✓
Restaurants	Restaurant	×	✓	=	✓	=	✓	✓	✓
Fashion	Fashion	×	✓	×	×	×	×	×	✓
Car dealers	Car dealer	=	✓	✓	✓	✓	✓	✓	✓
Retail Telco	Retail Telco	✓	✓	✓	✓	✓	✓	✓	✓
Health and wellness	Dental Clinic	✓	✓	=	✓	×	=	✓	=
	Parapharmacy	×	✓	✓	✓	×	✓	=	✓
	Hairdressing	×	✓	×	×	×	×	×	✓

✓ Interested = Neutral × Not Interested

Source: Prepared by authors

The interviewees were then asked to indicate their level of interest in the list of business use cases (11) that used the KPIs. Table 5.6 presents a summary of their feedback, wherein we again observe differences among businesses. At the bottom of the table, a simplified ratio between positive and negative answers highlights the overall level of interest. *Adapt out-of-store promotions*, *improve stock management,* and *modify layout of the store* are the least relevant. *Improve stock management* clearly shows its business-related effect as some of the businesses do not manage stock, however, it is interesting for household goods stores, fashion stores, and parapharmacies. *Adapt out-of-store promotions* and *modify layout of the store* are considered by the respondents to be out of their control ('the car brand controls the layout', (CEO, car dealer); 'the design is well defined by the corporation and no changes are made', (CMO, cosmetics)) and therefore their interest is reduced, even though store layout plays an important role in sales performance (Webber *et al.*, 2018).

The respondents were more interested in customer experience, as shown by the three most interesting use cases: *Adapt in-store promotions*, *improve service personalisation,* and *measure the effect of campaigns.* 'I would like to know the amount of time our sales attendant spends with each customer and the value of the sale', (operations manager, household goods). The interest in creating a more personalised service with better targeted promotions and measuring its impact is in line with previous findings (Pantano and Timmermans, 2014; Willems *et al.*, 2017). Another finding is apparent from looking at the topic with the least negative answers (15% of total answers), *Plan staff and schedule store times.* Our results show the relevance of this topic as one of the major cost drivers (Chuang *et al.*, 2016), although the respondents declared that they did not need automated processes to perform this activity.

From a sectorial perspective, there are three findings. First, the lack of interest of the banking sector in most of the use cases (only 22,7% of positive answers). 'I don't see the need to know the number of visitors', (CIO, bank); 'We don't want to generate attraction to the branches but increase the Web’, (operations manager, bank). The banking sector focuses on existing customers and online transactions, making the role of the branches uncertain (Arguedas-Sanz et al., 2013; Marakarkandy et al., 2017; Myerson & Sandbiller, 2018). Second, we also observe few positive answers (24,2%) in the health and wellness sector. Most of their services are by, thus their current systems may already enable them to have a first level of information that reduces the value gap of automated KPIs. Third, most positive answers come from retail shops: cosmetics stores, household goods stores, fashion, stores car dealerships and retail telco stores. These are the businesses where conversion rate is most relevant, which explains their higher level of interest.

Table 5.6: Interest in business use cases (declarative).

Sector	Company Business	Use Cases										
		Modify layout of the store	Modify product areas inside the	Plan staff and schedule store times	Improve stock management	Improve waiting time management	Adapt in store promotions	Adapt out-of-store promotions	Stores closure or new openings	Improve service personalization	Measure the effect of campaigns	Adjust product mix in the store
Specialized retail	Travel agency	=	=	✓	×	✓	✓	=	×	✓	✓	=
	Cosmetics	×	=	✓	=	✓	✓	✓	=	✓	✓	✓
	Household goods	=	✓	✓	✓	×	✓	=	×	✓	=	✓
Banking	Bank	×	✓	×	×	=	×	×	✓	✓	=	×
	Financial Services	×	×	×	×	×	✓	×	×	✓	×	×
Hotels	Hotel	✓	✓	✓	×	=	×	×	×	✓	✓	✓
Restaurants	Restaurant	×	✓	✓	=	✓	✓	✓	✓	×	✓	✓
Fashion	Fashion	✓	✓	✓	✓	✓	✓	×	✓	=	✓	✓
Car dealers	Car dealer	×	✓	✓	×	✓	✓	×	×	✓	✓	×
Retail Telco	Retail Telco	✓	✓	=	✓	=	✓	=	×	✓	✓	✓
Health and wellness	Dental Clinic	×	×	=	×	✓	✓	=	=	✓	✓	=
	Parapharmacy	=	×	=	✓	×	×	×	✓	=	×	×
	Hairdressing	×	×	=	×	×	✓	×	✓	=	=	=
Simplified Interested – Not Interested ratio		-4	3	5	-3	2	7	-5	-1	8	6	2

✓ Interested = Neutral ✗ Not Interested

Source: Prepared by authors

5.4.3 Discussion

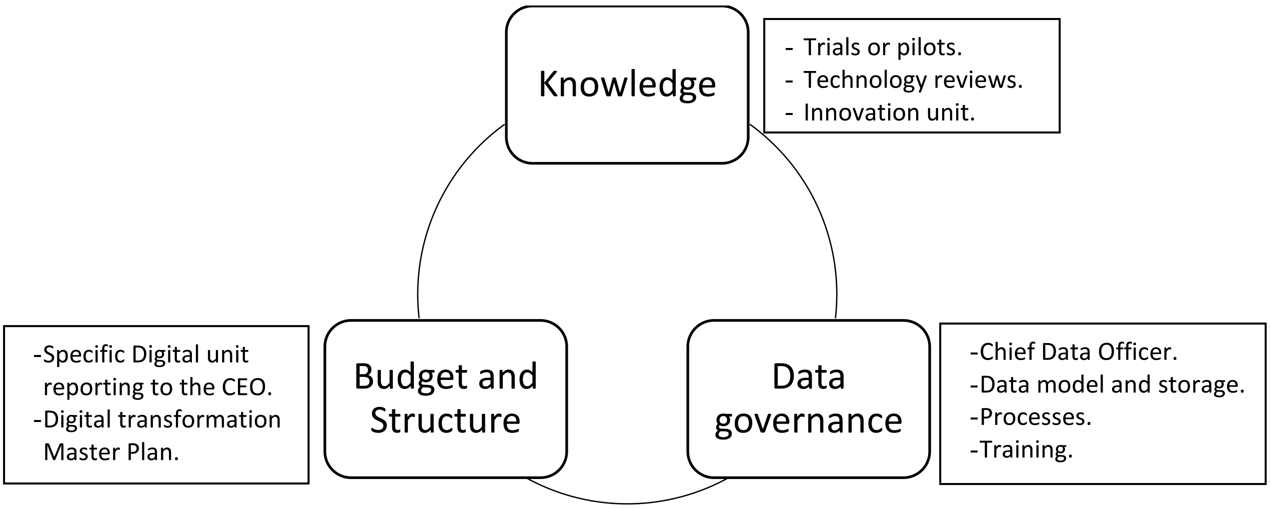
All the respondents claim that their companies are working on their digital transformation. However, in most cases, they mean solving short term needs with isolated solutions rather than building a comprehensive transformation plan. 'We talk about building the digital transformation department in 1-2 years', (CMO, cosmetics); 'We have a master plan for digitalization, but we are just starting to see solutions and all we do is still rudimentary', (CFO, restaurant). Why are all the respondents in the same situation? Why are companies running behind and what can be done to speed the process? Based on the responses, there are, generally, three main interrelated reasons. The first reason is the limited knowledge about and little confidence in the technology, which prevent them from seeing a return on investment (ROI). Although they have embraced the new in-store technologies in general, they remain concerned about the ROI and the effort required to adopt such technologies. For example, digital signage is the most extensive in-store technology, however, they recognise important set-up costs and the need for extra resources to manage the contents properly; they recognise important investments in tailoring the space, yet they do not measure whether the space configuration performs according to design. The data collected by existing solutions are spread across the company and, in general, nobody performs a systematic analysis of the data which makes it difficult to measure the value added by the investment. This leads to the second reason: budget priorities. From a budget perspective, digital transformation competes with other strategies, such as the opening of new shops or restaurants, or even the marketing budget. If the technology and data are not used properly by the organization in their strategy, little value may be derived from them. The budget allocation and limited priority leads to the third reason: there is no data culture in the companies. None of the respondents spoke about data governance or data-driven decisions. This analysis is consistent with the work of Gerrnann et al. (2014). In their study, conducted through a survey of 418 top managers, they found that analytics potential is not perceived by retailers and therefore they do not invest in appropriate levels, even though retailers would obtain relevant benefits of analytics deployments.

Becoming a data-driven organisation brings several benefits (Santoro et al., 2019), however, it is a major challenge. None of the respondents has a holistic view of data gathering and analysis. Although they are knowledgeable about online analytics, they do not show the same concern about their physical spaces, for the reasons mentioned above. Beyond sales, they have no digitally recorded data and some merely use manual input from sales attendants to record traffic or customer flows. They acknowledge this lack of data culture in the physical space and do not expect the organisation to allocate specific resources to properly process the data, should such data be obtained.

The three barriers (lack of knowledge about the technology, lack of priority in the budgets, and lack of data culture in the organizations) are consistent with previous studies on data-driven organisations (Olszak and Zurada, 2019) and research on technology acceptance models by organisations. Technology knowledge, financial resources and technology readiness are frequently related to the lack of adoption of a technology (Ratchford and Barnhart, 2012; Zhu et al., 2004). Respondents' answers match the early stages of Rogers diffusion of innovation theory (Rogers, 1983).

Each of the challenges must be addressed to reach the level of a data-driven company in the physical environment. Any action plan should tackle these three topics together. As an example, Figure 5.1 shows a potential action plan for companies to advance towards a data-driven organisation. They need to become more knowledgeable about technology, to undertake pilots, and to receive training. The board of directors needs to ensure that the organization believes in digital transformation through resource allocation. Finally, they must implement a data governance model that includes organisation, processes, and technology.

Figure 5.1: Proposed action plan to introduce In Store analytics.



Source: Prepared by authors

To improve the understanding of state-of-the-art technology, practitioners and manufacturers must simplify the technology and communicate real implementation uses cases and their benefits. Companies will devote more of their budgets to in-store analytics technology if they see a ROI. Only then will companies adopt a structured approach to their decision-making based on data (Troisi et al., 2020).

Beyond these findings, the respondents see the most advanced technology only in a few selected stores. Their view of the role of the physical store in the future is as a place much more experiential, something that cannot be replicated in the online world. This is consistent with previous studies (Poncin and Ben Mimoun, 2014; Garaus et al., 2017).

5.5 Conclusions

The objective of this study was to analyse the level of acceptance of customer tracking solutions in brick-and-mortar stores. The study follows an interview-based methodology, with semi-structured questions that allow exploration of different topics of high value for future research. This work is relevant because it addresses the in-store customer tracking technology from the perspective of organisations and delivers an exploratory analysis of state-of-the-art technology and interest from the retailers' perspective. This approach is unique, as none of the previous studies about the value of in-store analytics from a technology and a customer perspective is referred to the perception of firms or managers.

We highlight three major contributions from our study. First, related to our main research question (Are brick-and-mortar retailers leveraging in-store analytics?), our findings show that, following the nomenclature of the diffusion of innovation theory (Rogers, 1983), in-store tracking technologies remain in the early stages of their adoption. Prior to implementation, companies must know about a technology and be convinced of its value, before making deployment decisions. This will allow them to adopt organisational and strategic decisions for the digital transformation of their stores. We propose a simplified action plan, although further research is required on how to accelerate the plan from the point of view of technology, budget, organisation, and data management. Technology providers and practitioners should make significant advances on how to present technology in a business language, simple to use and to integrate in data-driven organisations, to facilitate a ROI analysis and confidence in the solutions. Success stories should be replicated, and pilots should be affordable. Second, we found that there was no digital master plan for brick-and-mortar stores in most of the retailers, regardless of their size or structure. Practitioners and scholars should focus on structured methodologies to achieve such plans in a simple and cost-effective manner. Third, there is a genuine interest in data-driven organisations, although no actions are taken to achieve such a platform on the physical side of the business. Further research could investigate an omni-channel data-driven framework that merges data from the online and offline worlds.

Two interesting findings emerged from an analysis of the responses by sector. First, in-store analytics are less interesting to businesses with appointments or reservations, where customers flows are more predictable. Second, the banking sector exhibits the lowest interest in customer flow information, due to a profound transformation of the banking business and the priorities in their digital transformation (Cuesta *et al.*, 2015; Vasiljeva and Lukanova, 2016).

The study has several limitations. The main one is the number of respondents. As the sample comprised only one respondent per business type, the results may be biased by the knowledge or personality of the respondents and some results may not represent the general trend in businesses. Nevertheless, we found consistent results to most questions, as shown in the results section, and, more specifically, in respect to the core question of our research. Despite the exploratory nature of our study, it brings interesting new insights that link with and extend previous research. A second limitation is the definition of the service. In-store analytics is a term without a single definition or scope in the industry. We narrowed the definition down to a specific service, In-store Insights, to allow a comparison of answers and to obtain significant findings. Finally, the number of different sectors in the sample is appropriate for an exploratory study, although specific work per sector should be done in future research to support or negate our findings with more evidence.

This study opens several avenues for research as, to the best of our knowledge, there are no in-store customer tracking technology adoption model studies that address the adoption status and how the implementation of such technologies can be accelerated. Further work should consider the three major barriers that respondents have revealed in the research: lack of data culture, lack of technology knowledge, and lack of budget priority. We urge scholars to focus on technology adoption models that can explain and confirm the exploratory findings of this work. We recommend that practitioners focus on simplifying the solution from a user experience perspective, to clearly show value added based on the KPIs that can be obtained automatically, and how to apply them to the specific use cases of each company. Finally, scholars and practitioners should develop practical methodologies to evaluate the digital transformation maturity of organisations and to generate action plans that lead to execution.

5.6 References

Anic, I.D., Radas, S. and Lim, L.K.S. (2010), "Relative effects of store traffic and customer traffic flow on shopper spending", *International Review of Retail, Distribution and Consumer Research*, Vol. 20 No. 2, pp. 237–250.

Arguedas-Sanz, R., Pra-Martos, I., & Reina-Paz, M. D. (2013). Las TIC y el sector bancario. Nuevos canales y herramientas de negocio. Papeles de Economía Española, 136, 243–257.

Beri, B. and Parminder, A.P. (2013), "Web Analytics: Increasing Website's Usability and Conversion Rate", *International Journal of Computer Applications*, Vol. 72 No. 6, pp. 35–38.

Betzing, J.H. (2018), "Beacon-based customer tracking across the high street: Perspectives for location-based smart services in retail", *Americas Conference on Information Systems 2018: Digital Disruption, AMCIS 2018*, New Orleans, USA, available at: https://aisel.aisnet.org/amcis2018/OrgTrasfm/Presentations/4/ (accessed 28 January 2021).

Bilgic, E. and Duan, Y. (2019), "E-commerce and Business Analytics: A Literature Review", *International Conference on Digital Economy*, Springer, Cham, pp. 173–182.

BuiltWith. (2020), "Google Analytics Usage Statistics", available at: https://trends.builtwith.com/analytics/Google-Analytics (accessed 11 April 2020).

Calvo-Porral, C. and Lévy-Mangín, J.P. (2018), "Pull factors of the shopping malls: an empirical study", *International Journal of Retail & Distribution Management*, Vol. 46 No. 2, pp. 110–124.

Chaffey, D. and Patron, M. (2012), "From web analytics to digital marketing optimization: Increasing the commercial value of digital analytics", *Journal of Direct, Data and Digital Marketing Practice*, Vol. 14 No. 1, pp. 30–45.

Chiang, K.P. and Dholakia, R.R. (2003), "Factors driving consumer intention to shop online: An empirical investigation", *Journal of Consumer Psychology*, Vol. 13 No. 1–2, pp. 177–183.

Childs, M., Blanchflower, T., Hur, S. and Matthews, D. (2020), "Non-traditional marketplaces in the retail apocalypse: investigating consumers' buying behaviours", *International Journal of Retail & Distribution Management*, Vol. 48 No. 3, pp. 262–286.

Choudrie, J. and Dwivedi, Y.K. (2005), "Investigating the research approaches for examining technology adoption issues", *Journal of Research Practice*, Vol. 1 No. 1, pp. 1–12.

Chuang, H.H.C., Oliva, R. and Perdikaki, O. (2016), "Traffic-Based Labor Planning in Retail

Stores”, *Production and Operations Management*, Vol. 25 No. 1, pp. 96–113.

Clement, J. (2019), “E-commerce share of total global retail sales from 2015 to 2023”, *Statista*, available at: https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/ (accessed 19 January 2021).

Cuesta, C., Ruesta, M., Tuesta, D. and Urbiola, P. (2015), “The digital transformation of the banking industry”, *Digital Economy Watch*, Vol. August 201, pp. 1–10.

Das, G. and Varshneya, G. (2017), “Consumer emotions: Determinants and outcomes in a shopping mall”, *Journal of Retailing and Consumer Services*, Vol. 38, pp. 177–185.

Dogan, O., Gurcan, O.F., Oztaysi, B. and Gokdere, U. (2019), “Analysis of Frequent Visitor Patterns in a Shopping Mall”, in Calisir, F., Cevikcan, E. and Camgoz Akdag, H. (Eds.), *Industrial Engineering in the Big Data Era*, Springer, Cham, pp. 217–227.

Farshidi, A. (2016), “The New Retail Experience and Its Unaddressed Privacy Concerns: How RFID and Mobile Location Analytics are Collecting Customer Information”, *Journal of Law, Technology, & the Internet*, Vol. 7 No. 1, pp. 15–38.

Garaus, M., Wagner, U. and Manzinger, S. (2017), “Happy grocery shopper: The creation of positive emotions through affective digital signage content”, *Technological Forecasting and Social Change*, Vol. 124, pp. 295–305.

Germann, F., Lilien, G.L., Fiedler, L. and Kraus, M. (2014), “Do Retailers Benefit from Deploying Customer Analytics?”, *Journal of Retailing*, Vol. 90 No. 4, pp. 587–593.

Graham, C. (2016), “The relationship between high street footfall, attraction and conversion”, in University., L.S.B. (Ed.), *Business in a Dynamic World Conference*, Limassol, Cyprus, available at: https://openresearch.lsbu.ac.uk/download/5398c570cce6e8c9d665951ad881bd7a3d57bfcb2f11d2bb54c5bb60f534ad27/99110/The relationship between high street footfall.docx.

Groß, M. (2015), “Mobile shopping: A classification framework and literature review”, *International Journal of Retail & Distribution Management*, Vol. 43 No. 3, pp. 221–241.

Hagberg, J., Sundstrom, M. and Egels-Zandén, N. (2016), “The digitalization of retailing: an exploratory framework”, *International Journal of Retail & Distribution Management*, Vol. 44 No. 7, pp. 694–712.

Härtfelder, J. and Winkelmann, A. (2016), “Opportunities and challenges for local retailing in an environment dominated by mobile internet devices - Literature review and gap analysis”, in Nissen, V., Stelzer, D., Straßburger, S. and Fischer, D. (Eds.), *Multikonferenz Wirtschaftsinformatik, MKWI 2016*, Vol. 1, Ilmenau, Germany, pp. 33–44.

Hong, Y., Li, Z. and Wang, J. (2020), “Business Value of Telecom Operators’ Big Data”, *Journal of Physics: Conference Series*, IOP Publishing, Vol. 1437 No. 1, pp. 1–7.

Hu, H. and Jasper, C.R. (2004), “Men and women: a comparison of shopping mall behavior”, *Journal of Shopping Center Research*, Vol. 11 No. 1, pp. 113–131.

Hui, S.K., Bradlow, E.T. and Fader, P.S. (2009), “Testing Behavioral Hypotheses Using an Integrated Model of Grocery Store Shopping Path and Purchase Behavior”, *Journal of Consumer Research*, Vol. 36 No. 3, pp. 478–493.

Huotari, V. (2015), *Depth Camera Based Customer Behaviour Analysis for Retail.*, *Master's Thesis*, available at: https://pdfs.semanticscholar.org/fb14/eb61ba91e33c040420df8567604a8a421e20.pdf.

Infosys. (2013), "Consumers Worldwide Will Allow Access To Personal Data For Clear Benefits", *Infosys*, available at: https://www.infosys.com/newsroom/press-releases/2013/digital-consumer-study.html (accessed 19 January 2021).

Ipsos. (2017), "In-store Analytics and Why You Need Them", available at: https://www.ipsos-retailperformance.com/en/insights/store-analytics-need/ (accessed 16 January 2021).

Jones, P. and Dent, M. (1994), "Improving Service: Managing Response Time in Hospitality Operations", *International Journal of Operations & Production Management*, Vol. 14 No. 5, pp. 52–58.

Kamaladevi, B. (2010), "Customer experience management in retailing", *Business Intelligence Journal*, Vol. 3 No. 1, pp. 37–54.

Karaman, E. (2015), "Integration of People Counter Systems to Decision Support Systems in Clothing Retail Industry: A Preliminary Analysis and Possible Applications", *Journal of Graduate School of Social Sciences*, Vol. 19 No. 2, pp. 271–290.

Kerem, K. and Ulla, M. (2018), "Perceived Intrusiveness of Personalized Marketing", in Pucihar, A., Kljajić Borštnar, M., Ravesteijn, P., Seitz, J. and Bons, R. (Eds.), *31st Bled EConference: Digital Transformation: Meeting the Challenges, June 17 - 20, 2018*, Univeristy of Maribor Press, Maribor, Slovenia, pp. 147–158.

Kesari, B. and Atulkar, S. (2016), "Satisfaction of mall shoppers: A study on perceived utilitarian and hedonic shopping values", *Journal of Retailing and Consumer Services*, Vol. 31, pp. 22–31.

Li, K., Li, Y.N., Yin, H., Hu, Y., Ye, P. and Wang, C. (2019), "Visual analysis of retailing store location selection", *The 12th International Symposium on Visual Information, Communication and Interaction (VINCI'2019), September 20–22, 2019, Shanghai, China*, Association for Computing Machinery, New York, NY, USA, pp. 1–8.

Louise, B.K. and Alison, W. (1994), "Collecting data using a semi-structured interview: a discussion paper", *Journal of Advanced Nursing*, Vol. 19 No. 2, pp. 328–335.

Luenendonk, M. (2015), "How Does In-Store Analytics Work", *Cleverism*, available at: https://www.cleverism.com/store-analytics-work/ (accessed 16 January 2021).

Marakarkandy, B., Yajnik, N. and Dasgupta, C. (2017), "Enabling internet banking adoption: An empirical examination with an augmented technology acceptance model (TAM)", *Journal of Enterprise Information Management*, Vol. 30 No. 2, pp. 263–294.

Mavroudis, V. and Veale, M. (2018), "Eavesdropping whilst you're shopping: Balancing personalisation and privacy in connected retail spaces", *Living in the Internet of Things: Cybersecurity of the IoT - 2018*, Vol. 2018, IET Conference Publications, London, UK, pp. 28–29.

Mende, M. and Noble, S.M. (2019), "Retail Apocalypse or Golden Opportunity for Retail Frontline Management?", *Journal of Retailing*, Vol. 95 No. 2, pp. 84–89.

Mingers, J. (2003), "The paucity of multimethod research: A review of the information systems literature", *Information Systems Journal*, Vol. 13 No. 3, pp. 233–249.

Mohd-Ramly, S. and Omar, N.A. (2017), "Exploring the influence of store attributes on customer experience and customer engagement", *International Journal of Retail & Distribution Management*, Vol. 45 No. 11, pp. 1138–1158.

Myerson, J. and Sandbiller, K. (2018), "Hybrid space making: Rethinking the bank branch experience for the digital age", *Corporate Real Estate Journal*, Vol. 7 No. 3, pp. 256–266.

Newman, A.J., Yu, D.K.. and Oulton, D.P. (2002), "New insights into retail space and format planning from customer-tracking data", *Journal of Retailing and Consumer Services*, Vol. 9 No. 5, pp. 253–258.

Nguyen, V. (2019), "Shopping For Privacy: How Technology in Brick-and-Mortar Retail Stores Poses Privacy Risks for Shoppers", *Fordham Intellectual Property, Media and Entertainment Law Journal*, Vol. 29 No. 2, p. 535.

Olszak, C. and Zurada, J. (2019), "Big Data-driven Value Creation for Organizations", *HICSS-52 2019, 52nd Hawaii International Conference on System Sciences, Jan 8-11, 2019, Grand Wailea, Maui*, Vol. 6, University of Hawaii at Manoa, Grand Wailea, Maui, Hawaii, pp. 164–173.

Pantano, E. and Timmermans, H. (2014), "What is Smart for Retailing?", *Procedia Environmental Sciences*, Elsevier B.V., Vol. 22, pp. 101–107.

Perdikaki, O., Kesavan, S. and Swaminathan, J.M. (2012), "Effect of traffic on sales and conversion rates of retail stores", *Manufacturing and Service Operations Management*, Vol. 14 No. 1, pp. 145–162.

Phippen, A., Sheppard, L. and Furnell, S. (2004), "A practical evaluation of Web analytics", *Internet Research*, Vol. 14 No. 4, pp. 284–293.

Poncin, I. and Ben Mimoun, M.S. (2014), "The impact of 'e-atmospherics' on physical stores", *Journal of Retailing and Consumer Services*, Vol. 21 No. 5, pp. 851–859.

Ramzan, B., Bajwa, I.S., Kazmi, R. and Ramzan, S. (2019), "An intelligent data analytics based model driven recommendation system", *Journal of Universal Computer Science*, Vol. 25 No. 10, pp. 1353–1372.

Ratchford, M. and Barnhart, M. (2012), "Development and validation of the technology adoption propensity (TAP) index", *Journal of Business Research*, Vol. 65 No. 8, pp. 1209–1215.

Rogers, E.M. (1983), *Diffusion of Innovations*, edited by Free Press of Glencoe, 3rd ed., New York.

Rowley, J. (2012), "Conducting research interviews", *Management Research Review*, Vol. 35 No. 3–4, pp. 260–271.

Saleem, H., Khawaja, M., Uddin, S., Habib-Ur-Rehman, S., Saleem, S. and Aslam, A.M. (2019), "Strategic Data Driven Approach to Improve Conversion Rates and Sales Performance of E-Commerce Websites", *International Journal of Scientific & Engineering Research*, Vol. 10 No. 4, pp. 588–593.

Santoro, G., Fiano, F., Bertoldi, B. and Ciampi, F. (2019), "Big data for business management in the retail industry", *Management Decision*, Emerald Group Publishing Ltd., Vol. 57 No. 8, pp. 1980–1992.

SightCorp. (2020), "In-Store Analytics. What is it? How to use the Benefits?", available at: https://sightcorp.com/knowledge-base/in-store-analytics/ (accessed 16 April 2020).

Somani, V. (2015), *Retail of the Future : O2O or O&O?*, Massachusetts Institute of Technology, available at: https://dspace.mit.edu/bitstream/handle/1721.1/98992/921181181-MIT.pdf.

Spanke, M. (2020), *Retail Isn't Dead*, edited by Palgrave McMillan*Retail Isn't Dead*, Springer International Publishing, Cham, available at:https://doi.org/10.1007/978-3-030-36650-6.

Telefonica. (2020), "Crowd Analytics to identify and understand audiences: Smart Steps", available at: https://luca-d3.com/products-services/business-insights/crowd-analytics (accessed 25 January 2021).

Triantafyllou, S., Koutsokera, L., Stavrou, V. and Griva, A. (2017), "Enhance shopping experience and support decision making leveraging BLE beacons in a grocery retail store", *DMST Student Conference, 27 May*, pp. 1–9.

Troisi, O., Maione, G., Grimaldi, M. and Loia, F. (2020), "Growth hacking: Insights on data-driven decision-making from three firms", *Industrial Marketing Management*, Vol. 90, pp. 538–557.

Turri, A.M., Smith, R.J. and Kopp, S.W. (2017), "Privacy and RFID Technology: A Review of Regulatory Efforts", *Journal of Consumer Affairs*, Vol. 51 No. 2, pp. 329–354.

Vasiljeva, T. and Lukanova, K. (2016), "Commercial banks and FINTECH companies in the digital transformation: Challenges for the future", *Journal of Business Management*, No. 11, pp. 25–33.

De Vries, J., Roy, D. and De Koster, R. (2018), "Worth the wait? How restaurant waiting time influences customer behavior and revenue", *Journal of Operations Management*, Elsevier B.V., Vol. 63, pp. 59–78.

Walkbase. (2020), "Retail Market", available at: https://www.walkbase.com/markets/retail/ (accessed 16 January 2021).

Webber, C. da C., Sausen, J.O., Basso, K. and Laimer, C.G. (2018), "Remodelling the retail store for better sales performance", *International Journal of Retail & Distribution Management*, Vol. 46 No. 11–12, pp. 1041–1055.

Weinswig, D. (2017), "IoT in Retail. Digitalizing Brick and Mortar Stores", *Fung Global Retail & Technology*, pp. 1–20.

Willems, K., Brengman, M. and van de Sanden, S. (2017), "In-store proximity marketing: experimenting with digital point-of-sales communication", *International Journal of Retail & Distribution Management*, Emerald Group Publishing Ltd., Vol. 45 No. 7–8, pp. 910–927.

Wilson, M. (2013), "Consumers prefer customized in-store experiences over online", *CSA*, available at: https://chainstoreage.com/operations/survey-consumers-prefer-customized-store-experiences-over-online (accessed 15 January 2021).

Yiu, C.Y. and Ng, H.C. (2010), "Buyers-to-shoppers ratio of shopping malls: A probit study in Hong Kong", *Journal of Retailing and Consumer Services*, Vol. 17 No. 5, pp. 349–354.

Zhu, K., Kraemer, K.L., Xu, S. and Dedrick, J. (2004), "Information Technology Payoff in E-Business Environments: An International Perspective on Value Creation of E-Business in the Financial Services Industry", *Journal of Management Information Systems*, Vol. 21 No. 1, pp. 17–54.

6. WILL COVID-19 CHANGE TECHNOLOGY ADOPTION IN BRICK-AND-MORTAR STORES? A STUDY ON SELF-CHECKOUTS

6 WILL COVID-19 CHANGE TECHNOLOGY ADOPTION IN BRICK-AND-MORTAR STORES? A STUDY ON SELF-CHECKOUTS

6.1 Abstract

The COVID-19 pandemic means a major disruption in brick-and-mortar stores. Customer-Facing In Store Technologies (CFIST) perception may be modified as new requirements and concerns arise when interacting in the physical space. Through surveys conducted before and after the COVID-19 lock down in Spain, this study brings relevant findings about the impact of the pandemic in the retailer perception of a specific CFIST technology, Self-Checkout systems (SCO). We used a simplified adoption framework including a new construct, *Safety to Use*, to analyse the impact of health concerns in CFIST. Results show that both *Perceived Enjoyment* and *Safety to Use* are relevant predictors of the *Attitude towards SCOs*, and that *Retailer Perception* is strongly influenced by the *Attitude towards SCOs*. This study is one of the first to study the impact of COVID-19 in retail technology. Results can help to improve the deployment of this technology after the pandemic and may be extended to other CFIST technologies, setting new avenues of research for technology adoption scholars.

6.2 Introduction

The retail sector has been suffering an important transformation in the last few years, mainly due to the disruption generated by e-commerce (Lal and Chavan 2019; Hagberg *et al.* 2016). Although retailers have embraced the omnichannel business, implementing e-commerce or click and collect services, there is still an important part of the business generated in the physical space (Clement, 2019). Customers expect improved experiences in the brick-and-mortar stores, that help them to buy quicker and with a higher satisfaction and control (Spanke, 2020; Wilson, 2013). Customer Facing In-Store Technologies (CFIST) (Betzing *et al.* 2018; Willems *et al.* 2017) play a major role in the evolution of the experience for two main reasons. First, customers are increasingly tech-savvy in all aspects of their life and are used to interact with the environment digitally, expecting retailers to follow them (Baier & Rese, 2020). Parasuraman (2000) states that any kind of customer experience, satisfaction, or loyalty, is mediated by the impact of technology. Second, CFIST bring benefits to retailers as they improve the information of the customer interactions, optimize supplies related processes, and integrate their online and offline channels through digitalization (Grewal et al., 2020; Inman & Nikolova, 2017).

Unfortunately COVID-19 has worsen the situation, generating a major disruption of the physical retail (Pantano *et al.*, 2020). Once reopen, stores are facing important modifications of the customer experience. Health related measures, like social distancing, temperature screening, or single person entry, to name a few, impact heavily in the shopping experience (Purcărea, 2020; Surendra & Lakshmi, 2020). As some of the consumers perceptions and beliefs will stay in the long term, once the pandemic is controlled (Roggeveen & Sethuraman, 2020a), it is relevant to review the impact of COVID-19 in the way that customers perceive and adopt CFIST technologies.

The objective of this work is to answer the following questions: Are there differences of perception about technology before and after the COVID-19 lockdown? Will health and safety become relevant to predict CFIST adoption? Our research will analyse Self-Checkout (SCO) technology in grocery stores. Among the different retail subsectors, grocery is following a slower pace of e-commerce adoption than others (Bauerova, 2019; Dannenberg *et al.*, 2020; Statista, 2020), due to the perception of customers that some products as meat or vegetables need to be seen and chosen by themselves (Zorzini 2018; Kühn *et al.* 2020), making CFIST more relevant. Among the different technologies, scholars consider SCO a relevant solution in this environment (Lee and Yang 2013; Verhoef *et al.* 2009).

This work delves into the customer's perception of SCO technology in grocery stores before and after the pandemic. Through a survey conducted before and after the lockdown, we analyse the differences in attitude towards use and retailer patronage, including the criteria of health risk for the post-pandemic survey. To the best of our knowledge, this is the first work to include health risk as an item related with technology adoption, so our results bring unique findings for both SCO adoption and the impact of health risk in technology usage, opening several avenues of research for the post pandemic retail experience.

The rest of the document is structured as follows: In the next section we set the theoretical grounds of our research, analysing the existing literature of SCO and the situation that COVID-19 has created in retail. We then develop in the third section the conceptual model that we use for the empirical analysis in the fourth section. We discuss our results in the following section, and finish our paper with relevant conclusions, recommendations, and new avenues of research.

6.3 Theoretical background

6.3.1 Overview of Self-Checkout Technologies

A Self-Checkout (SCO) may be defined as a system that "enables customers to place their merchandise on the counter and scan the items on their own, at the end of their shopping trip and after waiting in a checkout line" (Djelassi *et al.* 2018, p. 41). The first SCO was installed in 1992 in Price Chopper Supermarkets (Inman & Nikolova, 2017). SCOs are generally considered as a Self Service Technologies (SST), but such category is heterogeneous from adoption perspective due to its breadth, as it includes also mobile apps, ATMs or e-services (Kaushik & Rahman, 2015; Meuter et al., 2000). For the purpose of our work, we follow the extant literature that includes SCOs as a CFIST technology (Balaji et al., 2018; Grewal et al., 2020; Kim et al., 2017; Roggeveen & Sethuraman, 2020b; Roy et al., 2017; Vojvodić, 2019; Willems et al., 2017) as CFIST have their specificities from a customer adoption perspective (Lee 2015; James 2014; Djelassi et al, 2018; Inman and Nikolova 2017).

The installation of SCOs has steadily increased in the last decade and keeps its pace (Grand View Research, 2020; James, 2014). SCOs offer to retailers several benefits, as improved efficiency, decreased costs, or increase productivity (Kazancoglu & Kursunluoglu, 2018; H. J. Lee & Lyu, 2016). It has also a positive impact in customer experience and a growing percentage of customers prefer to use them (Kats, 2020; O'Shea, 2019; Statista, 2019). From an experience perspective, SCOs are a key element in the overall customer experience that leads to satisfaction and loyalty to brands (Verhoef *et al.*, 2009) and gives more control to consumers (Demoulin & Djelassi, 2016). The usage of SCO speeds up checkout and reduce waiting time in queuing (Kokkinou & Cranage, 2013; Vannucci & Pantano, 2019), but it changes also the feeling of the time spent as it turns a passive activity (queuing) into an active activity (scanning and packing) (Marzocchi & Zammit, 2006). Only specific profiles of customers are reluctant to their use, as they expect human interaction instead of a machine interaction (Jackson, Parboteeah, and Metcalfe-Poulton 2014; Lee *et al.* 2010; Dabholkar *et al.* 2003). SCOs are an appropriate option to evaluate technology adoption, as they are broadly deployed and therefore most people has used them. Furthermore, all SCOs have very similar characteristics, reducing perception bias (Lee *et al.* 2013).

6.3.2 Adoption of Self-Checkout Technologies

Although there is extant literature about SST adoption (Kallweit *et al.*, 2014) and CFIST adoption (Betzing et al., 2018; Inman & Nikolova, 2017; Shankar et al., 2011), only few of the studies focus specifically on grocery SCO systems and the impact they have in customer's perception of the service, and this field is considered understudied by scholars (Fernandes & Pedroso, 2017; Inman & Nikolova, 2017). The scarce literature available highlights four main findings that affect SCO adoption. First, the quality of the SCO implementation is key to customer satisfaction and customer loyalty (Demirci Orel and Kara 2014; Lee *et al.* 2009; Collier and Kimes 2013; Fernandes and Pedroso 2017). Second, personality and personal traits impact in the perception and adoption of SCOs (Jackson *et al.* 2014; Lee *et al.* 2010; Lee and Lyu 2016). Third, past usage and experience is a better predictor of SCO use than actual intention (Demoulin & Djelassi, 2016; Eastlick et al., 2012; H. J. Lee, 2015). Fourth, the perceived control, as a facilitating condition, boost the intention to use them (Demoulin & Djelassi, 2016; Fernandes & Pedroso, 2017). Other studies address the attitude towards co-producing a service as a predictor of positive attitude to use the service (Eastlick *et al.*, 2012), the favourable ethical acceptance of SCOs (Fullerton *et al.* 2017), the social acceptance of its usage (Kinard *et al.* 2009) or the perceived enjoyment (Fernandes and Pedroso 2017; Demoulin and Djelassi 2016; Lee *et al.* 2013). Situational factors like order size, wait-time tolerance or the presence of other customers or employees have been also found as having a strong influence in SCOs decisions (Collier et al., 2015; Yi & Kim, 2017). Only two studies addressed perceived risk related with SCOs adoption, but did not found any relationship (Jeon et al., 2020; Kazancoglu & Kursunluoglu, 2018). Furthermore, the questions asked to assess risk were related with the malfunction of the system rather than health or safety dimensions. To the best of our knowledge, there is no literature yet that studies the impact of COVID-19 effect in CFIST technology adoption.

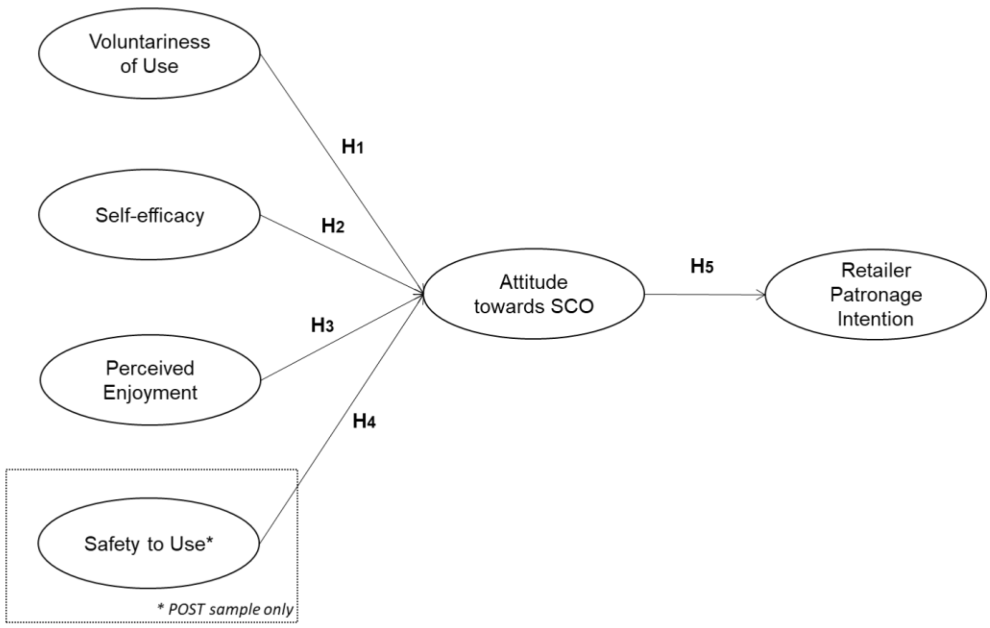
6.3.3 Impact of COVID-19 in customer experience

The full impact of COVID-19 in the society is still to be estimated as the pandemic continues, but the forecast is already devastating (Nicola *et al.*, 2020). Consumer's psychology has been dramatically impacted (Kirk & Rifkin, 2020) and it is difficult to anticipate what perceptions will last in the long term. In disruptive events, the first behavioural changes are connected to safety (Donthu & Gustafsson, 2020; Roggeveen & Sethuraman, 2020a). Groceries have implemented several measures to protect health that impact in customer experience, like social distancing, sanitizer usage, temperature screening, announcements, time limits, or contactless payments (Martin-Neuninger & Ruby, 2020; Surendra & Lakshmi, 2020). Contactless interactions are becoming relevant in the customer experience, not due to their convenience but to their safety; social distancing will accelerate online retailing but also non-human interactions in the physical space (Kirk & Rifkin, 2020). Brick-and-mortar grocery stores will still play a relevant role in the future (Dannenberg *et al.* 2020; Grashuis *et al.* 2020) and therefore we can anticipate the relevance of self-service solutions like SCOs to avoid contact.

6.4 Conceptual model

The main goal of our research is to see how CFIST technology adoption may be impacted by COVID-19 and how the emergent concern about safety can impact in customer's perception. Taking survey data from an ongoing research prior to the pandemic, we simplified the research framework and conducted a second survey once the lockdown was finished, including health risk related questions. Such framework, that can be seen in Figure 6.1, was then analysed before and after the COVID-19 lockdown. We have not based our simplified framework in a specific model but in specific constructs frequently present in the literature and relevant for our research question. According to Fernandes and Pedroso (2017), there is no evidence of a widely accepted model for SST adoption. Although TAM (Davis, 1989) is broadly used to explain technology adoption (Kallweit *et al.* 2014), it cannot explain completely SCO adoption (Curran & Meuter, 2005), as SCO technology aggregates self-service adoption characteristics (Kelly *et al.*, 2010). Another work suggests that perceived usefulness, a relevant component of TAM, is not relevant for SST technologies (Dabholkar & Bagozzi, 2002).

Figure 6.1: PRE and POST research models.



6.4.1 Voluntariness of use

Customers must perceive the value gain of using SCOs (Hilton *et al.*, 2013). They will decide to use them if they obtain clear benefits beyond the interests of the retailer (Fernandes & Pedroso, 2017). The perception of SCOs and self-service in general is heavily influenced by customer personality (Jackson *et al.* 2014; Lee *et al.* 2010; Lee and Lyu 2016). As personality traits cannot be controlled by retailers, forcing customers to use SCOs may reduce patronage and increase technology anxiety (H. J. Lee, 2015). *Voluntariness of use* is a moderating variable of the UTAUT model (Venkatesh *et al.*, 2003), and may is defined as whether or not a customer may choose to use the technology (Rawstorne *et al.*, 2000). It becomes relevant in a post COVID-19 scenario, as the pandemic has modified the capacity of stores, increased waiting times, and forced contactless transactions, reducing customer choices at checkout (Surendra & Lakshmi, 2020). According to this, we state:

H1: *Voluntariness of Use* has a positive impact in *Attitude towards SCO*.

6.4.2 Self-efficacy

Self-efficacy is well grounded in technology adoption theories (Bandura, 1978) and is related to the confidence of having the skills to use the technology and appears positively related with satisfaction in the literature (Demoulin and Djelassi 2016; Wang *et al.* 2013). A similar description appears in the literature for perceived control

(Fernandes & Pedroso, 2017), showing also a positive relationship with attitude and repeated patronage (Wang 2012). Another related concept, technology anxiety, defined as the fear to use technology, appears as a strong reverse predictor of SCOs usage (Meuter et al., 2003; Oyedele & Simpson, 2007). Self-efficacy and the lack of technology anxiety improve perceived control (James, 2014) that leads also to satisfaction (Marzocchi & Zammit, 2006), supporting the relationship among them. Self-efficacy becomes then a relevant comparison element between the PRE and POST COVID-19 scenarios. Therefore, we state that:

H2: *Self-efficacy* has a positive impact in *Attitude towards SCO.*

6.4.3 Perceived Enjoyment

Perceived Enjoyment is the perception of a customer that the usage of a technology is enjoyable, and is related with the hedonistic reasons to use the technology (Wang, 2012). Several studies relate positively perceived enjoyment with SST adoption: It increases satisfaction and delight (Collier & Barnes, 2015; Fernandes & Pedroso, 2017; Marzocchi & Zammit, 2006), reduces anxiety (M. Wang, 2012), increases service quality perception (Demirci Orel & Kara, 2014), and is a better predictor of SST adoption than usefulness (Jones *et al.*, 2006), making it a valuable construct for the analysis of PRE and POST COVID-19 scenarios. Therefore, we propose the following:

H3: *Perceived Enjoyment* has a positive impact in *Attitude towards SCO*.

6.4.4 Safety to Use

We define *Safety to Use* as the perception of individuals that their health is safe when using the technology. Although there is no precedent of usage of this construct for technology adoption, the concept is well grounded by previous research. COVID-19 has forced several safety measures and new consumers perceptions (Surendra & Lakshmi, 2020; Zwanka & Buff, 2020), and customers will always put safety first in their new behaviours (Donthu & Gustafsson, 2020; Hahm et al., 2019). Furthermore, previous studies did include perceived risk as relevant construct for technology adoption, defined as the perception of potential negative consequences when adopting a specific technology (Roy *et al.*, 2017). Although perceived risks related with SCO have been more of social and performance nature, (Dabholkar et al., 2003; Kazancoglu & Kursunluoglu, 2018; Meuter et al., 2005), and have being found as non-relevant for SCOs (Eastlick *et al.*, 2012), we expect customers to evaluate any future interaction in the physical space considering the potential risks for their health due to contagion. Therefore, we state that:

H4: *Safety to Use* has a positive impact in *Attitude towards SCO.*

6.4.5 Attitude towards SCOs and Retailer Patronage Intentions

There is extant literature relating attitude with technology adoption. Attitude is a very common antecedent of intention in adoption models as TAM (Davis, 1989), and can be regarded as a full mediator of intention in CFIST technologies (Kim *et al.* 2017; Lee *et al.* 2006; Kim and Forsythe 2007). Literature shows a positive impact of SCOs adoption in retailer patronage intentions and vice versa. Inman and Nikolova (2017) suggested that the behavioural intention to use CFIST technologies are mediated by the perception of the retailer. According to Lee (2015), customers prefer to shop in retailers where the option to use SCO is available, and this creates an halo effect, creating a positive attitude towards SCOs. Patrons are more satisfied with the store when they use SCOs (Djelassi *et al.*, 2018). Customers perceive SCOs as an element of the overall experience and therefore they associate positive usage of SCOs with retailer patronage (Fernandes & Pedroso, 2017). According to this, we state the following:

H5: *Attitude towards SCO* has a positive impact in *Retailer Patronage Intention*.

6.5 Methodology

6.5.1 Instrument

An online survey was developed to empirically test the conceptual model, as this is the most frequent methodology used in technology adoption literature (Choudrie & Dwivedi, 2005). Some of the advantages of conducting it online are wider geographical reach, reduced costs and quicker response times (Lee and Yang 2013). The survey consisted of 17 items, including questions about age, gender, and previous experience. The survey was designed using the Qualtrics survey platform, a private online survey development platform that allows the creation of surveys which can be accessed through a link. An explanation of the SCOs including a picture was presented prior to the questions. Scales were adapted from existing literature, modifying the wording to adapt it to the context. The list of items and their origin can be found in Table 6.1.

Table 6.1: Instrument.

Variable	*Item*		*Source (adapted)*
Voluntariness of Use	VOL_1	I can decide to use the Self-Checkout or not in the places where I buy	Venkatesh *et al.* (2003)
Self-Efficacy	SEE_1	I believe that using Self-Checkout is a task I can perform well	Lee&Lyu (2016)
Perceived	PEE_1	Shopping using Self-Checkouts is more interesting	Demirci Orel&Kara (2014)
Enjoyment	PEE_2	I enjoy using Self-Checkouts	Fernandes&Pedroso (2017)
	PEE_3	It is fun to check out the items yourself	Fernandes&Pedroso (2017)
Safety to Use	SAF_1	Self-Checkouts are not risky as they reduce the physical contact	Kazancoglu *et al.* (2018)
	SAF_2	Self-Checkouts are not risky as they allow social distancing	Kazancoglu *et al.* (2018)
	SAF_3	Overall, using Self-Checkouts is not risky	Meuter *et al.* (2005)
Attitude	ATT_1	As a customer, Self-Checkout are Ineffective - Effective	Lee&Lyu (2016)
towards SCO	ATT_2	As a customer, Self-Checkout are Impractical - Practical	Lee&Lyu (2016)
	ATT_3	As a customer, Self-Checkout are Not helpful - Helpful	Lee&Lyu (2016)
Retailer	RPI_1	I prefer groceries that have Self-Checkouts	Lee (2015)
Patronage	RPI_2	I will shop again in stores with Self-Checkouts	Lee (2015)
Intention	RPI_3	I would recommend a store with Self-Checkouts to a friend	Lee (2015)

A five-point Likert scale, from "Totally agree" to "Totally disagree" was used, except for characterization questions (age, gender, and previous experience) and *Attitude towards SCO* (semantic differential, e.g., positive / negative). To make results more easily understandable, we reversed all scores such as low values represent disagreement and high values represent agreement with each statement. Items were presented in a random order to each respondent to avoid bias. The preliminary version of the PRE questionnaire was tested on 30 consumers that were requested to give extra feedback about the clarity, length or meaning of the items, that led to wording modifications. Due to the differences of *Safety to Use* (new variable in the POST questionnaire) with previous literature, an extra validation was done in two steps. First, 10 individuals were requested to suggest modifications to existing literature questions. Then, the questions were presented to other 10 individuals asking them to suggest the purpose of such questions, confirming that the items represented safety related topics.

Regarding common method bias, we took different measures, both procedural and statistical, to minimize risks. First, we conducted pilots to make sure that items were clear to avoid ambiguous items and, therefore, participants' reliance on systematic response tendencies such as a midpoint response style. Second, the questionnaire was anonymous to reduce social desirability. Third, items were randomly presented to participants. Fourth, we ascertained that Variance Inflation Factors (VIF) were low as the occurrence of VIF greater than 3.3 is proposed as an indication of pathological collinearity and an indication that a model may be contaminated by common method bias in PLS-SEM (Kock, 2015). Regarding validity, we calculated for all the variables the Average Variance Extracted (AVE) values, which were above the critical threshold of 0.50, indicating good convergent validity (AVE values are included in Table 5). The AVE measures the amount of variance that is captured by the construct in relation to the amount of variance due to measurement error (Fornell & Larcker, 1981); thus, an AVE value greater than 0.50 indicates that the variance captured by the construct is larger than the variance due to measurement error. In order to assess the constructs' discriminant validity we applied the Fornell and Larcker's (1981) criterion, this is, $\sqrt{AVE}$ values for each variable are greater than the correlations with the other variables, and we concluded that the measures in the model exhibit discriminant validity. Construct validity of the measures allows us to rule out substantial method effects. Last, reliability coefficients (Cronbach's alphas and composite reliability) range between 0.69 and 0.93 (see Table 5), close to or over the recommended value (0.70).

6.5.2 Sample and Procedure

Field work was conducted in two moments: March 2020, before COVID-19 lockdown in Spain (PRE sample), and May-June 2020, once the lockdown finished (POST sample). PRE field work did not include the *Safety to Use* variable, as at that moment there was no forecast of the reach of the pandemic; this variable (three items) was included for the POST field work. In both cases, the snowballing procedure was used, as it is considered effective in the literature specifically for self-service technologies (Considine & Cormican, 2017). Social networks were also used to distribute the survey.

The demographic composition of PRE and POST samples is presented in Table 6.2.

Table 6.2: Demographic composition of PRE and POST samples.

PRE sample				POST sample			
	Variables		%		Variables		%
TOTAL	*N*	416		TOTAL	*N*	286	
	Gender	Male	52.9		Gender	Male	49.0
		Female	47.1			Female	51.0
	Age	18 - 25	3.4		Age	18 - 25	1.4
		26 - 35	7.9			26 - 35	5.6
		36 - 45	18.8			36 - 45	22.4
		46 - 55	52.6			46 - 55	55.2
		56 - 65	11.8			56 - 65	11.5
		> 65	5.5			> 65	3.8
No SCO previous experience	*n*	11	2.6	No SCO previous experience	*N*	16	5.6
	Gender	Male	81.8		Gender	Male	37.5
		Female	18.2			Female	62.5
	Age	18 - 25	0		Age	18 - 25	0
		26 - 35	0			26 - 35	0
		36 - 45	18.2			36 - 45	0.3
		46 - 55	27.3			46 - 55	43.8
		56 - 65	9.1			56 - 65	25.0
		> 65	45.5			> 65	31.2
SCO previous experience	*n*	405	97.4	SCO previous experience	*n*	270	94.4
	Gender	Male	52.1		Gender	Male	49.6
		Female	47.9			Female	50.4
	Age	18 - 25	3.5		Age	18 - 25	1.5
		26 - 35	8.1			26 - 35	5.9
		36 - 45	18.8			36 - 45	23.7
		46 - 45	53.3			46 - 55	55.9
		56 - 65	11.9			56 - 65	10.7
		> 65	4.4			> 65	2.2

The PRE sample consisted of 416 participants (52.9% male, 47.1% female). Data were collected between March 5th and March 14th, 2020, before the enactment of the lockdown in Spain. As high as 97.4% (405 participants) had used SCOs before. Although we found some differences between users and non-users in their responses, the number of non-user's responses was too small to reach conclusions. Comparison between male and female participants only resulted in significant difference in one item "I will shop again in stores with Self-Checkouts" (RPI_2; male, n = 220: M = 3.12, SD = 1.16; female, n = 196: M = 2.85, SD = 1.11; t = 2.43). Regarding age groups, we found differences only in four items: "I believe that using Self-Checkout is a task on which I can perform well" (SEE_1; $F(5, 410) = 3.72$, $p = .003$), "Shopping using Self-Checkouts is more interesting" (PEE_1; $F(5, 410) = 3.39$, $p = .005$), "I enjoy using Self-Checkouts" (PEE_2; $F(5, 410) = 3.54$, $p = .004$), and "As a customer, Self-Checkout are Not helpful - Helpful" (ATT_3; $F(5, 410) = 2.34$, $p = .041$). In general, participants over 65, and in some cases aged 55-65, showed slightly lower scores than younger participants.

The POST sample consisted of 286 participants (51% female, 49% male). Data were collected between May 5th and June 22nd, 2020, once lockdown was lifted in Spain. 94.4% (270 participants) had used SCOs at least once, in line with the PRE sample. Comparison between genders only resulted in significant differences in two items: "I enjoy using Self-Checkouts" (PEE_2; male, n = 140: M = 3.16, SD = 1.23; female, n = 146: M = 3.48, SD = 1.26; t = -2.14), and "I will shop again in stores with Self-Checkouts" (RPI_2; male: M = 3.04, SD = 1.19; female: M = 2.74, SD = 1.18; t = 2.17). Finally, no differences were found regarding age groups.

In subsequent analyses, we focused on the data of those participants who had previous experience in SCOs (n_1 = 405 and n_2 = 270). The number of participants is similar to other SCOs studies (Demoulin & Djelassi, 2016; Fernandes & Pedroso, 2017).

6.5.3 Data analysis

Descriptive statistics (mean values, standard deviations, mean comparisons) were calculated using SPSS software (Statical Package for Social Science). Data were further analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM), which is useful in case complex mediation models are analysed with a large number of indicators and relationships (Hair *et al.*, 2017). SmartPLS v3.0 software was used (Ringle *et al.* 2015).

6.6 Results

First, we compared data gathered in the PRE and POST samples at item level (Table 6.3), only using data from participants who had previously used SCOs (n_1 = 405 and n_2 = 270). Participants showed statistically higher agreement to the following statements in the PRE sample: "I can decide to use the Self-Checkout or not in the places where I buy" (VOL_1) and "As a customer, Self-Checkout are Ineffective - Effective" (ATT_1).

Next, the mean scores and correlations between the variables were analysed. Table 6.4 shows that participants scored moderately high on *Attitude towards SCO*, both in the PRE sample (PRE: M = 3.78, SD = 1.13) and in the POST sample (POST: M = 3.68, SD = 1.14), and moderately on *Retailer Patronage Intention* (PRE: M = 3.33, SD = 1.05; POST: M = 3.25, SD = 1.09). All the correlations between the study variables were significant and positive.

Table 6.3: Item comparison between PRE and POST samples.

		PRE (T1)		POST (T2)			
		M	*SD*	*M*	*SD*	*t*	*p*
Voluntariness of Use	VOL_1	4.04	1.12	3.80	1.33	2.449	.015
Self-Efficacy	SEE_1	4.63	0.73	4.66	0.70	-0.570	.569
Perceived Enjoyment	PEE_1	3.12	1.23	2.98	1.19	1.523	.128
	PEE_2	3.36	1.34	3.36	1.23	0.000	1.00
	PEE_3	3.76	1.29	3.69	1.29	0.731	.465
Safety to Use	SAF_1	-	-	4.23	1.03		
	SAF_2	-	-	3.15	1.20		
	SAF_3	-	-	3.70	1.24		
Attitude towards SCO	ATT_1	4.11	1.13	3.92	1.23	2.087	.037
	ATT_2	3.86	1.24	3.79	1.19	0.745	.457
	ATT_3	3.38	1.41	3.35	1.41	0.246	.806
Retailer Patronage Intention	RPI_1	3.54	1.24	3.42	1.23	1.219	.223
	RPI_2	2.99	1.15	2.91	1.20	0.793	.428
	RPI_3	3.45	1.23	3.40	1.26	0.481	.631

Note. n_1 = 405 and n_2 = 270.

Table 6.4: Descriptive statistics and correlations between study and control variables by time of participation (PRE / POST).

	PRE (*n* = 405) *M* (*SD*)	POST (*n* = 270) *M* (*SD*)	1	2	3	4	5	6	7
1. Voluntariness of Use	**4.04 (1.12)**	**3.80 (1.33)**	-	.20**	.16**	.20**	.15*	.20**	-.02
2. Self-Efficacy	4.63 (0.73)	4.66 (0.70)	.20***	-	.27***	.35***	.28***	.23***	-.07
3. Perceived Enjoyment	3.41 (1.14)	3.34 (1.05)	.24***	.32***	-	.71***	.75***	.76***	.06
4. Safety to Use	-	3.70 (0.91)	-	-	-	-	.69***	.76***	-.11
5. Attitude towards SCO	3.78 (1.13)	3.68 (1.14)	.31***	.32***	.80***	-	-	.78***	-.04
6. Retailer Patronage Intention	3.33 (1.05)	3.25 (1.09)	.29***	.27***	.73***	-	.76***	-	-.09
7. Gender (1=male, 2=female)	1.48 (0.50)	1.50 (0.51)	.07	-.07	.05	-	.02	-.08	-

*Note. Means in bold denote significant differences between PRE and POST participants at p < .05. Zero-order correlations below the diagonal correspond to PRE participants; zero-order correlations above the diagonal correspond to POST participants. *p < .05. **p < .01. ***p < .001.*

In evaluating and reporting the results, a two-step analysis was accomplished following the guidelines on partial least squares structural modelling (PLS-SEM) given by Hair *et al.* (2017). First, we assessed the measurement models (tests of validity and reliability of the measures); second, we evaluated the structural model (this is, to what extent variables allowed predicting *Attitude towards SCO* to adopt technology and this, in turn, *Retailer Patronage Intention*). We used the bootstrapping procedure and selected 5,000 samples (no missing data; *Safety to Use* was only measured in the POST survey).

For both the PRE and the POST samples, all the relationships between the indicators and their constructs were significant ($p < .001$; except for *Voluntariness of Use* and *Self-Efficacy*, comprised by a single item respectively) and their outer loadings were above the recommended value of .70 (Table 6.5). Average Mean Extracted (AVE) and composite reliability values achieved the critical thresholds, .50 and .60, respectively (Bagozzi & Yi, 1988). These results provide evidence of the internal consistency and convergent validity of the constructs.

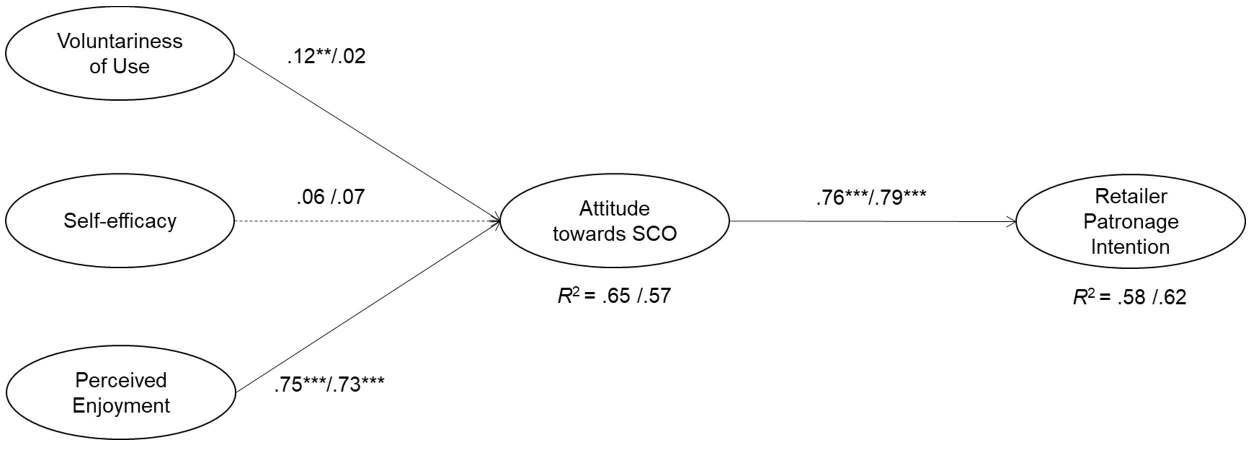
Table 6.5: Measurement models: Reliability and convergent validity for PRE and POST samples.

Note. λ = outer loading. ρc = composite reliability. α = Cronbach's alfa. AVE = Average Mean Extracted.

		PRE (*n* = 405)				POST (*n* = 270)			
Latent variable	Item	λ	ρ_c	α	AVE	λ	ρ_c	α	AVE
Voluntariness of Use	VOL_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Self-Efficacy	SEE_1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Perceived Enjoyment			.91	.86	.78		.88	.80	.72
	PEE_1	.88				.85			
	PEE_2	.90				.84			
	PEE_3	.87				.85			
Attitude towards SCO			.92	.88	.80		.93	.88	.80
	ATT_1	.89				.90			
	ATT_2	.92				.90			
	ATT_3	.86				.89			
Retailer Patronage Intention			.91	.84	.76		.92	.86	.78
	RPI_1	.90				.89			
	RPI_2	.82				.84			
	RPI_3	.89				.92			
Safety to Use		-					.83	.69	.62
	SAF_1	-				.68			
	SAF_2	-				.83			
	SAF_3	-				.83			

Figure 6.2 depicts the relationships between the different variables considered for both the PRE and the POST samples. Before comparing both groups (PLS-SEM multigroup analysis), measurement invariance was tested. The MICOM (measurement invariance of composite models) procedure (Hair *et al.*, 2018) consists of three steps. First, configural invariance was successfully established as measurement models, structural model, and algorithm settings are identical for both groups. Second, compositional invariance assessment showed permutation *p*-values were larger than .05, so compositional invariance was established for all the variables. Third, measurement invariance was examined. No significant differences were found in the composite mean values and composite variances of variables across the two samples, except for *Voluntariness of Use.* Therefore, we conclude that the PRE and POST composite mean values and variances were equal regarding *Self-Efficacy, Perceived Enjoyment, Attitude towards SCO*, and *Retailer Patronage Intention*, but differed in the case of *Voluntariness of Use*. Consequently, full measurement invariance was not established.

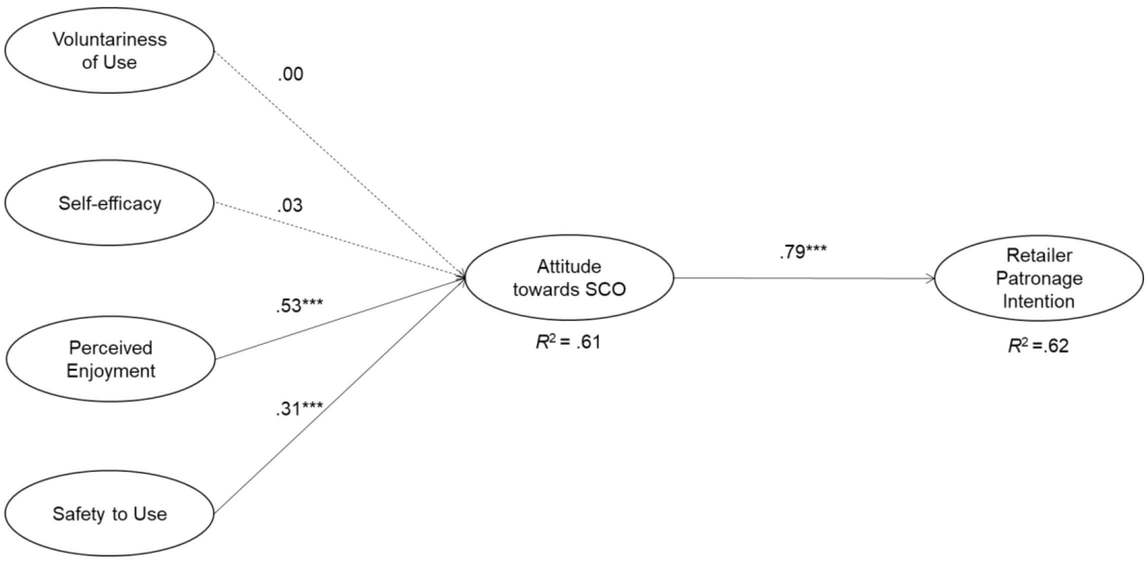
Figure 6.2: PRE (left values) and POST (right values) structural models.



Note. Dotted lines: Non-significant paths. ***p* < .01. ****p* < .001.

Finally, we retested the model including *Safety to Use* (only considering the POST sample, Figure 6.3). Internal consistency and convergent validity of the constructs were adequate (specifically for *Safety to Use*: $\lambda_{SAF\_1} = .68$, $\lambda_{SAF\_2} = .83$, $\lambda_{SAF\_3} = .83$; composite reliability = .83; Cronbach's alfa = .69; Average Mean Extracted = .62). The addition of this new variable slightly improved the variance explained of *Attitude towards SCO* to 61.2%, and no changes were found in the explained variance of *Retailer Patronage Intention* (61.9%). Although the most relevant variable continued to be *Perceived Enjoyment*, it reduced its strength (β decreased from .73 to .53). *Safety to Use* appeared as the second relevant variable, while *Voluntariness of Use* and *Self-Efficacy* remained non-significant.

Figure 6.3: POST structural model including Safety to Use.



Note. Dotted lines: Non-significant paths. ****p* < .001.

6.7 Discussion

The field research of the present work consists of two samples taken with a difference of three months. Such period is too short to register significant differences in technology adoption unless a disruptive event happens, such as COVID-19. Indeed, in the interval between surveys, the pandemic reached its peak and participants endured a lockdown of fifty days in their homes. Our research shows similar results for PRE and POST samples, except for the construct *Voluntariness of Use*, which was slightly significant in the PRE model but not in the POST model after lockdown. As shown in Table 6.3, both samples show a statistical difference in the answer to the question "I can decide to use the Self-Checkout or not in the places where I buy", probably related with the change to local grocery stores during the pandemic, as consumers strongly reduced their movements and malls were partially closed. In such convenience stores there is a smaller penetration of SCOs and therefore customers responded based on the lack of systems where they were buying. The lack of relevance of *Voluntariness of Use* may be explained by the instrument used to test the model. In previous studies voluntariness was measured by on site surveys and therefore the respondent had just used the SCO (Demirci Orel & Kara, 2014; Demoulin & Djelassi, 2016; Fernandes & Pedroso, 2017). In our case, as respondents answered the online survey based on their previous experiences, results allow to intuit that they mixed different experiences, with and without voluntariness, to answer the questionnaire.

Results show a significant, strong, and positive link between *Perceived Enjoyment* and *Attitude towards SCO* in both samples, showing the importance of *Perceived*

Enjoyment as antecedent of *Attitude towards SCO*. This finding is consistent with previous works that relate enjoyment with SCOs adoption in different ways. Demoulin and Djelassi (2016) found that enjoyment is not only an antecedent of perceived ease of use in an extended TAM3 model, but also a direct predictor of technology usage. Enjoyment is the strongest effect on service quality, and service quality on intentions, in Dabholkar's work (1996). Besides the support that this finding has in existing literature, our results go one step beyond as they show that, contrary to our hypothesis, *Self-Efficacy* is irrelevant in our model, allowing us to state the predominance of enjoyment over control. SCOs users participate in the creation of the service (Pantano *et al.* 2018; Eastlick *et al.* 2012), reduce their queuing time (Collier *et al.*, 2015) and improve their social reputation (Kinard *et al.*, 2009), increasing their level of satisfaction and creating a feeling of entertainment. Although this feeling cannot be reached if there is a lack of service quality or complex processes (H. J. Lee et al., 2009), our simplified model shows a prevalence that has important managerial and theoretical implications.

As the main objectives of our study, *Safety to Use* was introduced in the POST survey and resulted in a relevant variable in the model with also a positive and strong link to *Attitude towards SCO* (POST: $\beta = .31$, $p < .001$). This result shows the influence of the pandemic in the results and is from our perspective the biggest contribution of this study to technology adoption theory. The analysis of the POST model with and without *Safety to Use* shows the impact on *Perceived Enjoyment*, that stays as the most relevant antecedent of *Attitude towards SCO* but reduces its influence (from $\beta = .73$, $p < .001$ to $\beta = .53$, $p < .001$), showing that the need to shop safely is a requirement to have a positive perception of the SCO technology.

Finally, both the PRE and POST samples show the importance of *Attitude towards SCO* as predictor of *Retailer Patronage Intention* (PRE: $\beta = .76$, $p < .001$; POST: $\beta = .79$, $p < .001$). This finding is consistent with previous works. Lee (2015) analysed the perception of the quality of an SST service and concluded that patronage intentions had similar antecedents that actual usage intentions, showing that a positive retailer perception impacts in the perception of the technology and vice versa. More importantly, Djelassi *et al.* (2018) found that the satisfaction with SCOs was a strong mediator on store satisfaction and therefore in *Retailer Patronage Intention*. Our study is different in that the survey has not been administered on site, nor related with a specific brand, increasing the value of the generic relationship between the *Attitude towards SCO* and a positive *Retailer Patronage Intention*.

6.8 Conclusions

The objective of our study was to analyse the impact of COVID-19 on the attitude of customers towards the adoption of CFIST technologies, specifically SCO systems. To the best of our knowledge, there is no previous studies that introduce health related conditions in the usage of SCOs and therefore our findings entail an original contribution to post COVID-19 research.

The similarities of results between the two samples, PRE and POST, indicates the stability and appropriateness of the proposed model. Furthermore, the simplicity of our model has allowed us to highlight important conclusions about enjoyment, safety, attitude, and retailer patronage intention related with SCO usage. The answer to our research question ("Are there differences of perception about technology before and after the COVID-19 lockdown?”) is positive: *Safety to Use* becomes relevant while reducing the importance of *Voluntariness of Use* and *Perceived Enjoyment*.

Our paper has important technology and managerial implications, as the robustness of the findings allow to define action plans based on the constituents of our model. The SCO systems and their physical set up in the stores must consider the importance of enjoyment to increase their usage. SCOs must be built in a way that makes them enjoyable, with a pleasant user interface and simple flows carefully designed, probably including interactions with customers smartphones, delivering appropriate information of what is happening and transmitting empathy to customers when something goes wrong. New interfaces should be tested, like augmented reality or gesture-based, and gamification options could be also considered.

Our main contribution is the relevant and unique finding of this study about the impact that criteria related with health protection are having and will have on technology adoption. The coming of the pandemic, far from ruining our running study as initially planned, has offered us the option to compare data and obtain compelling findings. *Safety to Use* shows a very relevant impact in *Attitude towards SCO*, which means that customer have included in their mindset the perception of the value of a technology to protect their health. Manufacturers and retailers must go beyond implementing safety measures; such measures must be communicated to customers that have to perceive security. Otherwise, even if there is an objective protection, customers will not feel safe, and their perception will restrain them to adopt the technology. In the case of SCOs, several options can be implemented: Contactless technology, self-cleaning surfaces, distance between machines, and frequent cleaning of all surfaces, to name a few. But such options require to be complemented by communication and visible proofs of what is claimed. Waiting time reduction has been a positive element of the usage of SCOs in the past (Collier *et al.* 2015; Djelassi *et al.* 2018; Marzocchi and Zammit 2006), but has become also relevant for safety, as waiting mean queues and queues mean crowds. Retailers wanting to increase SCOs usage should link the efficiency with the security in order to have customers tend to SCOs.

The strong relevance of *Attitude towards SCO* in *Retailer Patronage Intention* has also important implications for the management in the evolution of SCOs. Beyond the benefits of efficiency and cost reduction that SCOs bring in the short and long term, retailers must value the impact in the perception of the overall experience. The optimisation of any SCO deployment will bring several benefits, creating a virtuous circle of efficiency, service quality and customer experience. SCO can be a competitive advantage from all points of view. Retailers must install SCO whenever the volume of the business justifies the investment, carefully planning the layout, communication, and choice of technology.

Our study also adds up to the existing CFIST literature. We expect this category to settle with one name or the other, as different researchers are using different names (Betzing *et al.* 2018; Grewal *et al.* 2020; Roy *et al.* 2017; Lorente-Martínez *et al.* 2020). CFIST technologies are a cornerstone of brick-and-mortar stores survival and we expect a paramount role of them in the business and technology research.

Even though this study presents original and relevant findings, it is not free of limitations. First, the model used had few constructs, looking to reduce the size of the survey and therefore increase the number of valid responses. A more complete model would probably extract further conclusions. Second, *Safety to Use* construct was not included in the PRE sample, as at this time there was no expectation of the coming crisis and therefore no expected relevance of such construct. Third, PRE and POST samples have not been undertaken over the same respondents, due to the anonymous nature of the survey. With the same respondents for both moments the data would have an additional value. Fourth, there is a potential technology bias in the online survey, that is probably the reason of such a big percentage of previous usage of SCOs in the sample. The fact of responding through digital means reduce the diversity of respondents. An onsite survey to random population of a grocery would reduce this bias, although it would likely introduce others (geographical, day of the week, or time of the day).

For scholars, this study opens several avenues of research. We foresee three major lines of work. First, further theoretical models that include *Safety to Use* as construct can be applied to SCOs adoption, in order to see the comparative importance of this new construct. Second, the model can be taken to other CFIST technologies, whether they are SST technologies or other kind of customer facing technologies. Third, a more detailed research on *Safety to Use* as a construct may lead to split it into different elements to delve into customers health-related concerns when interacting with technology in retailers.

The results allow us to answer our research questions. The most relevant difference in technology perception before and after COVID-19 lockdown is the safety related aspects, that become relevant in the post COVID-19 era.

We hope that this study helps to understand the shift in perception that the pandemic has generated in consumers and contributes to look for solutions that help retailers to stay in the game despite the crisis that we will endure in the next years.

6.9 References

Bagozzi, R., & Yi, Y. (1988). On the Evaluation of Structure Equation Models Reshoring from a demand-side perspective View project household food waste minimization View project. *Article in Journal of the Academy of Marketing Science*. https://doi.org/10.1007/BF02723327

Baier, D., & Rese, A. (2020). How to increase multichannel shopping satisfaction? An adapted Kano based stage-gate approach to select new technologies. *Journal of Retailing and Consumer Services*, *56*, 157–163. https://doi.org/10.1016/j.jretconser.2020.102172

Balaji, M. S., Roy, S. K., Sengupta, A., & Chong, A. (2018). User Acceptance of IoT Applications in Retail Industry. In IGI Global (Ed.), *Technology Adoption and Social Issues: Concepts, Methodologies, Tools, and Applications* (pp. 1331–1352). https://doi.org/10.4018/978-1-5225-5201-7.ch061

Bandura, A. (1978). Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy*, *1*(4), 139–161. https://doi.org/10.1016/0146-6402(78)90002-4

Bauerova, R. (2019). Online grocery shopping acceptance: The impact on the perception of new technologies and loyalty in retailing. *Central European Business Review*, *8*(3), 18–34. https://doi.org/10.18267/j.cebr.216

Betzing, J. H., Hoang, A. Q. M., & Becker, J. (2018). In-store technologies in the retail servicescape. *MKWI 2018 - Multikonferenz Wirtschaftsinformatik*, *2018-March*, 1671–1682.

Choudrie, J., & Dwivedi, Y. K. (2005). Investigating the research approaches for examining technology adoption issues. *Journal of Research Practice*, *1*(1), 1–12.

Clement, J. (2019). *E-commerce share of total global retail sales from 2015 to 2023*. Statista. https://www.statista.com/statistics/534123/e-commerce-share-of-retail-sales-worldwide/

Collier, J. E., & Barnes, D. C. (2015). Self-service delight: Exploring the hedonic aspects of self-service. *Journal of Business Research*, *68*(5), 986–993. https://doi.org/10.1016/j.jbusres.2014.09.036

Collier, J. E., & Kimes, S. E. (2013). Only If It Is Convenient: Understanding How Convenience Influences Self-Service Technology Evaluation. In *Journal of Service Research* (Vol. 16, Issue 1, pp. 39–51). SAGE PublicationsSage CA: Los Angeles, CA. https://doi.org/10.1177/1094670512458454

Collier, J. E., Moore, R. S., Horky, A., & Moore, M. L. (2015). Why the little things matter: Exploring situational influences on customers' self-service technology decisions. *Journal of Business Research*, *68*(3), 703–710. https://doi.org/10.1016/j.jbusres.2014.08.001

Considine, E., & Cormican, K. (2017). The rise of the prosumer: An analysis of self-service technology adoption in a corporate context. *International Journal of Information Systems and Project Management*, *5*(2), 25–39. https://doi.org/10.12821/ijispm050202

Curran, J. M., & Meuter, M. L. (2005). Self-service technology adoption: Comparing three technologies. *Journal of Services Marketing*, *19*(2), 103–113. https://doi.org/10.1108/08876040510591411

Dabholkar, P. A. (1996). Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality. *International Journal of Research in Marketing*, *13*(1), 29–51. https://doi.org/10.1016/0167-8116(95)00027-5

Dabholkar, P. A., & Bagozzi, R. P. (2002). An attitudinal model of technology-based self-service: Moderating effects of consumer traits and situational factors. *Journal of the Academy of Marketing Science*, *30*(3), 184–201. https://doi.org/10.1177/0092070302303001

Dabholkar, P. A., Bobbitt, L. M., & Lee, E. J. (2003). Understanding consumer motivation and behavior related to self-scanning in retailing implications for strategy and research on technology-based self-service. *International Journal of Service Industry*

Management, *14*(1), 59–95. https://doi.org/10.1108/09564230310465994

Dannenberg, P., Fuchs, M., Riedler, T., & Wiedemann, C. (2020). Digital Transition by COVID-19 Pandemic? The German Food Online Retail. *Tijdschrift Voor Economische En Sociale Geografie*, *111*(3). https://doi.org/10.1111/tesg.12453

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Demirci Orel, F., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. *Journal of Retailing and Consumer Services*, *21*(2), 118–129. https://doi.org/10.1016/j.jretconser.2013.07.002

Demoulin, N. T. M., & Djelassi, S. (2016). An integrated model of self-service technology (SST) usage in a retail context. *International Journal of Retail & Distribution Management*, *44*(5), 540–559. https://doi.org/10.1108/IJRDM-08-2015-0122

Djelassi, S., Diallo, M. F., & Zielke, S. (2018). How self-service technology experience evaluation affects waiting time and customer satisfaction? A moderated mediation model. *Decision Support Systems*, *111*, 38–47. https://doi.org/10.1016/j.dss.2018.04.004

Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. In *Journal of Business Research* (Vol. 117, pp. 284–289). Elsevier. https://doi.org/10.1016/j.jbusres.2020.06.008

Eastlick, M. A., Ratto, C., Lotz, S. L., & Mishra, A. (2012). Exploring antecedents of attitude toward co-producing a retail checkout service utilizing a self-service technology. *International Review of Retail, Distribution and Consumer Research*, *22*(4), 337–364. https://doi.org/10.1080/09593969.2012.690775

Fernandes, T., & Pedroso, R. (2017). The effect of self-checkout quality on customer satisfaction and repatronage in a retail context. *Service Business*, *11*(1), 69–92. https://doi.org/10.1007/s11628-016-0302-9

Fornell, C., & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Fullerton, S., Brooksbank, R., & Neale, L. (2017). Consumer perspectives on the ethics of an array of technology-based marketing strategies: An exploratory study. *Asia Pacific Journal of Marketing and Logistics*, *29*(5), 1079–1096. https://doi.org/10.1108/APJML-09-2016-0179

Grand View Research. (2020). *Self-checkout Systems Market Size 2020-2027*. https://www.grandviewresearch.com/industry-analysis/self-checkout-systems-market

Grashuis, J., Skevas, T., & Segovia, M. S. (2020). Grocery shopping preferences during the COVID-19 pandemic. *Sustainability (Switzerland)*, *12*(13). https://doi.org/10.3390/su12135369

Grewal, D., Noble, S. M., Roggeveen, A. L., & Nordfalt, J. (2020). The future of in-store technology. *Journal of the Academy of Marketing Science*, *48*(1), 96–113.

https://doi.org/10.1007/s11747-019-00697-z

Hagberg, J., Sundstrom, M., & Egels-Zandén, N. (2016). The digitalization of retailing: an exploratory framework. *International Journal of Retail & Distribution Management*, *44*(7), 694–712. https://doi.org/10.1108/IJRDM-09-2015-0140

Hahm, Y., Yoon, H., & Choi, Y. (2019). The effect of built environments on the walking and shopping behaviors of pedestrians; A study with GPS experiment in Sinchon retail district in Seoul, South Korea. *CITIES*, *89*, 1–13. https://doi.org/10.1016/j.cities.2019.01.020

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (Sage (ed.); 2nd ed.). https://doi.org/10.1080/1743727x.2015.1005806

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). *Advance issues in Partial Least Squares Structural Equation Modeling* (Sage (ed.)). SAGE PublicationsSage CA: Los Angeles, CA.

Hilton, T., Hughes, T., Little, E., & Marandi, E. (2013). Adopting self�service technology to do more with less. *Journal of Services Marketing*, *27*(1), 3–12. https://doi.org/10.1108/08876041311296338

Inman, J. J., & Nikolova, H. (2017). Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, *93*(1), 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Jackson, T. W., Parboteeah, P., & Metcalfe-Poulton, S. (2014). The Effects of Consumer Personality Types on the Attitudes and Usage of Self-Checkout Technology in the Retail Sector among 18-22 Years Old. *International Journal of Marketing Studies*, *6*(2). https://doi.org/10.5539/ijms.v6n2p15

James, K. (2014). Exploration of User Satisfaction with Retail Self-Service Technologies [University of Minnesota]. In *University of Minnesota*. https://doi.org/10.4324/9781315853178

Jeon, H. M., Sung, H. J., & Kim, H. Y. (2020). Customers' acceptance intention of self-service technology of restaurant industry: expanding UTAUT with perceived risk and innovativeness. *Service Business*, *14*(4), 533–551. https://doi.org/10.1007/s11628-020-00425-6

Jones, M. A., Reynolds, K. E., & Arnold, M. J. (2006). Hedonic and utilitarian shopping value: Investigating differential effects on retail outcomes. *Journal of Business Research*, *59*(9), 974–981. https://doi.org/10.1016/j.jbusres.2006.03.006

Kallweit, K., Spreer, P., & Toporowski, W. (2014). Why do customers use self-service information technologies in retail? The mediating effect of perceived service quality. *Journal of Retailing and Consumer Services*, *21*(3), 268–276. https://doi.org/10.1016/j.jretconser.2014.02.002

Kats, R. (2020). *Self-Checkout Is Changing the Retail Landscape*. EMarketer. https://www.emarketer.com/content/self-checkout-is-changing-the-retail-landscape

Kaushik, A. K., & Rahman, Z. (2015). An alternative model of self-service retail technology adoption. *Journal of Services Marketing*, *29*(5), 406–420. https://doi.org/10.1108/JSM-08-2014-0276

Kazancoglu, I., & Kursunluoglu, E. (2018). How food retailing changed in Turkey: spread of self-service technologies. *British Food Journal*, *120*(2), 290–308. https://doi.org/10.1108/BFJ-03-2017-0189

Kelly, P., Lawlor, J., & Mulvey, M. (2010). A Review of Key Factors Affecting the Adoption of Self-Service Technologies in Tourism . CONSUMER ' S ADOPTION AND USAGE OF SELF-. *THRIC Conference*, *March*, 1–21. http://www.shannoncollege.com/wp-content/uploads/2009/12/THRIC-2010-Full-Paper.-P.-Kelly-et-al.pdf

Kim, J., & Forsythe, S. (2007). Hedonic usage of product virtualization technologies in online apparel shopping. *International Journal of Retail & Distribution Management*, *35*(6), 502–514. https://doi.org/10.1108/09590550710750368

Kim, Lee, J., Mun, J., & Johnson, K. (2017). Consumer adoption of smart in-store technology: assessing the predictive value of attitude versus beliefs in the technology acceptance model. *International Journal of Fashion Design, Technology and Education*, *10*(1), 26–36. https://doi.org/10.1080/17543266.2016.1177737

Kinard, B. R., Capella, M. L., & Kinard, J. L. (2009). The impact of social presence on technology based self-service use: The role of familiarity. *Services Marketing Quarterly*, *30*(3), 303–314. https://doi.org/10.1080/15332960902993593

Kirk, C. P., & Rifkin, L. S. (2020). I'll trade you diamonds for toilet paper: Consumer reacting, coping and adapting behaviors in the COVID-19 pandemic. *Journal of Business Research*, *117*, 124–131. https://doi.org/10.1016/j.jbusres.2020.05.028

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of E-Collaboration*, *11*(4), 1–10. https://doi.org/10.4018/ijec.2015100101

Kokkinou, A., & Cranage, D. A. (2013). Using self-service technology to reduce customer waiting times. *International Journal of Hospitality Management*, *33*(1), 435–445. https://doi.org/10.1016/j.ijhm.2012.11.003

Kühn, F., Lichters, M., & Krey, N. (2020). The touchy issue of produce: Need for touch in online grocery retailing. *Journal of Business Research*, *117*, 244–255. https://doi.org/10.1016/j.jbusres.2020.05.017

Lal, B., & Chavan, C. R. (2019). A Road Map: E-Commerce to World Wide Web Growth of Business World. *Global Journal of Management And Business Research*, *19*(11), 1–11.

Lee, H. H., Fiore, A. M., & Kim, J. (2006). The role of the technology acceptance model in explaining effects of image interactivity technology on consumer responses. *International Journal of Retail and Distribution Management*, *34*(8), 621–644. https://doi.org/10.1108/09590550610675949

Lee, H. J. (2015). Consumer-to-store employee and consumer-to-self-service technology (SST) interactions in a retail setting. *International Journal of Retail & Distribution Management*, *43*(8), 676–692. https://doi.org/10.1108/IJRDM-04-2014-0049

Lee, H. J., Cho, H. J., Xu, W., & Fairhurst, A. (2010). The influence of consumer traits and demographics on intention to use retail self-service checkouts. *Marketing Intelligence and Planning*, *28*(1), 46–58.

https://doi.org/10.1108/02634501011014606

Lee, H. J., Fairhurst, A., & Cho, H. J. (2013). Gender differences in consumer evaluations of service quality: self-service kiosks in retail. *Service Industries Journal*, *33*(2), 248–265. https://doi.org/10.1080/02642069.2011.614346

Lee, H. J., Fairhurst, A. E., & Lee, M. Y. (2009). The importance of self-service kiosks in developing consumers' retail patronage intentions. *Managing Service Quality*, *19*(6), 687–701. https://doi.org/10.1108/09604520911005071

Lee, H. J., & Lyu, J. (2016). Personal values as determinants of intentions to use self-service technology in retailing. *Computers in Human Behavior*, *60*, 322–332. https://doi.org/10.1016/j.chb.2016.02.051

Lee, H. J., & Yang, K. (2013). Interpersonal service quality, self-service technology (SST) service quality, and retail patronage. *Journal of Retailing and Consumer Services*, *20*(1), 51–57. https://doi.org/10.1016/j.jretconser.2012.10.005

Lorente-Martínez, J., Navío-Marco, J., & Rodrigo-Moya, B. (2020). Analysis of the adoption of customer facing InStore technologies in retail SMEs. *Journal of Retailing and Consumer Services*, *57*, 1–9. https://doi.org/10.1016/j.jretconser.2020.102225

Martin-Neuninger, R., & Ruby, M. B. (2020). What Does Food Retail Research Tell Us About the Implications of Coronavirus (COVID-19) for Grocery Purchasing Habits? *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01448

Marzocchi, G. L., & Zammit, A. (2006). Self-scanning technologies in retail: Determinants of adoption. *Service Industries Journal*, *26*(6), 651–669. https://doi.org/10.1080/02642060600850790

Meuter, M. L., Bitner, M. J., Ostrom, A. L., & Brown, S. W. (2005). Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies. *Journal of Marketing*, *69*(2), 61–83. https://doi.org/10.1509/jmkg.69.2.61.60759

Meuter, M. L., Ostrom, A. L., Bitner, M. J., & Roundtree, R. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research*, *56*(11), 899–906. https://doi.org/10.1016/S0148-2963(01)00276-4

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-service technologies: Understanding customer satisfaction with technology-based service encounters. *Journal of Marketing*, *64*(3), 50–64. https://doi.org/10.1509/jmkg.64.3.50.18024

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. In *International Journal of Surgery* (Vol. 78, pp. 185–193). Elsevier Ltd. https://doi.org/10.1016/j.ijsu.2020.04.018

O'Shea, D. (2019). *Study: 73% of consumers want self-service technology*. Retail Dive. https://www.retaildive.com/news/study-73-of-consumers-want-self-service-technology/546044/

Oyedele, A., & Simpson, P. M. (2007). An empirical investigation of consumer control factors on intention to use selected self-service technologies. *International Journal of Service Industry Management*, *18*(3), 287–306. https://doi.org/10.1108/09564230710751497

Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? Retailers' ups and downs during the COVID-19 outbreak. *Journal of Business Research*, *116*(May), 209–213. https://doi.org/10.1016/j.jbusres.2020.05.036

Pantano, E., Priporas, C. V., & Dennis, C. (2018). A new approach to retailing for successful competition in the new smart scenario. *International Journal of Retail & Distribution Management*, *46*(3), 264–282. https://doi.org/10.1108/IJRDM-04-2017-0080

Purcărea, T. (2020). Retailers under Pressure of Faster Adaptation to the New Marketing Environment. *EconPapers*, *March*, 1–11.

Rawstorne, P., Jayasuriya, R., & Caputi, P. (2000). Issues in Predicting and Explaining Usage Behaviors with the Technology Acceptance Model and the Theory of Planned Behavior when Usage is Mandatory. *Proceedings of the Twenty First International Conference on Information Systems*, 35–44. https://aisel.aisnet.org/icis2000/5

Ringle, C., Wende, S., & Becker, J. (2015). *SmartPLS 3. Bönningstedt: SmartPLS*. http://www.smartpls.com

Roggeveen, A. L., & Sethuraman, R. (2020a). How the COVID-19 Pandemic May Change the World of Retailing. In *Journal of Retailing* (Vol. 96, Issue 2, pp. 169–171). Elsevier Ltd. https://doi.org/10.1016/j.jretai.2020.04.002

Roggeveen, A. L., & Sethuraman, R. (2020b). Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions. In *Journal of Retailing* (Vol. 96, Issue 3, pp. 299–309). Elsevier Ltd. https://doi.org/10.1016/j.jretai.2020.08.001

Roy, S. K., Balaji, M. S., Sadeque, S., Nguyen, B., & Melewar, T. C. (2017). Constituents and consequences of smart customer experience in retailing. *Technological Forecasting and Social Change*, *124*, 257–270. https://doi.org/10.1016/j.techfore.2016.09.022

Shankar, V., Inman, J. J., Mantrala, M., Kelley, E., & Rizley, R. (2011). Innovations in shopper marketing: Current insights and future research issues. *Journal of Retailing*, *87*(SUPPL. 1). https://doi.org/10.1016/j.jretai.2011.04.007

Spanke, M. (2020). Retail Isn't Dead. In Palgrave McMillan (Ed.), *Retail Isn't Dead*. Springer International Publishing. https://doi.org/10.1007/978-3-030-36650-6

Statista. (2019). *Consumer usage and interest in using self-service checkouts in-store in the United States in 2019*. https://www.statista.com/statistics/1117352/consumer-usage-and-interest-in-using-self-service-checkouts-in-store-us/

Statista. (2020). *Share of total retail sales made online in Great Britain in July 2020, by sector*. https://www.statista.com/statistics/280655/proportion-of-retail-sales-made-online-great-britain-by-retail-sector/

Surendra, N. S., & Lakshmi, A. S. N. (2020). A Study on Safety Measures of Customers & Employees ar Retail during COVID-19. *UGC CARE Journal*, *31*(16), 239–245.

https://doi.org/10.2478/abmj-2020-0003

Vannucci, V., & Pantano, E. (2019). Digital or human touchpoints? Insights from consumer-facing in-store services. *Information Technology and People*, *33*(1), 296–310. https://doi.org/10.1108/ITP-02-2018-0113

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly: Management Information Systems*, *27*(3), 425–478. https://doi.org/10.2307/30036540

Verhoef, P. C., Lemon, K. N., Parasuraman, A., Roggeveen, A., Tsiros, M., & Schlesinger, L. A. (2009). Customer Experience Creation: Determinants, Dynamics and Management Strategies. *Journal of Retailing*, *85*(1), 31–41. https://doi.org/10.1016/j.jretai.2008.11.001

Vojvodić, K. (2019). Brick-and-mortar retailers: Becoming smarter with innovative technologies. *Strategic Management*, *24*(2), 3–11. https://doi.org/10.5937/straman1902003v

Wang, C., Harris, J., & Patterson, P. (2013). The Roles of Habit, Self-Efficacy, and Satisfaction in Driving Continued Use of Self-Service Technologies: A Longitudinal Study. *Journal of Service Research*, *16*(3), 400–414. https://doi.org/10.1177/1094670512473200

Wang, M. (2012). Determinants and consequences of consumer satisfaction with self-service technology in a retail setting. *Managing Service Quality*, *22*(2), 128–144. https://doi.org/10.1108/09604521211218945

Willems, K., Smolders, A., Brengman, M., Luyten, K., & Schöning, J. (2017). The path-to-purchase is paved with digital opportunities: An inventory of shopper-oriented retail technologies. *Technological Forecasting and Social Change*, *124*, 228–242. https://doi.org/10.1016/j.techfore.2016.10.066

Wilson, M. (2013). *Consumers prefer customized in-store experiences over online*. CSA. https://chainstoreage.com/operations/survey-consumers-prefer-customized-store-experiences-over-online

Yi, Y., & Kim, S. Y. (2017). The role of other customers during self-service technology failure. *Service Business*, *11*(4), 695–715. https://doi.org/10.1007/s11628-016-0325-2

Zorzini, C. (2018). *Why Has Buying Groceries Online Been Slow to Catch On?* https://ecommerce-platforms.com/articles/buying-groceries-online-slow-catch

Zwanka, R. J., & Buff, C. (2020). COVID-19 Generation: A Conceptual Framework of the Consumer Behavioral Shifts to Be Caused by the COVID-19 Pandemic. *Journal of International Consumer Marketing*, 1–10. https://doi.org/10.1080/08961530.2020.1771646

7. HOW WILL RETAIL SMES OVERCOME COVID-19?

IMPLICATIONS OF THE PANDEMIC IN RETAIL SMEs BUSINESS MANAGEMENT

7 HOW WILL RETAIL SMES OVERCOME COVID-19? IMPLICATIONS OF THE PANDEMIC IN RETAIL SMES BUSINESS MANAGEMENT

7.1 Abstract

The purpose of this paper is to propose a business framework that enables SMEs to consider and implement action plans to increase their strength after COVID-19. We undertake an introductory analysis of the situations that SME retailers have endured. After the analysis of the characteristics of the crisis for retail SMEs, we conclude with three characteristics that companies must foster in such extreme conditions: Resilience, digitalization, and empathy. We propose a framework that gathers, from a point of view of management and organization, some guidelines that can help retail SMEs to assess and improve their responsiveness to the crisis and build new strengths to face the post COVID-19 transformation and subsequent crisis, proposing an original approach to undertake strategic plans in SMEs. SMEs managers and practitioners may use the proposed framework to conduct a strategic assessment of the business in order to prepare the firm to overcome the post pandemic scenario and increase the resilience for further crisis.

7.2 Introduction

The retail business has been suffering a dramatic transformation in the last few years. Even before COVID-19 crisis, retail Small and Medium Enterprises (SMEs) were diminishing their number (European Commission 2019; Abel-Koch et al. 2019). The physical stores have been challenged by the shift to online, as eCommerce is growing over 20 percent Year over Year (YoY) (Clement 2019; Lal and Chavan 2019), and a big part of the business is moving to global retailers like Amazon (Stanton 2019). This situation is affecting primarily retail SMEs, that account for 5.4 million businesses in Europe, 20 million jobs, and 30 percent of all SMEs, and are considered the lifeblood of the European economy (Euro Commerce 2017). Although some scholars only see an eCommerce based future for retail SMEs (Khaskheli et al., 2017; Lal & Chavan, 2019), most of these companies are local and try to leverage the proximity to their customers.

Unfortunately, when it rains it pours. the COVID-19 emergency has widened their crisis and impacted retail SMEs stronger than larger companies for four reasons: First, they don’t have financial reserves to survive after few months (Cowling, Brown, and Rocha 2020; Martin, Romero, and Wegner 2019). Second, there is a prevalence of SMEs in retail, with 70 percent of the workforce in companies of less than 10 employees, being retail one of the high risk sectors in COVID-19 crisis (ILO 2020), and two thirds of jobs at risk are in SMEs (McKinsey & Company 2020). Third, most retail SMEs are local microbusinesses (Euro Commerce 2017), and the global lockdown has shut down their business except the services considered essential like groceries. In a survey[4] to 600 UK SMEs in May 2020, 75 percent of them expected to be out of the business by January 2021 if their revenues were to be reduced 30 percent. Finally, small companies are the least prepared of all organizations for crisis, due to their limited planning and organizational culture, among other reasons (Jones et al. 2008). Their size makes then vulnerable to all kind of events (Eggers 2020). The risk of a massive closure of SMEs retail business presents a systemic threat to most economies as this kind of companies are predominant in the business ecosystem (Cowling et al. 2020). The landscape is devastating.

As in previous crisis, government are assisting SMEs as one of the priority actions (Pathak and Ahmad 2018). Governments are providing a rapid response to COVID-19 by preventing liquidity shortages and job losses (Juergensen et al. 2020) and tackling first existing the survival of existing companies, what can jeopardize the mid a long term entrepreneurship environment (Giones et al. 2020). Economy is already moving from survival phase to support for recovery as relative optimism is growing and lock down restrictions are softened (OECD 2020a). On the organizational side, SMEs must improve their robustness looking ahead, taking new decisions or reasserting existing ones. The challenges posed by COVID-19 crisis are massive, but such limit situation force

[4] https://www.mckinsey.com/industries/public-and-social-sector/our-insights/how-the-COVID-19-crisis-is-affecting-uk-small-and-medium-size-enterprises

companies to look for innovation and new business models and organizations (Seetharaman 2020).

The objective of this paper is twofold. First, to consider how retail SMEs have been facing COVID-19 and what kind of decisions and actions have been taken from an organizational and marketing perspective to adapt to restrictions and customer behaviour. Second, we provide an intellectual contribution to better understand the challenges that retail SMEs are facing and the consequences for their business activities, to draw insights for their management. We present a simplified framework allowing retail SMEs to confront their internal capabilities during and after the COVID-19 crisis, looking for actions that can help them in the next months and throughout other potential threats that can challenge the business situation in the future (Williams et al. 2017).

7.3 Analysis of the COVID-19 Impact in Retail SMEs

7.3.1 First Phase of the Crisis: The Lockdown

The rapid evolution of the health crisis during the first weeks of the pandemic, and the rapid lockdown decisions and restrictions taken by governments and institutions, did not let time for companies to prepare for the situation. The depth and spread of the lockdown was not anticipated and the pandemic has been considered by business scholars as a black swan (Taleb 2007; Cowling et al. 2020).

During the early moments of the lockdown, the disruption of the business came with days of anticipation, if any. Furthermore, although other kinds of SMEs like manufacturing faced both demand and supply disruptions (Juergensen et al. Narula 2020), COVID-19 started as a channel crisis for retail. From the day before to the day after the lockdown announcement, there was no worsening of the financial market, or a shift in customers preferences, or a new disruptive technology, making this crisis very different from previous demand or supply crisis (Giones et al. 2020). For retail SMEs, the physical channel had just disappeared. Some retailers where the activity was considered essential could stay open but with important modifications in the customer experience. Goods shortage was generated rather by irrational stockpiling associated with uncertainty (Sheth 2020) than by a real problem of supply, and lasted only few days. Once customers understood that even during lockdown their first need good were available the consumption pattern went back to normal (Hall et al. 2020). Some retail SMEs had started their evolution to include the online channel and had a slight advantage, but with a lack of experience and limitations in their processes.

The priority of the health crisis and its control applied also to the organizations. Companies prioritized the wellbeing of employees and measures of confinement and quarantine, increasing dramatically absenteeism and the loss of working hours (ILO 2020), including opened essential stores, that had to cope with an increase in demand with a reduced staff. These essential stores have shown also structural differences in their response when implementing health restriction rules or pick-at-the-store services.

During the lockdown, all kinds of retail SMEs have experimented with new channels and new delivery methods. Business to business grocery and meat suppliers were not able to sell to hotels and restaurants due to closures. Therefore, they had to look for new customers and direct sale to final customer in order to keep their business running, forcing them to create Webs or WhatsApp channels and to set home delivery and click and collect options[5]. Organizational reaction to the lockdown has included also rapid modifications in the value proposition. Several fine dining restaurants have modified their menus to produce meals that could be more appropriate for delivery[6].

On their side, customers had suddenly no access to most of their goods suppliers in brick-and-mortar stores. They had to look for alternative channels and in several cases to alternative providers. Embracing digital technology is one of the consumer habits that has accelerated during the pandemic (Sheth 2020). Several categories of products have been bought for the first time by new online consumers, creating during the lockdown an increase in the overall online sales from six percent in 2019 to 10 percent (OECD 2020b). Digital adoption has jumped in Europe from 81 percent to 95 percent during the pandemic (McKinsey Digital 2020). Interestingly, even with groceries opened during lockdown, online shoppers of such products experimented a rise, showing that changes in demand trends are not only related with channel availability but with awareness and experience (Seetharaman 2020). This shift may be temporary and smaller than expected

[5] https://fortune.com/2020/04/01/coronavirus-restaurants-supply-chains-food-industry-COVID-19/

[6] https://www.bbc.com/news/business-52321761

(Dannenberg et al. 2020). Customers had also to face their own personal and financial situation. The uncertainty of the future economy and the temporary or permanent loss of jobs have made them modify their expenses patterns, regardless of the hurdles to consume during the lock down. Customer have not only found new ways to shop but also new brands and providers. Some brands have been more helpful than others and customer will record such information and use it for future consumption decisions (Pantano et al. 2020). In the opened stores, mainly groceries, customers had to endure disrupted customer experiences: Long waiting times, social distancing, shortage of essential products, or reduced staff. Such drawbacks were well supported by consumers, as expected in such situations (Pantano et al. 2020), and may modify the customers perceptions in the milder phases of the crisis or even once controlled.

7.3.2 Second Phase of the Crisis: The Social Distancing Scenario

Once the total lockdown has been lifted, the scenario is not in any way like the one prior to the pandemic. Although brick and mortar shops and restaurants are now reopened, the customer experience, the customer perception and the business dynamics are very different. For example, customers show their concern to attend open groceries if the spreading of the virus is increasing (Grashuis et al. 2020), and some papers foresee the end of closed malls as a shopping alternative (Rosenbaum and Russell-Bennett 2020). We can talk about a second phase of the organizational crisis, or even a second crisis, as companies have had to deploy additional actions to cope with this situation.

Putting wellbeing of customers and employees first, SMEs had quickly to modify their stores with new security elements like gel dispenser and screens. Employees have increased the number of their activities as several sanitary actions have to be taken. The regulation of most governments has left a lot of room in the way to implement things, and due to the financial scenario, most companies have decided to make minimal investments.

Companies have reacted in different ways when getting in touch again with their customers. Marketing orientation has changed. Main messages have been taken by security and health, and all stores have focused in informing that it was safe to shop, as hygiene and cleanliness have become paramount for customers (Stanciu et al. 2020; Jiang and Wen 2020).

Customers have shifted their priorities for brick-and-mortar shopping experience. Although different profiles behave in different ways[7][8], they all have accepted the limitations that regulations have put to their comeback, like longer procedures that include sanitizing to use fitting rooms or prohibition of touching the

[7] https://www.kantar.com/Campaigns/COVID-19-Barometer

[8] https://www.ey.com/en_gl/consumer-products-retail/how-COVID-19-could-change-consumer-behavior

goods that they used to paw in the past. Such limitations, in time of crisis, are not expected to impact in customer satisfaction (Pantano et al. 2020).

Once reopen, local SMEs have taken advantage of the caution of consumers to freely roam streets and malls. Nearby businesses are preferred as the risk of contagion seems smaller (Stanciu et al. 2020). Large stores represent in general longer trips and more potential interactions.

7.4 Management Implications of COVID-19 Crisis for Retail SMEs. An Exploratory Framework

COVID-19 could represent the paradigm of the definition of a global organizational crisis for any kind of company: An unexpected, unlikely and high impact situation that threatens the future of the organization (Pearson and Clair 1998). However, from an organizational perspective we see three major differences with the 2008 financial crisis (Soininen et al. 2012; Murphy 2011; Arrieta-Paredes et al., 2020).

First, the sudden lockdown did not let any time for anticipation or preparation to companies. Despite previous attempts of virus-related pandemic, the last as close as 2009 (Jester, Uyeki, and Jernigan 2018), and economic leaders warnings[9], governments

[9] See Bill Gates 2015 TED Talk The next outbreak? We're not ready https://www.youtube.com/watch?v=6Af6b_wyiwI&t=63s

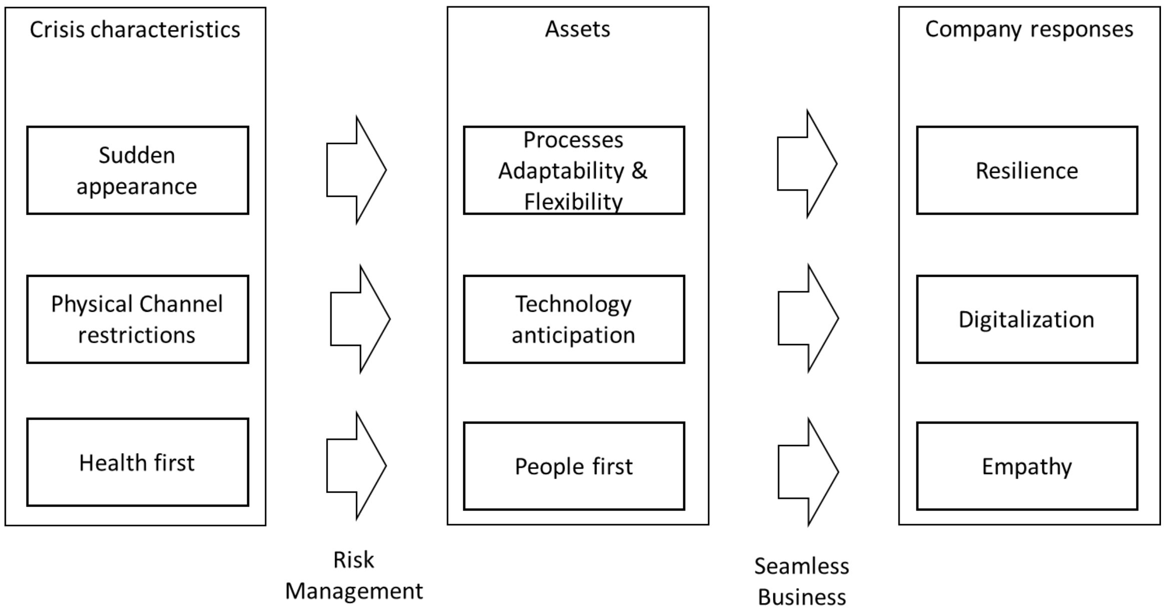
and companies had no plans in place to face such event. Without previous plans or regulations, and no experience, retailers had to react with the skills, resources and procedures already present in their organizations.

Second, the origin of the economic crisis is sanitary, an event external to the economy without direct impact in the means of production or in consumers (beyond the terrible loss of lives). There has been no massive destruction and disruption of production and logistics like in a war or an earthquake. The day one of the lockdown, funding, supply chain and demand were the same than the day before. But lockdown forced a disconnection between retailers and demand. With rare exceptions, consumers had not rationalized what to buy. They simply could not. The economical origin of the crisis is the sudden elimination of the physical channel and the subsequent disruption of supply chains, which is a brand-new scenario. Previous research on consumer reaction towards crisis or disasters may not apply to COVID-19 due to the different nature of the disruption (Larson and Shin 2018).

Third, the lockdown was a government decision, not an inexorable event. Different governments reacted with different levels of restriction, impacting differently in local economies (Cheng et al., 2020). The heaviness and duration of lockdown and social distancing shows a health first strategy. Most companies have also taken decisions to protect employees and customers beyond the government rules, putting people first. The end of the lockdown has allowed retailers to reopen, but this has generated new outbreaks. What is the right trade-off between contagions, lives cost and the protection of the economy from collapse? The scales have tipped in favour of life protection and society support. SMEs are taking care of customers and employees by creating a safe environment. This attitude has been spotted by customers and is setting new emotional relations between customers and retailers.

Each of the previous three characteristics require specific structural assets from SMEs to survive the COVID-19 crisis. Figure 1 shows a simplified framework of which management and organization-oriented assets and responses are required to address the main characteristics of the crisis.

Figure 7.1. Simplified framework of assets and crisis responses



Source: Prepared by authors

The sudden appearance of the crisis has put to test the adaptability and flexibility of the processes, as the constant change in restrictions has required the implementation of mitigation measures in rather hours than days, improvising workarounds (Sheth 2020). Such ability to adapt requires changing the way decisions are taken, deviating from existing plans in simple processes to avoid delays in the innovations (Williams et al. 2017). For example, some restaurants have quickly embraced new channels (from dine-in to home delivery) but also created new menus that can stay fresh when delivered[10] (Seetharaman 2020). Marketing orientation, understood that a quick and proactive answer to customer needs, is easier to achieve in SMEs than big corporations (Petzold et al. 2019). Furthermore, implementing such flexible decisions requires flexible process and quick roll out projects. This flexibility and adaptability are major internal assets of the organizational resilience (Williams et al. 2017). For the purpose of our work, resilience is the ability to "effectively absorb uncertainty, develop situation-specific responses to threats, and ultimately engage in transformative activities so that they can capitalize on disruptive surprises that potentially threaten their survival" (Lengnick-Hall et al. 2011, pp. 248). Resilience is a cornerstone asset of small firms and differs from large companies (Sullivan-Taylor and Branicki 2011). Resilience can be improved by innovation (Tejeiro Koller et al., 2017). Resilience has to infuse managers and employees' actions, but also processes and strategies. Although financial resilience is always put first in economic crisis (Cowling et al. 2020), it is an outcome of a visionary strategy that appears from organizational skills. SMEs can have a worse access to

10 https://www.mckinsey.com/industries/retail/our-insights/how-restaurants-can-thrive-in-the-next-normal

financial resources than large firms, but they are more adaptative and flexible than large firms (Vossen 1998), as their decision-makers are closer to their customers and stakeholders (Eggers, Hansen, and Davis 2012), and they must lever these assets in such unexpected and intense crisis.

With respect to physical channel restriction, the lockdown has forced retailers and consumers to look for channels that get around the blocked ones. During a lockdown it is not possible to attend a music concert, eat in a restaurant, or try on and buy clothes; but these activities can have an alternative: The music concert can be broadcasted, the restaurant can introduce home delivery, or the clothes can be bought in an online store. All the alternatives are based in technology and require a digitalization of the operations to keep the business running. Going online does not mean closing brick and mortar stores (Khaskheli et al. 2017), it means using technology to interact with customers in fully transactional relations regardless of the channel used, including phone, WhatsApp, social networks or web. First data show this trend: Retailers SMEs in US have increased their digital presence from 10 percent to 17 percent in the last months[11].

Furthermore, it is not only about enhancing alternative channels; it is also about preparing digitally the brick and mortar stores for a more controlled and adapted experience (Lorente-Martínez et al., 2020; Betzing 2018). Once the total lockdown is finished and the social distancing has started, technology is also playing an important

[11] https://www.uschamber.com/report/small-business-coronavirus-impact-poll-june

role in the physical space. Crowd control, self-service technology, temperature measurement, digital signage security campaigns, among others [12][13] . Although the plans for digitalization of SMEs have been on the table for a while already (OECD 2017), it seems obvious that they will accelerate in the next years due to the crisis (Kim 2020; Soto-Acosta 2020; European Commission 2020), as digital technologies are key to secure business continuity (Papadopoulos et al., 2020; Pedroche et al., 2014).

Finally, the reaction of retailers to the difficult decision to prioritize health over business, and the actions and communications they have taken, have shown their true colors for employees and customers, that react accordingly. 71 percent of consumers claim that they will lose their trust forever in brands that put profit before people (Edelman 2020). Although some companies may have increased prices and made false claims on their products, most of them have committed with help and support to the society and employees (He and Harris 2020). Solving ethical dilemmas, like prioritizing the well-being of customers and employees over the short term profitability, is a characteristic of empathic organizations (Dietz and Kleinlogel 2014). Empathy can be defined as “the ability to understand other’s feelings in such a way that one can identify with him” (Salari and Nastiezaie 2020, p.53). Research has found that empathy is a key trait for leaders and for employees (Humphrey 2013; Bahadur et al. 2018) and impact in

[12] https://www.cnbc.com/2020/09/06/how-coronavirus-convinced-grocery-chains-to-experiment-with-new-tech-.html

[13] https://www.securitymagazine.com/articles/92836-video-technologies-help-retailers-deliver-a-safe-in-store-shopping-experience-in-the-age-of-COVID-19

customers satisfaction (Bahadur et al., 2018; Sevilla-Sevilla et al., 2019). Organizational empathy brings to companies skills to undertake collaborative activities, improve responsibility and arouse pro-social behaviour (Salari and Nastiezaie 2020). On their side, customers have been also much more open to endure non satisfactory experiences due to the context (Pantano et al. 2020). The disruption of the economy model has also accelerated the concern of consumers for the origin and brands of the products they buy (He and Harris 2020). They are showing an increased preference for local production and retail that can stay as a trend once the crisis is over (Sheth 2020); this can be leveraged by retail SMEs that are mainly local.

The model presented shows how SMEs can react to the main traits of the COVID-19 crisis, facing the challenges in processes, technology and people with resilience, digitalization, and empathy.

7.5 Conclusions

The present paper aims to highlight the main organizational responses that retail SMEs require to survive during and after the COVID-19 disruption. We consider resilience, digitalization, and empathy the most relevant organizational responses for the specific challenges that make this crisis different, as presented in the framework of Figure 1. The existence of such responses is improving their odds to survive, and therefore our framework has important managerial consequences, as companies must encourage their development. SMEs that want to be more resilient must review their decision-making processes and the speed to decide and to execute. Although companies can be prepared in different levels for organizational crisis, not all scenarios or kind of crisis can be completely anticipated. Therefore, as suggested by Williams et al. (2017), it is key to improvise decision making, resource allocation and communication activities. Thanks to their size, SMEs have a relative advantage to implement these actions.

With respect to digitalization, SMEs must catch up in their digitalization processes. The relation with customer needs to shift to omnichannel, leveraging in their brick-and-mortar assets if this is the strategy. An omnichannel backend that manages a single online and offline inventory, allowing customers to choose home delivery or pick at store, cannot be improvised. Added to this, the trend towards digitalization of customers is a threat that SMEs, due to their limited resources, must review carefully. Customer will request more and more digital touchpoints, regardless of the presence of the physical touchpoint in the E2E experience. We expect European policies to be focused on supporting retail SMEs to go online and implement social distancing measures (OECD 2020a; OECD 2020b).

In order to leverage empathy, SMEs must preserve any improvement obtained in their emotional relationship with customers during the pandemic. We share the view of He and Harris (2020) that the bond with retailers will stay in the long run and give more chances to improve the relationship with consumers. Once the health crisis is eventually controlled or mitigated, we expect the regulation to keep habits that should protect us from new outbreaks or new virus-related events. Such regulation will deepen in the emerging consumer habits and therefore we expect the post COVID-19 consumer trends to stay. Consumer satisfaction perspective will probably also be modified. Both the new regulation and the experience during the pandemic can change the perception of situations that were negative before the crisis, like waiting times, as anticipated by Pantano et al. (2020).

We encourage retail SMEs to undertake adapted contingency and continuity plans, although their perception is that their size do not entail such need (Sullivan-Taylor and Branicki 2011). The effort for both firms and institutions must focus on developing guidance and policies to improve resilience. It will be easier if measures are closely related with their mainstream business and not seen as an extra concern (Jones et al. 2008). Considering this COVID-19 crisis as an opportunity may be seen offensive due to the high cost in lives and in wealth worldwide. Nevertheless, as retailers were already immersed in the eCommerce transformation, they have to take this chance to accelerate the decisions on projects that should have been running prior to the COVID-19 crisis, catching up in the transformation that was happening and improving the key organizational characteristics that will allow them to cope better with further disruptions.

This work presents some limitations. First, we have focused on management aspects, disregarding the financial implications of the crisis. Even the strongest organizational assets require a financial viability. Further research should be done to see how our recommendations apply to retail SMEs according to their financial situation. Second, as shown by the July 2020 OECD report (2020a), there is a large casuistry around the globe of policies and government actions, that will require a detailed analysis to raise more categorical conclusions.

This research represents a first theoretical approach to the core elements required by a retail SME to survive in a crisis such as COVID-19. As findings are driven mainly by observation and first studies, it opens several avenues of research to delve into the three main characteristics: Resilience, digitalization, and empathy. Our work also present inputs for SMEs to analyse current organizational challenges and possible paths to managerial responsiveness. We truly hope that our modest contribution may bring them some help to endure this difficult path to overcome the pandemic.

7.6 References

Abel-Koch, Jennifer, Leath Al Obaidi, Sabrina El Kasmi, Miguel Fernández, Laetitia Morin, and Anna Topczewska (2019), “Going Digital. The Challenges Facing European SMEs,” Warszawa.

Arrieta-Paredes, Mary Paz, Alan G. Hallsworth, and J. Andres Coca-Stefaniak (2020), “Small Shop Survival – The Financial Response to a Global Financial Crisis,” *Journal of Retailing and Consumer Services*, 53 (March), Elsevier Ltd, 1–10, doi:10.1016/j.jretconser.2019.101984.

Bahadur, Waseem, Saira Aziz, and Salman Zulfiqar (2018), “Effect of Employee Empathy on Customer Satisfaction and Loyalty during Employee–Customer Interactions: The

Mediating Role of Customer Affective Commitment and Perceived Service Quality," *Cogent Business & Management*, 5 (1), Cogent OA, 1–21, doi:10.1080/23311975.2018.1491780.

Betzing, Jan Hendrik (2018), "Beacon-Based Customer Tracking across the High Street: Perspectives for Location-Based Smart Services in Retail," in *24th Americas Conference on Information Systems (AMCIS)*, New Orleans, USA, https://aisel.aisnet.org/amcis2018/OrgTrasfm/Presentations/4/.

Cheng, Cindy, Joan Barceló, Allison Spencer Hartnett, Robert Kubinec, and Luca Messerschmidt (2020), "COVID-19 Government Response Event Dataset (CoronaNet v.1.0)," *Nature Human Behaviour*, 4 (7), Nature Research, 756–68, doi:10.1038/s41562-020-0909-7.

Clement, J. (2019), "Annual Retail E-Commerce Sales Growth Worldwide from 2014 to 2023," *Statista*, https://www.statista.com/statistics/288487/forecast-of-global-b2c-e-commerce-growt/.

Cowling, Marc, Ross Brown, and Augusto Rocha (2020), "Did You Save Some Cash for a Rainy COVID-19 Day? The Crisis and SMEs," *International Small Business Journal*, , August, SAGE Publications Ltd, doi:10.1177/0266242620945102.

Dannenberg, P., M. Fuchs, T. Riedler, and C. Wiedemann (2020), "Digital Transition by COVID-19 Pandemic? The German Food Online Retail," *Tijdschrift Voor Economische En Sociale Geografie*, 111 (3), Wiley-Blackwell, doi:10.1111/tesg.12453.

Dietz, Joerg and Emmanuelle P. Kleinlogel (2014), "Wage Cuts and Managers' Empathy: How a Positive Emotion Can Contribute to Positive Organizational Ethics in Difficult Times," *Journal of Business Ethics*, 119 (4), Springer, 461–72, doi:10.1007/s10551-013-1836-6.

Edelman (2020), "Edelman Trust Barometer 2020. Trust and the Coronavirus."

Eggers, Fabian (2020), "Masters of Disasters? Challenges and Opportunities for SMEs in Times of Crisis," *Journal of Business Research*, 116 (August), Elsevier Inc., 199–208, doi:10.1016/j.jbusres.2020.05.025.

———, David J. Hansen, and Amy E. Davis (2012), "Examining the Relationship between Customer and Entrepreneurial Orientation on Nascent Firms' Marketing Strategy," *International Entrepreneurship and Management Journal*, 8 (2), Springer, 203–22, doi:10.1007/s11365-011-0173-4.

Euro Commerce (2017), "Contribution of Retail and Wholesale SMEs to the EU Economy," https://www.eurocommerce.eu/media/135423/contribution_of_retail_and_wholesale_smes_to_the_eu_economy.pdf.

European Commission (2019), "Annual Report on European SMEs 2018/2019 - Research & Development and Innovation by SMEs," doi:10.2826/500457.

——— (2020), "Europe's Moment: Repair and Prepare for the Next Generation," https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590732521013&uri=COM%3A2020%3A456%3AFIN.

Giones, Ferran, Alexander Brem, Jeffrey M. Pollack, Timothy L. Michaelis, Kim Klyver, and Jan Brinckmann (2020), "Revising Entrepreneurial Action in Response to Exogenous Shocks: Considering the COVID-19 Pandemic," *Journal of Business Venturing Insights*, 14, Elsevier, doi:10.1016/j.jbvi.2020.e00186.

Grashuis, Jasper, Theodoros Skevas, and Michelle S. Segovia (2020), "Grocery Shopping Preferences during the COVID-19 Pandemic," *Sustainability (Switzerland)*, 12 (13), Multidisciplinary Digital Publishing Institute (MDPI), doi:10.3390/su12135369.

Hall, Michael C., Girish Prayag, Peter Fieger, and David Dyason (2020), "Beyond Panic Buying: Consumption Displacement and COVID-19," *Journal of Service Management*, Emerald, doi:10.1108/JOSM-05-2020-0151.

He, Hongwei and Lloyd Harris (2020), "The Impact of Covid-19 Pandemic on Corporate Social Responsibility and Marketing Philosophy," *Journal of Business Research*, 116 (August), Elsevier Inc., 176–82, doi:10.1016/j.jbusres.2020.05.030.

Humphrey, Ronald H. (2013), "The Benefits of Emotional Intelligence and Empathy to Entrepreneurship," *Entrepreneurship Research Journal*, 3 (3), Walter de Gruyter GmbH, 287–94, doi:10.1515/erj-2013-0057.

ILO (2020), "COVID-19 and the World of Work.Fifth Edition."

Jester, Barbara, Timothy Uyeki, and Daniel Jernigan (2018), "Readiness for Responding to a Severe Pandemic 100 Years After 1918," *American Journal of Epidemiology*, 187 (12), NLM (Medline), 2596–2602, doi:10.1093/aje/kwy165.

Jiang, Yangyang and Jun Wen (2020), "Effects of COVID-19 on Hotel Marketing and

Management: A Perspective Article," *International Journal of Contemporary Hospitality Management*, 32 (8), Emerald Group Publishing Ltd., 2563–73, doi:10.1108/IJCHM-03-2020-0237.

Jones, Keith, Bingunath Ingirige, and David Proverbs (2008), "Investigating SME Resilience and the Adaptive Capacity to Extreme Weather Events: Literature Review and Synthesis," in *Building Resilience BEAR 2008*, Universitiy of Salford, ed., Kandalama: http://www.baufachinformation.de/aufsatz.jsp?ul=2009061000637, 582–93, http://www.irbnet.de/daten/iconda/CIB11642.pdf.

Juergensen, Jill, José Guimón, and Rajneesh Narula (2020), "European SMEs amidst the COVID-19 Crisis: Assessing Impact and Policy Responses," *Journal of Industrial and Business Economics*, 47 (3), Springer, 499–510, doi:10.1007/s40812-020-00169-4.

Khaskheli, Asadullah, Yun Jun, and Miraj Ahmed Bhuiyan (2017), "M-Commerce and Mobile Apps: Opportunities for SMEs in Developing Countries," *Journal of International Business Research and Marketing*, 2 (2), 20–23, doi:10.18775/jibrm.1849-8558.2015.22.3003.

Kim, Rae Yule (2020), "The Impact of COVID-19 on Consumers: Preparing for Digital Sales," *IEEE Engineering Management Review*, Institute of Electrical and Electronics Engineers Inc., doi:10.1109/EMR.2020.2990115.

Lal, Bechoo and Chandrahauns R Chavan (2019), "A Road Map: E-Commerce to World Wide Web Growth of Business World," *Global Journal of Management And Business Research*, 19 (11), 1–11.

Larson, Lindsay R.L. and Hyunju Shin (2018), "Fear During Natural Disaster: Its Impact on Perceptions of Shopping Convenience and Shopping Behavior," *Services Marketing Quarterly*, 39 (4), Taylor & Francis, 293–309, doi:10.1080/15332969.2018.1514795.

Lengnick-Hall, Cynthia A., Tammy E Beck, and Mark L Lengnick-Hall (2011), "Developing a Capacity for Organizational Resilience through Strategic Human Resource Management," *Human Resource Management Review*, 21 (3), 243–55, doi:10.1016/j.hrmr.2010.07.001.

Lorente-Martínez, Javier, Julio Navío-Marco, and Beatriz Rodrigo-Moya (2020), "Analysis of the Adoption of Customer Facing InStore Technologies in Retail SMEs," *Journal of Retailing and Consumer Services*, 57 (November), Elsevier Ltd, 1–9, doi:10.1016/j.jretconser.2020.102225.

Martin, Domingo, Isidoro Romero, and Douglas Wegner (2019), "Individual, Organizational, and Institutional Determinants of Formal and Informal Inter-Firm Cooperation in SMEs," *Journal of Small Business Management*, 57 (4), Blackwell Publishing Ltd, 1698–1711, doi:10.1111/jsbm.12445.

McKinsey & Company (2020), "Safeguarding Europe's Livelihoods: Mitigating the Employment Impact of COVID-19," https://www.mckinsey.com/industries/public-and-social-sector/our-insights/safeguarding-europes-livelihoods-mitigating-the-employment-impact-of-covid-19.

McKinsey Digital (2020), "Europe's Digital Migration during COVID-19: Getting Past the Broad Trends and Averages," https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/europes-digital-migration-during-covid-

19-getting-past-the-broad-trends-and-averages.

Murphy, Austin (2011), "An Analysis of the Financial Crisis of 2008: Causes and Solutions," *SSRN Electronic Journal*, , December, Elsevier BV, , 1–27, doi:10.2139/ssrn.1295344.

OECD (2017), "ENHANCING THE CONTRIBUTIONS OF SMEs IN A GLOBAL AND DIGITALISED ECONOMY," *Meeting of the OECD Council at Ministerial Level*, doi:10.1787/9789264064553-en.

——— (2020a), "Tackling Coronavirus (COVID-19): Contributing to a Global Effort. SME Policy Responses.," Paris, http://www.oecd.org/coronavirus/policy-responses/coronavirus-covid-19-sme-policy-responses-04440101/.

——— (2020b), "Tackling Coronavirus (COVID-19): Contributing to a Global Effort. COVID-19 and the Retail Sector: Impact and Policy Responses," Paris, http://www.oecd.org/coronavirus/policy-responses/covid-19-and-the-retail-sector-impact-and-policy-responses-371d7599/.

Pantano, Eleonora, Gabriele Pizzi, Daniele Scarpi, and Charles Dennis (2020), "Competing during a Pandemic? Retailers' Ups and Downs during the COVID-19 Outbreak," *Journal of Business Research*, 116 (May), Elsevier, 209–13, doi:10.1016/j.jbusres.2020.05.036.

Papadopoulos, Thanos, Konstantinos N. Baltas, and Maria Elisavet Balta (2020), "The Use of Digital Technologies by Small and Medium Enterprises during COVID-19: Implications for Theory and Practice," *International Journal of Information*

Management, Elsevier, doi:10.1016/j.ijinfomgt.2020.102192.

Pathak, S. and M. M. Ahmad (2018), "Role of Government in Flood Disaster Recovery for SMEs in Pathumthani Province, Thailand," *Natural Hazards*, 93 (2), Springer Netherlands, 957–66, doi:10.1007/s11069-018-3335-7.

Pearson, Christine M. and Judith A. Clair (1998), "Reframing Crisis Management," *Academy of Management Review*, 23 (1), Academy of Management, 59–76, doi:10.5465/AMR.1998.192960.

Pedroche, S. C., Andrada, L. R., Antón, J. M. R., & Almeida, M. D. M. A. (2014). La influencia de la crisis en la adopción y uso de las Tecnologías de la Información y las Comunicaciones en el sector alojamiento en España. *Turitec 2014: X Congreso Nacional Turismo y Tecnologías de La Información y Las Comunicaciones*, 296–308. Universidad de Málaga (UMA).

Petzold, Stéphanie, Valérie Barbat, Frank Pons, and Michel Zins (2019), "Impact of Responsive and Proactive Market Orientation on SME Performance: The Moderating Role of Economic Crisis Perception," *Canadian Journal of Administrative Sciences / Revue Canadienne Des Sciences de l'Administration*, 36 (4), Wiley-Blackwell Publishing, 459–72, doi:10.1002/cjas.1514.

Rosenbaum, Mark Scott and Rebekah Russell-Bennett (2020), "Editorial: Service Research in the New (Post-COVID) Marketplace," *Journal of Services Marketing*, JAI Press, doi:10.1108/JSM-06-2020-0220.

Salari, Marzi and Naser Nastiezaie (2020), "The Relationship between Transformational

Leadership and Organizational Intimacy with Mediating Role of Organizational Empathy," *International Journal of Psychology and Educational Studies*, 2020 (1), 51–60, doi:10.17220/ijpes.2020.01.005.

Seetharaman, Priya (2020), "Business Models Shifts: Impact of Covid-19," *International Journal of Information Management*, 54 (June), 1–4, doi:10.1016/j.ijinfomgt.2020.102173.

Sevilla-Sevilla, C., Mondéjar-Jiménez, J., & Reina-Paz, M. D. (2019). Before a hotel room booking, do perceptions vary by gender? The case of Spain. Economic Research-Ekonomska Istrazivanja , 32(1), 3853–3868. https://doi.org/10.1080/1331677X.2019.1677487

Sheth, Jagdish (2020), "Impact of Covid-19 on Consumer Behavior: Will the Old Habits Return or Die?," *Journal of Business Research*, 117 (September), Elsevier Inc., 280–83, doi:10.1016/j.jbusres.2020.05.059.

Soininen, Juha, Kaisu Puumalainen, Helena Sjögrén, and Pasi Syrjä (2012), "The Impact of Global Economic Crisis on SMEs: Does Entrepreneurial Orientation Matter?," *Management Research Review*, 35 (10), Emerald Group Publishing Limited, 927–44, doi:10.1108/01409171211272660.

Soto-Acosta, Pedro (2020), "COVID-19 Pandemic: Shifting Digital Transformation to a High-Speed Gear," *Information Systems Management*, Taylor and Francis Inc., doi:10.1080/10580530.2020.1814461.

Stanciu, Silvius, Universitatea Dunarea, De Jos Galati, Riana Iren Radu, Universitatea

Dunarea, De Jos Galati, Violeta Sapira, Universitatea Dunarea, De Jos Galati, Bogdan Dumitrache Bratoveanu, Universitatea Dunarea, and De Jos Galati (2020), "Consumer Behavior in Crisis Situations . Research on the E Ffects of COVID - 19 in Romania," *Annals of "Dunarea de Jos" University of Galati*, 1 (May), doi:10.35219/eai1584040975.

Stanton, Taylor (2019), "Millenials Help Amazon Own 43% of The Online Holiday Market," *The Brief Blog*, https://www.rakutenintelligence.com/blog/2016/millennials-help-amazon-own-43-percent-of-the-online-holiday-market.

Sullivan-Taylor, Bridgette and Layla Branicki (2011), "Creating Resilient SMEs: Why One Size Might Not Fit All," *International Journal of Production Research*, 49 (18), Taylor & Francis Group, 5565–79, doi:10.1080/00207543.2011.563837.

Taleb, Nassim Nicholas (2007), *The Black Swan: The Impact of the Highly Improbable*, Random house.

Tejeiro Koller, M. R., Morcillo Ortega, P., Rodríguez Antón, J. M., & Andrada, L. R. (2017). Corporate culture and long-term survival of Spanish innovative firms. *International Journal of Innovation Science*, *9*(4), 335–354. https://doi.org/10.1108/IJIS-11-2016-0053

Vossen, Robert W. (1998), "Relative Strengths and Weaknesses of Small Firms in Innovation," *International Small Business Journal*, 16 (3), 88–94, doi:10.1177/0266242698163005.

Williams, Trenton A., Daniel A. Gruber, Kathleen M. Sutcliffe, Dean A. Shepherd, and Eric Yanfei Zhao (2017), “Organizational Response to Adversity: Fusing Crisis Management and Resilience Research Streams,” *Academy of Management Annals*, 11 (2), 733–69, doi:10.5465/annals.2015.0134.

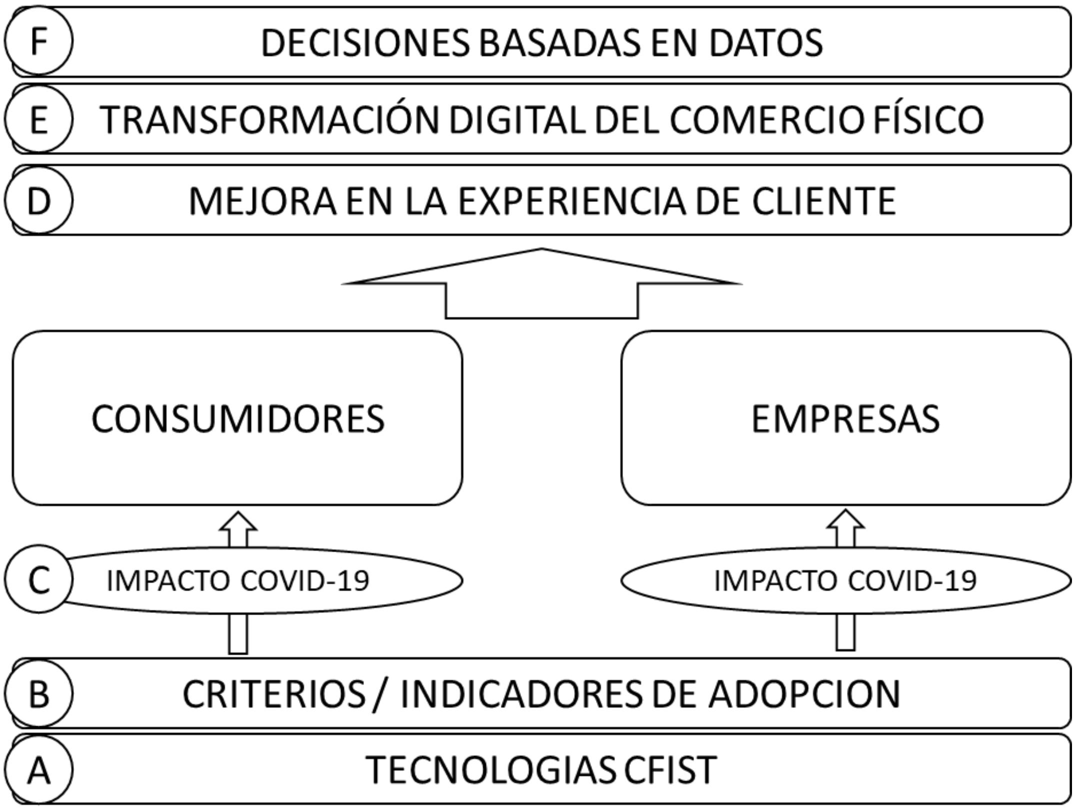
8. CONCLUSIONES FINALES

8 CONCLUSIONES FINALES

8.1 Hallazgos principales de la investigación

El objetivo de esta tesis ha sido profundizar en diversos aspectos de las tecnologías en el punto de venta físico y su impacto en la evolución del comercio tradicional, en particular en las PYMEs. Cada uno de los estudios planteados en este trabajo proporciona hallazgos relevantes en este sentido, planteando a su vez nuevas cuestiones para futuras líneas de investigación. Estos hallazgos pueden ser organizados teniendo en cuenta el alcance conceptual definido en el capítulo 1 y que reproducimos en la figura 8.1. Se exponen a continuación las conclusiones a las que han dado lugar los estudios de los capítulos anteriores con relación a las tecnologías CFIST, ordenados de acuerdo con el marco conceptual y los objetivos de esta tesis doctoral. Siguiendo la nomenclatura propuesta en la Figura 8.1., se enumeran los 6 bloques conceptuales señalados con las letras A a la F.

Figura 8.1: Alcance conceptual del estudio (a partir de la Figura 1.1)



Fuente: Elaboración propia

A. Tecnologías CFIST

La exhaustiva revisión bibliográfica realizada, así como las investigaciones empíricas con directivos de compañías, han mostrado el aún incipiente estado de adopción de estas tecnologías. La literatura existente es dispersa, sin una columna vertebradora alrededor de la cual se organice todo el conocimiento. El incremento de los últimos años en cuanto a publicaciones no ha mejorado este aspecto, ni tampoco lo han conseguido los intentos por parte de algunos académicos de proporcionar una taxonomía a la categoría. Los empresarios a su vez tienen un conocimiento limitado de las capacidades de la tecnología y la asocian a costosos procesos de transformación. Al mismo tiempo el número de tecnologías y casos de uso en la categoría se sigue incrementando, si bien los más estudiados son tres: Las tecnologías de autoservicio, la tecnología RFID y el marketing dinámico. El estudio y conocimiento de las capacidades de analítica de datos que habilitan las tecnologías CFIST es anecdótica, aunque la literatura prueba la viabilidad de obtención de datos en el espacio físico similares a los que se utilizan en el comercio electrónico.

La investigación ha permitido extraer pautas de análisis de las tecnologías de cara a su aplicación práctica, proponiendo un método de decisión y mejora sobre tecnologías específicas como los sistemas de autoservicio y el RFID. En el caso de los sistemas de autoservicio, se propone un cuestionario de cinco preguntas que permiten discriminar el éxito de la solución en una implementación concreta. Para la tecnología RFID, se define un marco conceptual basado en los casos de uso habilitados por el RFID tanto desde el punto de vista de la experiencia de usuario como del comercio, todo ello teniendo en cuenta un elemento clave en la adopción como es la privacidad percibida.

B. Criterios de adopción

Un hallazgo de aplicación práctica inmediata es la importancia de las características del gestor de la empresa en la percepción de las tecnologías CFIST. Este hallazgo se produce tanto en el comercio en general, donde los resultados muestran una relación directa con este puesto directivo, como en el caso particular de los restaurantes, donde la adopción se relaciona con la percepción de la tecnología del encuestado y por lo tanto con el mismo puesto directivo. El reconocimiento de esta subjetividad, por encima de otros criterios de decisión más objetivos como el retorno de la inversión, las capacidades funcionales de la tecnología, o el nivel de demanda de los clientes, tiene implicaciones en las iniciativas de transformación, como veremos más adelante en las recomendaciones. Este hallazgo es consistente con literatura de adopción de tecnología en las PYMEs, pero con un importante valor adicional: El estudio de tecnologías en las PYMEs se ha ceñido a tecnologías que son usadas por los empleados, mientras que nuestro estudio se centra en tecnologías que son usadas por los clientes.

Por lo tanto, los hallazgos sobre los clientes también son relevantes. En nuestro estudio se resalta el aspecto hedónico y de entretenimiento como un parámetro clave en la propensión a adoptar la tecnología, más allá del efecto del COVID-19, que será comentado más adelante. La literatura académica estudia con modelos similares la adopción de tecnología por parte de un empleado y de un cliente, cuando el primero la adopta para realizar un trabajo y el segundo la adopta para experimentar una experiencia de compra, siendo a priori situaciones que pueden ser gobernadas por criterios diferentes. Esta diferencia queda reflejada en nuestros hallazgos, en cuanto a cuáles son los criterios que más influyen en las decisiones de los clientes. La experiencia de cliente, de la que el aspecto de entretenimiento forma parte, se construye como un continuo en el que la tecnología es un elemento más. Si el uso de la tecnología no refuerza la experiencia de cliente, los aspectos utilitarios y funcionales de la tecnología no tienen preponderancia. Nuevamente las recomendaciones que surgen de este hallazgo son múltiples y de aplicación práctica directa a gestores y desarrolladores, como plantearemos posteriormente.

C. El impacto de COVID-19

La irrupción de la pandemia COVID-19 mientras que se realizaba este estudio ha permitido reflexionar sobre su impacto y, en la medida de lo posible, se ha encauzado parte de la investigación para obtener hallazgos relacionados con esta situación inédita. El estudio sobre el uso de las cajas de autoservicio antes y después del confinamiento de la primavera del 2020 muestra la sensibilidad añadida de los clientes a los aspectos que tienen que ver con la seguridad sanitaria cuando interaccionan con la tecnología en el punto de venta. Este aspecto es especialmente relevante para la categoría de tecnologías que nos ocupa, ya que por su propia definición (tecnologías de cara al cliente) requieren interacción, y la interacción conlleva riesgos sanitarios por la posibilidad de contacto con dependientes o superficies. El estudio muestra que, a mayor percepción de seguridad de las cajas de autoservicio, existe mayor propensión a usarlas. Este hallazgo abre el camino a profundizar en el resultado realizando el mismo estudio con otras tecnologías de la categoría CFIST, como podrían ser las etiquetas de precios dinámicos o los probadores inteligentes (*Smart fitting rooms*), o incluyendo nuevas características de adopción que puedan influir en la percepción de la tecnología, como otros aspectos de seguridad e información del comercia. Además, el hallazgo permite proponer líneas de trabajo de aplicación práctica que se expondrán posteriormente. En este sentido, los estudios empíricos quedan complementados con la revisión bibliográfica, que agrega y ordena el conocimiento que de forma aislada se ha ido obteniendo en estudios anteriores.

En cuanto a las empresas, el COVID-19 ha ido mucho más allá de impactar en la adopción de la tecnología. Ha puesto en duda la viabilidad de los comercios físicos. Nuestro estudio, en base a la reacción de los primeros meses de pandemia y la literatura referente al impacto de los eventos disruptivos en las empresas, nos ha permitido extraer el tipo de respuesta necesaria para cada una de las tres características principales de la crisis: Su falta de predictibilidad, las severas restricciones del canal físico y el foco en la salud antes que en la economía. Cada una de ellas requiere un tipo de respuesta transformacional que a su vez requiere del desarrollo de unas capacidades estratégicas. Este hallazgo es nuevamente de aplicación práctica directa al poder utilizarse el esquema conceptual como punto de partida de un análisis transformacional en las organizaciones.

D. Experiencia de cliente

Si bien los hallazgos específicos de experiencia de cliente se han producido en las investigaciones empíricas relacionadas con la adopción de tecnología, ya comentadas anteriormente, una aportación relevante de esta tesis a la mejora de la experiencia de cliente es la aproximación conceptual del estudio. La propia selección de la tecnología, siempre enfocada desde el cliente y no desde otros aspectos igualmente relevantes de la transformación digital, como puede ser la eficiencia, marca una forma de afrontar la investigación más relacionada con la realidad empresarial. En los grandes comercios, las decisiones sobre tecnología CFIST no son tomadas por los directivos técnicos (CIO, CTO o similar). Éstos evidentemente formarán parte de la decisión en su vertiente de viabilidad. Pero las decisiones son finalmente tomadas por los responsables de negocio, responsables de la cuenta de resultados y de la experiencia de cliente asociada. Además, estos decisores no ven tecnologías sino casos de uso, por lo que el enfoque debe ser multi tecnología, como se ha planteado en este trabajo. La investigación de las tecnologías CFIST requiere de datos que se producen en la interacción de los clientes con la tecnología, por lo que necesita la realización de experimentos en el punto de venta, así como la compartición de información del negocio del comercio objeto del estudio. Este enfoque de investigación requiere una participación de las empresas, que deben permitir la realización del experimento en sus tiendas físicas y compartir ciertos datos que pueden tener valor estratégico. Pocas empresas se plantean alterar la experiencia de compra de sus clientes para un experimento científico. Probablemente ésta sea la causa por la que muy pocos estudios académicos sobre las CFIST tienen una orientación a la experiencia de cliente. Por lo tanto, recomendamos a las empresas que reflexionen sobre el valor de estos estudios para permitir su realización con más frecuencia, produciendo una interacción fructífera entre el entorno académico y el empresarial.

E. Transformación digital

La transformación digital del comercio físico está presente en todos los estudios realizados en esta tesis, pero lo podemos explicitar en algunos hallazgos concretos. Quizá la parte de la investigación que mejor refleja la situación del comercio físico en cuanto a su grado de madurez en la transformación digital sea el estudio empírico sobre la obtención de datos de comportamiento en tienda de los clientes del Capítulo 5 . Dicho estudio demuestra el poco nivel de transformación digital en el espacio físico. Las empresas no están preparadas a nivel organizativo, no existen presupuestos ad-hoc, y las soluciones tecnológicas se gestionan de forma aislada. Es significativo el hallazgo de que estas mismas compañías, que no están preparadas para la gestión de datos en el mundo físico, tienen sin embargo estrategias *online* bien definidas, con las que obtienen un gran aprovechamiento de la tecnología para la toma de decisiones.

El análisis de la situación de las PYMES durante la pandemia refuerza estos hallazgos al mostrar las dificultades para dar continuidad al negocio en un entorno de restricciones del canal físico. Estas dificultades no aplican solo a los comercios cerrados, sino incluso a los abiertos y considerados esenciales, donde la baja digitalización de sus procesos ha generado todo tipo de incidencias. La digitalización aparece como uno de los pilares para hacer frente a la situación actual y sobre todo para aumentar la robustez frente a eventos disruptivos futuros.

F. Decisiones basadas en datos

Dentro del objetivo de la investigación se incluía el análisis del nivel de uso de los datos en la organización. Los resultados muestran que su uso es aún tan incipiente, y los hallazgos se limitan a reflejar este bajo grado de madurez, por lo que no se ha podido valorar el paso posterior que supone el uso generalizado y estructurado de esos datos para la toma de decisiones. Para las organizaciones, el valor de las tecnologías CFIST se centra actualmente en la mejora de la experiencia de usuario, que conlleva una mayor satisfacción de los clientes y, en algunos casos, mejoras de eficiencia en los procesos de venta. Algunos estudios han mostrado previamente este diagnóstico en cuanto a madurez (Santoro et al., 2019), quedando como área a explorar conforme se vayan produciendo casos de éxito en el mercado y se avance en la transformación digital del comercio físico.

8.2 Limitaciones

Los diversos trabajos empíricos que conforman este estudio no están exentos de limitaciones. Por un lado, las muestras, de forma general, son limitadas en tamaño. Esta limitación afecta a la capacidad de validación de los supuestos planteados en cada capítulo. Modelos más complejos requieren muestras más amplias que permitan la verificación de un mayor número de hipótesis de forma categórica. Esta limitación se puede mitigar en el futuro realizando la investigación con muestras mayores. Por otro lado, la realización de las pruebas de campo ha requerido que se concrete en tecnologías concretas, lo que puede producir un sesgo de resultados asociado a las particularidades de cada tecnología. La selección de tecnologías actual puede ser complementada con estudios similares pero basados en otras tecnologías. La metodología de investigación, basada en encuestas, aporta en sí misma también algunas limitaciones. Aunque se hayan validado los instrumentos de los experimentos de campo, existe un sesgo relacionado con la redacción de las preguntas, o con la selección de las dinámicas en el caso de la metodología de entrevistas. Para mitigar esta limitación, se recomienda repetir el análisis de las conclusiones con otras herramientas. Por último, consideramos una limitación de nuestro estudio la ausencia de una taxonomía de la categoría CFIST. Las propuestas actuales se centran fundamentalmente en el concepto de comercio inteligente (*smart retail*) y no en el concepto de experiencia de cliente inteligente (Inman & Nikolova, 2017; Roggeveen & Sethuraman, 2020; Wolpert & Roth, 2020). Al no existir un modelo asentado de categorización, se dificulta la obtención sistemática de conclusiones.

8.3 Recomendaciones

Las implicaciones prácticas de los hallazgos de este estudio son numerosas y valiosas. Su aplicación práctica es directa en la mayoría de los casos, permitiendo a académicos, gestores y responsables de políticas públicas incluir en sus planes las recomendaciones que emanan de esta investigación.

8.3.1 Recomendaciones para los académicos y futuras líneas de investigación

El incipiente estado de avance de la investigación referente a las tecnologías CFIST, evidenciado a lo largo de todo el trabajo realizado, abre multitud de posibles vías de investigación para los académicos. Estas vías pueden organizarse en tres bloques conceptuales: Tecnológico, de experiencia de cliente y de transformación digital.

Desde el punto de vista tecnológico, es necesario profundizar en la creación de un marco común de definición que permita generalizar qué se incluye y qué no en la categoría de tecnologías CFIST, que permita definir qué características las relacionan y cuáles son las dimensiones en las que se deben medir sus diferencias. Al tratarse de una categorización orientada a la funcionalidad y no la tecnología subyacente, es necesario reflejar de forma unificada un conjunto de atributos que sea válido para tecnologías diferentes. La investigación futura debe establecer esa taxonomía y los distintos estudios deben ir situando las diversas tecnologías de acuerdo con esa ordenación, permitiendo estandarizar la comparación y abordar análisis más complejos, como el estudio de experiencias de cliente que incluyan a la vez varias de las tecnologías CFIST.

Las recomendaciones del presente trabajo para la investigación sobre experiencia de cliente se centran en dos aspectos principalmente. Primero, completar los estudios de adopción de tecnologías de forma individual. Ciertas tecnologías como las cajas de autoservicio han recibido una atención relevante de los académicos, pero algunas otras como los *beacons*, las pantallas táctiles, o los probadores inteligentes, por citar tan solo unos ejemplos, no han sido prácticamente estudiadas. Segundo, no existen estudios que mezclen más de una de estas tecnologías en una única experiencia de cliente. Por lo tanto, se recomienda estudiar de forma conjunta varias de estas tecnologías en una única investigación.

En cuanto a la transformación digital, la investigación debe profundizar en la relación entre la digitalización del espacio físico por medio de la tecnología y el impacto que esta digitalización tiene en la transformación de las compañías. No se han encontrado estudios que muestren cómo cambian las organizaciones del sector comercio conforme se implementan cambios tecnológicos en el canal físico.

De las muchas líneas de trabajo que aparecen a raíz de las recomendaciones anteriores, se pretende, para darle continuidad a esta tesis, continuar la investigación en dos líneas fundamentales: La primera es ampliar el análisis de la adopción de tecnología a otros casos de uso, y la segunda tiene como objetivo definir y demostrar la relación entre la introducción de la tecnología y parámetros propios del sector comercio: Ventas, visitas, tamaño del ticket de venta, y otros indicadores habituales de la gestión de las tiendas.

8.3.2 Recomendaciones para la gestión empresarial

Los gestores de comercios físicos encontrarán en los diversos capítulos de esta tesis diversas propuestas aplicables para el análisis de sus negocios, que podemos resumir en cinco recomendaciones globales. En primer lugar, es fundamental la formación del equipo directivo en cuanto al valor de la tecnología, el impacto en la experiencia de cliente, las mejores prácticas en el mercado, o el uso de los datos obtenidos, por citar algunos ejemplos. No basta con que las compañías dispongan de expertos en la materia. La percepción de los gestores es relevante para las decisiones y es necesario que se invierta en el conocimiento a ese nivel. En segundo lugar, se recomienda que analicen las tecnologías de forma sistemática, de acuerdo con las propuestas de esta tesis. Si bien sólo se han abordado algunas muy específicas en este trabajo, existen otros trabajos del ámbito académico en los que se pueden apoyar para este análisis. En tercer lugar, se recomienda encarecidamente implantar una estrategia de obtención y uso de los datos. Es necesario entender el valor del dato y cómo se puede emplear para mejorar la gestión de las compañías como primer paso hacia implantar tecnología que los recoja en el espacio físico. En algunos casos, es recomendable plantear pilotos controlados que permitan experimentar el valor de este tipo de datos, si no hay argumentos suficientes para tomar la decisión. Este aspecto de la transformación se conoce como *Data Governance* (Al-Ruithe et al., 2019). En cuarto lugar, se realiza un planteamiento estratégico sobre el nivel de robustez del comercio físico frente a eventos como el COVID-19. Basándose en el marco de referencia propuesto en esta investigación, los gestores deben analizar en que estadio se encuentran en cuanto a las tres capacidades claves presentadas: La resiliencia, la digitalización, y la empatía. En quinto y último lugar, y también relacionado con el COVID-19, las empresas deben responder a la sensibilidad de los clientes en cuanto a sus preocupaciones en los espacios de compra físicos, modificando los procesos de interacción con ellos.

8.3.3 Recomendaciones para guiar las políticas públicas

Las conclusiones de este trabajo de investigación pueden aportar criterios relevantes a la hora de aplicar políticas públicas de apoyo a la digitalización de las PYMES, que podemos resumir en dos recomendaciones. La primera es que, dado que el futuro de los comercios no se encuentra exclusivamente en el mundo *online*, las administraciones deben apoyar elementos de transformación más allá de la disponibilidad de una página web o de una tienda *online*. Los apoyos deben también canalizarse a aspectos de la tienda física como la mejora de la imagen de marca y la información de los productos, el conocimiento del cliente y de sus hábitos en la tienda, o la interacción de los elementos del espacio con el móvil del cliente para realizar actividades relacionadas con la selección y compra de los productos. La segunda recomendación es acerca de la formación de los directivos de las PYMEs. La pura subvención de inversiones es un aspecto necesario, pero no suficiente, cuando no se ha creado ni una visión ni una cultura de transformación digital. Por lo tanto, el primer paso en el proceso de transformación del comercio español es el de sus directivos vía la formación y la información. Las iniciativas relacionadas con la formación no deben cubrir únicamente el conocimiento de las tecnologías disponibles y su valor a nivel de negocio, sino que deben instruir en herramientas de toma de decisiones, de análisis de las fortalezas y debilidades de la compañía en el nuevo entorno digital, y en todo lo referente a la cultura del dato. De esta forma se sentarán las bases para que la adopción de la tecnología por parte de las empresas sea meditada, oportuna y exitosa.

Tenemos el convencimiento de que existe un futuro para el comercio físico. Un futuro con un paradigma distinto, con interacción con otros canales y donde la tecnología juega un papel relevante. Creemos que este estudio supone una importante aportación a ese futuro, en un momento crítico de transformación agravado por la pandemia de COVID-19. Con el presente trabajo demostramos que se puede trabajar de forma sistemática en la implantación de tecnologías en punto de venta, ofreciendo en nuestros hallazgos numerosas líneas de aplicación inmediata para académicos, gestores de comercios y organismos públicos. Esperamos poder completar en futuras investigaciones alguna de las numerosas y emocionantes parcelas que quedan aún por explorar.

9. BIBLIOGRAFÍA

9 BIBLIOGRAFÍA

Agnihotri, A. (2015). Can Brick-and-Mortar Retailers Successfully Become Multichannel Retailers? *Journal of Marketing Channels*, *22*(1), 62–73. https://doi.org/10.1080/1046669X.2015.978702

Al-Ruithe, M., Benkhelifa, E., & Hameed, K. (2019). A systematic literature review of data governance and cloud data governance. *Personal and Ubiquitous Computing*, *23*(5–6), 839–859. https://doi.org/10.1007/s00779-017-1104-3

Arrieta-Paredes, M. P., Hallsworth, A. G., & Coca-Stefaniak, J. A. (2020). Small shop survival – The financial response to a global financial crisis. *Journal of Retailing and Consumer Services*, *53*, 1–10. https://doi.org/10.1016/j.jretconser.2019.101984

Bollweg, L., Lackes, R., Siepermann, M., Sutaj, A., & Weber, P. (2016). Digitalization of local owner operated retail outlets: The role of the perception of competition and customer expectations. *Pacific Asia Conference on Information Systems, PACIS 2016 - Proceedings*.

CEOE. (2019). *El Sector Comercio en la Economía Española*. https://contenidos.ceoe.es/CEOE/var/pool/pdf/publications_docs-file-699-el-sector-comercio-en-la-economia-espanola-noviembre-2019.pdf

Cowling, M., Brown, R., & Rocha, A. (2020). Did you save some cash for a rainy COVID-19 day? The crisis and SMEs. *International Small Business Journal*. https://doi.org/10.1177/0266242620945102

Dacko, S. G. (2017). Enabling smart retail settings via mobile augmented reality shopping apps. *Technological Forecasting and Social Change*, *124*. https://doi.org/10.1016/j.techfore.2016.09.032

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, *13*(3), 319–339. https://doi.org/10.2307/249008

Dekimpe, M. G., Geyskens, I., & Gielens, K. (2020). Using technology to bring online convenience to offline shopping. *Marketing Letters*, *31*(1), 25–29. https://doi.org/10.1007/s11002-019-09508-5

DePietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology and environment. In L. G. Tornatzky & M. Fleischer (Eds.), *The processes of technological innovation* (pp. 151–175). Lexington Books.

Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. In *Journal of Business Research* (Vol. 117, pp. 284–289). Elsevier. https://doi.org/10.1016/j.jbusres.2020.06.008

Foroudi, P., Gupta, S., Sivarajah, U., & Broderick, A. (2018). Investigating the effects of smart technology on customer dynamics and customer experience. *Computers in Human Behavior*, *80*, 271–282. https://doi.org/10.1016/j.chb.2017.11.014

Gahinet, M. C., & Cliquet, G. (2018). Proximity and time in convenience store patronage: Kaïros more than chronos. *Journal of Retailing and Consumer Services*, *43*, 1–9. https://doi.org/10.1016/j.jretconser.2018.02.008

Ganesha, H. R., & Aithal, P. S. (2021). Measuring the Level of Preparedness to Face Challenges during Uncertain Times: A Firm-Level Scale for Brick-and-Mortar

Retailers in India (FLSPU-b). *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3778793

Hänninen, M., Smedlund, A., & Mitronen, L. (2018). Digitalization in retailing: multi-sided platforms as drivers of industry transformation. *Baltic Journal of Management*, *13*(2), 152–168. https://doi.org/10.1108/BJM-04-2017-0109

INE. (2020). *Contabilidad nacional anual de España: agregados por rama de actividad. Últimos datos*. https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736177056&menu=ultiDatos&idp=1254735576581

Inman, J. J., & Nikolova, H. (2017). Shopper-Facing Retail Technology: A Retailer Adoption Decision Framework Incorporating Shopper Attitudes and Privacy Concerns. *Journal of Retailing*, *93*(1), 7–28. https://doi.org/10.1016/j.jretai.2016.12.006

Jayaram, A. (2017). Smart Retail 4 . 0 IoT Consumer Retailer Model for Retail Intelligence and Strategic Marketing of In-store Products. *Proceedings of the 17th International Business Horizon-INBUSH ERA-2017*, *February*.

Jimenez-Delgado, F., Reina-Paz, M. D., & Sanz-Rosa, D. (2018). The shopping experience in virtual sales : a study of the influence of website atmosphere on purchase intention The shopping experience in virtual sales : a study of the influence of website atmosphere on purchase intention. Researchgate.Net, October.

Khaskheli, A., Jun, Y., & Ahmed Bhuiyan, M. (2017). M-Commerce and Mobile Apps: Opportunities for SMEs in Developing Countries. *Journal of International Business*

Research and Marketing, *2*(2), 20–23. https://doi.org/10.18775/jibrm.1849-8558.2015.22.3003

Krymov, S., Kolgan, M., Suvorova, S., & Martynenko, O. (2019). Digital technologies and transformation of modern retail. *IOP Conference Series: Materials Science and Engineering*, *497*(1), 012126. https://doi.org/10.1088/1757-899X/497/1/012126

Lal, B., & Chavan, C. R. (2019). A Road Map: E-Commerce to World Wide Web Growth of Business World. *Global Journal of Management And Business Research*, *19*(11), 1–11.

Loonam, J., Eaves, S., Kumar, V., & Parry, G. (2018). Towards digital transformation: Lessons learned from traditional organizations. *Strategic Change*, *27*(2), 101–109. https://doi.org/10.1002/jsc.2185

Mishra, R., Singh, R. K., & Koles, B. (2021). Consumer decision-making in omnichannel retailing: Literature review and future research agenda. *International Journal of Consumer Studies*, *45*(2), 147–174. https://doi.org/10.1111/ijcs.12617

Nysveen, H., & Pedersen, P. E. (2016). Consumer adoption of RFID-enabled services. Applying an extended UTAUT model. *Information Systems Frontiers*, *18*(2), 293–314. https://doi.org/10.1007/s10796-014-9531-4

Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? Retailers' ups and downs during the COVID-19 outbreak. *Journal of Business Research*, *116*(May), 209–213. https://doi.org/10.1016/j.jbusres.2020.05.036

Pantano, E., Priporas, C. V., & Dennis, C. (2018). A new approach to retailing for successful competition in the new smart scenario. *International Journal of Retail &*

Distribution Management, *46*(3), 264–282. https://doi.org/10.1108/IJRDM-04-2017-0080

Pantano, E., & Vannucci, V. (2019). Who is innovating? An exploratory research of digital technologies diffusion in retail industry. *Journal of Retailing and Consumer Services*, *49*, 297–304. https://doi.org/10.1016/j.jretconser.2019.01.019

Pantano, E., & Viassone, M. (2014). Demand pull and technology push perspective in technology-based innovations for the points of sale: The retailers evaluation. *Journal of Retailing and Consumer Services*, *21*(1), 43–47. https://doi.org/10.1016/j.jretconser.2013.06.007

Poncin, I., & Ben Mimoun, M. S. (2014). The impact of "e-atmospherics" on physical stores. *Journal of Retailing and Consumer Services*, *21*(5), 851–859. https://doi.org/10.1016/j.jretconser.2014.02.013

Pous, R., Morenza-Cinos, M., Melià-Seguí, J., Rashid, Z., & Carreras, A. (2013). Cricking: Customer-product interaction in retail using pervasive technologies. *Proceedings of the 2013 ACM Conference on Pervasive and Ubiquitous Computing Adjunct Publication*, 1023–1028. https://doi.org/10.1145/2494091.2496015

Radhakrishnan, M., Sen, S., Vigneshwaran, S., Misra, A., & Balan, R. (2016). IoT+Small Data: Transforming in-store shopping analytics & services. *2016 8th International Conference on Communication Systems and Networks, COMSNETS 2016*. https://doi.org/10.1109/COMSNETS.2016.7439946

Ramadhan, M. S. F., & Syahputri, N. A. (2020). How does Technological Dependence Affect Consumer Shopping Behavior among Baby Boomers, Millennials, and Digital

Natives? *International Journal of Innovative Science and Research Technology*, *5*(8), 1004–1009. https://doi.org/10.38124/ijisrt20aug488

Reinartz, W., Wiegand, N., & Imschloss, M. (2019). The impact of digital transformation on the retailing value chain. *International Journal of Research in Marketing*, *36*(3). https://doi.org/10.1016/j.ijresmar.2018.12.002

Roggeveen, A. L., & Sethuraman, R. (2020). Customer-Interfacing Retail Technologies in 2020 & Beyond: An Integrative Framework and Research Directions. In *Journal of Retailing* (Vol. 96, Issue 3, pp. 299–309). Elsevier Ltd. https://doi.org/10.1016/j.jretai.2020.08.001

Santoro, G., Fiano, F., Bertoldi, B., & Ciampi, F. (2019). Big data for business management in the retail industry. *Management Decision*, *57*(8), 1980–1992. https://doi.org/10.1108/MD-07-2018-0829

Seetharaman, P. (2020). Business models shifts: Impact of Covid-19. *International Journal of Information Management*, *54*, 102173. https://doi.org/10.1016/j.ijinfomgt.2020.102173

Shankar, V., Douglass, T., Hennessey, J., Kalyanam, K., Setia, P., Golmohammadi, A., Tirunillai, S., Bull, J. S., & Waddoups, R. (2020). How Technology is Changing Retail. *Journal of Retailing*. https://doi.org/10.1016/j.jretai.2020.10.006

Somoza-Medina, X., & López-González, A. (2017). Crisis, Comercio y Ciudad. Cambios en la Actividad Comercial y el Consumo en España. *Revista de Estudios Andaluces*, *34*, 293–320. https://doi.org/10.12795/rea.2017.i34.10

Vojvodić, K. (2019). Brick-and-mortar retailers: Becoming smarter with innovative technologies. *Strategic Management*, *24*(2), 3–11. https://doi.org/10.5937/straman1902003v

Wolpert, S., & Roth, A. (2020). Development of a classification framework for technology based retail services: a retailers' perspective. *International Review of Retail, Distribution and Consumer Research*, *30*(5), 498–538. https://doi.org/10.1080/09593969.2020.1768575

Wu, X., & Gereffi, G. (2018). Amazon and Alibaba: Internet governance, business models, and internationalization strategies. In *Progress in International Business Research* (Vol. 13, pp. 327–356). Emerald Group Publishing Ltd. https://doi.org/10.1108/S1745-886220180000013014