UNIVERSIDAD DE MÁLAGA

Programa de Doctorado en Turismo por la Universidad de Alicante; la Universidad de Málaga; la Universidad de Sevilla y la Universidad Rey Juan Carlos

DOCTORAL THESIS

Analysis of the benefits of blockchain technology application for tourism: medical tourism and smart tourism perspectives

Realized by: Inessa Tyan

Supervised by: Dr. Antonio Jesus Guevara Plaza

Dr. Mariemma Inmaculada Yagüe Valle

2023

AUTORA: Inessa Tyan

https://orcid.org/0000-0001-5991-2475

EDITA: Publicaciones y Divulgación Científica. Universidad de Málaga

DECLARACIÓN DE AUTORÍA Y ORIGINALIDAD DE LA TESIS PRESENTADA PARA OBTENER EL TÍTULO DE DOCTOR

D./Dña INESSA TYAN
Estudiante del programa de doctorado EN TURISMO de la Universidad de Málaga, autor/a de la tesis, presentada para la obtención del título de doctor por la Universidad de Málaga, titulada: "Analysis of the benefits of blockchain technology application for tourism: smart tourism and medical tourism perspectives"
Realizada bajo la tutorización de MARIEMMA I. YAGÜE VALLE y dirección de ANTONIO JESUS GUEVARA-PLAZA Y MARIEMMA I. YAGÜE VALLE

DECLARO QUE:

La tesis presentada es una obra original que no infringe los derechos de propiedad intelectual ni los derechos de propiedad industrial u otros, conforme al ordenamiento jurídico vigente (Real Decreto Legislativo 1/1996, de 12 de abril, por el que se aprueba el texto refundido de la Ley de Propiedad Intelectual, regularizando, aclarando y armonizando las disposiciones legales vigentes sobre la materia), modificado por la Ley 2/2019, de 1 de marzo.

Igualmente asumo, ante a la Universidad de Málaga y ante cualquier otra instancia, la responsabilidad que pudiera derivarse en caso de plagio de contenidos en la tesis presentada, conforme al ordenamiento jurídico vigente.

En Málaga, a de de

Fdo.:
Doctoranda INESSA TYAN

Fdo.:
Tutora DR. MARIEMMA I. YAGÜE VALLE

Fdo.:
Directores de tesis: DR. MARIEMMA I. YAGÜE VALLE
DR.ANTONIO JESUS GUEVARA-PLAZA

Edificio Pabellón de Gobierno. Campus El Ejido. 29071
Tel.: 952 13 10 28 / 952 13 14 61 / 952 13 71 10
E-mail:doctorado@uma.es

Dra MARIEMMA I. YAGÜE VALLE, Profesora de la Universidad de Málaga, TUTORA dentro del programa de doctorado en la facultad de turismo y DIRECTORA de la presente tesis doctoral por el doctorando y

Dr ANTONIO JESUS GUEVARA-PLAZA, Profesor de la Universidad de Málaga, DIRECTOR de la presente tesis doctoral por el doctorando

HACEN CONSTAR:

Que INESSA TYAN ha realizado bajo su dirección el trabajo de investigación correspondiente a su TESIS DOCTORAL titulada "Analysis of the benefits of blockchain technology application for tourism: smart tourism and medical tourism perspectives".

Revisado el presente trabajo, estimamos que puede ser presentado al tribunal que ha de juzgarlo.

Para que así conste a los efectos oportunos, autorizamos la presentación de esta Tesis Doctoral en la Universidad de Málaga.

En Málaga, a de de

Fdo.: LA TUTORA: DR. MARIEMMA I. YAGÜE VALLE

Fdo.: LOS DIRECTORES: DR. MARIEMMA I. YAGÜE VALLE
DR.ANTONIO JESUS GUEVARA-PLAZA

Edificio Pabellón de Gobierno. Campus El Ejido.
29071
Tel.: 952 13 10 28 / 952 13 14 61 / 952 13 71 10
E-mail:doctorado@uma.es

Acknowledgment

I would like to thank the following people, without whom I would not have been able to complete this dissertation, and without whom I would not have made it through my doctoral degree:

My supervisors Dr Mariemma Inmaculada Yagüe Valle and Dr Antonio Jesus Guevara-Plaza for their knowledge, thoughtful comments and recommendations, and consistent support and guidance during the compilation of the publications and this dissertation;

My professors Dr Chung Namho and Dr Koo Chulmo for their insights and encouragement;

My family for their unconditional support and patience during these four academic years;

My friends Dr Maria Pak, Ms Svetlana Pak, and Ms Ramziia Bikchentaeva for their moral support, valuable advices, and inspiration.

INDEX

Page

RESUMEN

1. INTRODUCCIÓN

La Cuarta Revolución Industrial ha afectado fundamentalmente diferentes sectores y ha cambiado los modelos y procesos sociales. La adopción y el uso de las tecnologías innovadoras como inteligencia artificial, internet de las cosas, blockchain, realidad aumentada, realidad virtual, etc. han transformado el sector turístico, las decisiones turísticas, los comportamientos de los turistas y las experiencias. La tecnología blockchain parece ser la tecnología menos investigada e implementada en comparación con otras tecnologías inteligentes. Por este motivo esta tesis se ha elaborado para fomentar y avanzar la investigación sobre la tecnología blockchain en turismo. La tesis intenta aclarar los potenciales de la tecnología blockchain para el sector turístico y los métodos de la adopción de blockchain en turismo.

1.1. ¿QUÉ ES LA TECNOLOGÍA BLOCKCHAIN?

El término blockchain fue presentado por la primera vez en el trabajo ʻBitcoin: A Peer-to-Peer Electronic Cash System ʼpublicado por Satoshi Nakamoto en octubre de 2008. Nakamoto (2008) presentó la tecnología blockchain en el protocolo Bitcoin como el protocolo de la tecnología abierta, transparente y segura que permitía realizar pagos online directamente de una persona a otra sin la necesidad de la intermediación de la tercera parte de manera eficiente, verificable e inmutable. Es una base de datos distribuida donde cada usuario en la red realiza y registra transacciones agrupándolas en forma de bloques.

La tecnología blockchain funciona encima del protocolo la Red y guarda las transacciones usando las técnicas criptográficas y los algoritmos del acuerdo

distribuido entre todos los usuarios de la network (Tapscott & Tapscott, 2016). La blockchain como tal es un resultado de otras tecnologías como el desarrollo software, tecnología criptográfica y tecnología de bases de datos, y por eso se puede ver como meta-tecnología (Mougayar 2016).

Actualmente, se conocen tres generaciones de la tecnología blockchain (Zhao et al., 2016).

La primera generación, Blockchain 1.0, incluye el desarrollo de criptomonedas permitiendo a los individuales hacer transacciones directas entre ellos sin depender de una institución financiera.

La segunda generación, Blockchain 2.0, incluye el desarrollo de los contratos inteligentes o smart contracts y las aplicaciones distribuidas o DApps. Los contratos inteligentes son contratos que se ejecutan de forma automatizada sin la necesidad de una entidad tercera. Los contratos inteligentes permitieron el desarrollo de Dapps en el resultado de lo cual fueron creados nuevos productos como los protocolos de finanzas descentralizadas (DeFi), videojuegos NFTs y navegadores web.

La tercera generación, Blockchain 3.0, trata de resolver los problemas de la escalabilidad y la interoperabilidad e incluye las aplicaciones en áreas fuera de las previas dos versiones como gobierno, salud, ciencia, turismo, y la Red de Cosas (IoT).

La tecnología blockchain constituye una base de datos descentralizada y transparente con los registros de transacciones y todos eventos digitales realizados que es compartida por todos los participantes (Crosby et al. 2016). Las transacciones en el sistema principal se registran en bloques que se vinculan entre sí en orden cronológico y eventualmente generan una estructura similar a una cadena, es de ahí de donde su nombre proviene: blockchain o cadena de bloques. Cada bloque se

conecta con el anterior y el posterior y contiene el identificador hash del bloque anterior que proporciona una versión única de su historial y crea registros a prueba de manipulaciones (Gupta, 2017).

La figura 1 muestra el funcionamiento de una transacción en blockchain. Una vez generada la transacción, se representa como un bloque. El bloque se envía a todos los miembros de la cadena. Cada transacción se verifica por el acuerdo de la mayoría de los participantes de la cadena. Los miembros de la cadena deben estar de acuerdo en si la transacción ha de añadir en el bloque o no. Tras conseguir el acuerdo, el bloque se añade a la cadena existente de forma inalterable y transparente para todos. Y se puede concluir que la transacción se ha completado. Una vez añadidos los bloques, se quedan inmutables y verificados por los protocolos de automación y gobernanza (Swan, 2015). Adicionalmente, el proceso de verificación junto a las técnicas criptográficas asegura la seguridad de datos contra el acceso no autorizado (Wang et al., 2019) y confianza.

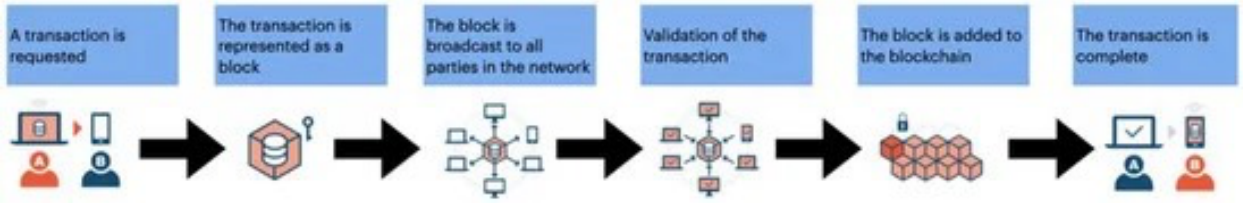

Figura 1. Funcionamiento de una transacción en blockchain (Zignuts, 2018)

Hay tres tipos de las redes blockchain basadas en la administración y los permisos de la red:

- Pública. La red de blockchain pública es abierta a todos. Cualquiera puede participar, leer, ver y verificar las transacciones. Opera peer-to-peer de manera totalmente descentralizada y anónima (Nakamoto, 2008). El ejemplo de la blockchain pública más conocida es Bitcoin (Nakamoto, 2008). Para decidir cuál

bloque hay que añadir a la cadena, los miembros tienen que completar la prueba de trabajo o Proof-of-Work (PoW) (Garay et al., 2015).

- Privada. En blockchain privada el acceso está restringido a una comunidad u organización concreta. Una figura central autoritaria decide a quién permitir el acceso a la red. Los componentes de la red son conocidos, pero las transacciones se realizan de manera encriptada. Este tipo de blockchain se usa para crear los sistemas basados en blockchain entre las empresas privadas (Gao et al., 2018). Las blockchains privadas pueden evitar los mecanismos de PoW costosos y aceptar muchos protocolos de acuerdo basados en desincentivos (Casino et al., 2019).

- Federada o de consorcio. En este tipo de blockchain el acceso está restringido a los miembros preseleccionados. El grado de privacidad de los datos, la delegación de derechos y los estándares establecidos son decididos en consorcio por los mismos (Gao et al., 2018). Sólo los miembros elegidos pueden crear los nuevos bloques. Las blockchains federadas tienen ventajas en términos de gastar menos recursos y alcanzar la latencia de transacción más baja y alto rendimiento.

Entre las principales características de la tecnología blockchain son: desintermediación, inmutabilidad, transparencia, seguridad, automatización, confianza, costos, consenso (Tabla 1).

Tabla 1. Principales características de blockchain

Característica	Explicación
Desintermediación	La cadena peer-to-peer significa que no hay necesidad de contar con una autoridad central.
Inmutabilidad	Una vez la información entra en la cadena, no puede ser modificada. Todos los datos en la cadena están vinculados con los datos anteriores, haciendo así que cualquier intento de alterar los datos sea rápidamente detectado y eludido.
Transparencia	Todos los participantes del sistema tienen la posibilidad de acceder a los datos y verificarlos.
Seguridad	Existe un sistema criptográfico, el cual puede variar a través de los mecanismos de claves públicas y privadas.
Automatización	La blockchain puede facilitar generar las acciones autónomas (por ejemplo, los contratos inteligentes).
Confianza	El nivel más alto de confianza es posible porque las personas pueden hacer las transacciones directamente entre ellas sin la tercera parte.
Costos	Los costos pueden ser reducidos por la eliminación de los intermediarios.
Consenso	El mecanismo de consenso se aplica para llegar a un acuerdo con el estado de la cadena y validación de las transacciones.

A pesar de sus ventajas la tecnología blockchain cuenta con algunas limitaciones las cuales han de ser abordadas para la implementación y adopción de la tecnología (Swan, 2015; Filimonau & Naumova, 2020; Nam et al., 2019):

• Seguridad: Existe una posibilidad de ataques de hackeo.

- Recursos desperdiciados: Minería en blockchain malgasta unas cantidades enormes de la energía.

- Latencia: Mucho tiempo es requerido para crear un bloque y confirmar una transacción mientras manteniendo la seguridad.

- Nivel de consciencia: Faltan los conocimientos y la pericia sobre la tecnología blockchain.

En general, la tecnología blockchain se considera como la siguiente revolución digital y a menudo se compara con la evolución de Internet a principio de los años 90 (Tapscott & Tapscott, 2017). Se argumenta que la tecnología blockchain tiene un potencial de provocar un cambio de la 'Internet de Información' hacia la 'Internet de Valores' (Froystad & Holm, 2016) y se prevé que tendrá un gran impacto en distintos sectores e industrias incluidos turismo (Treiblmaier & Beck, 2019 a, b; Valeri, 2020).

1.1.2 LA INDUSTRIA TURÍSTICA Y BLOCKCHAIN

La industria turística muestra un alto interés en la adopción de la tecnología blockchain invirtiendo mucho dinero en las empresas emergentes basadas en blockchain. Sin embargo, en comparación con otros sectores encontrados una gran variedad de las aplicaciones de blockchain, el sector turístico carece los casos reales del uso de blockchain. Estos son algunos negocios turísticos que empezaron a aplicar la tecnología blockchain: TUI usando la tecnología blockchain en sus sistemas de reservas y de pagos (Sixtin, 2017); CheapAir, Expedia, One Shot Hotels y Webjet aceptando los bitcoins como método de pago (Chokun, 2016). La última aplicación de blockchain es el desarrollo de las aplicaciones descentralizadas (DApps), las cuales están creadas para la mejor interacción con los clientes. Algunos de las DApps más populares en el sector turístico se muestran en la tabla 2. No obstante, pocos

turistas usan esas DApps lo que limita los estudios estadísticos que puedan aportar las ideas y perspectivas valiosos sobre las actitudes de los turistas con respecto a la adopción de la tecnología blockchain.

Tabla 2. DApps relacionadas con turismo

DApp	Descripción
Winding Tree	Usando los contratos inteligentes y los protocolos ERC827 conecta a los turistas directamente con los proveedores de los servicios turísticos, así ofreciendo las mejores ofertas y ahorros para todos y reduciendo los costos relacionados con el proceso de reservas.
Sandblock	Trata de mejorar los programas de fidelización de los clientes; está creando un token mucho más personalizable para todas las empresas turísticas con el objetivo de hacer sus programas de fidelización más efectivos.
Accenture	Introduce el Sistema de Identidad Digital gracias al cual los aeropuertos pueden acelerar el proceso de la verificación de los documentos y, asimismo, reducir las colas en los aeropuertos.
Travelchain	Trata de crear un sistema de fuente abierta para gestionar los datos de los turistas. El sistema vigilará y protegerá todos los datos turísticos y los usuarios recibirán tokens por compartir sus datos.
Trippki	Trata de mejorar los sistemas de fidelización de clientes.
ShoCard and SITA	Trata de mejorar la gestión de identidad en la industria turística.

Lockchain	Habilita el mercado directo para los hoteles y aerolíneas; usa el sistema descentralizado para pagos, gestión de propiedades y reservas.

La investigación académica sobre la tecnología blockchain en turismo es un tema nuevo. El pequeño número de los artículos académicos lo justifica. A pesar de la popularidad de bitcoin, pocos estudios fueron realizados con el objetivo de conocer la intención del uso de bitcoin para compras de viaje online (Leung and Dickinger, 2017). La mayoría de los artículos trata el desarrollo potencial de la tecnología blockchain (Nam et al., 2019) y sus implicaciones en el sector turístico y hotelero (Dogru et al., 2018; Udegbe, 2017). Algunos estudios han confirmado que la tecnología blockchain se puede ser implementada con éxito para asegurar la transparencia y fiabilidad en las cadenas del suministro de alimentos (Baralla et al., 2018) y para garantizar el cambio de datos de los usuarios controlado por los mismos (Shrestha et al., 2017). Ozdemir et al. (2019) en su trabajo han propuesto los criterios básicos de blockchain que se pueden utilizar para comparar las varias aplicaciones distribuidas. A pesar de los diferentes focos de la investigación, los académicos están de acuerdo que existe una necesidad de la investigación más profunda sobre las aplicaciones blockchain relacionadas con el turismo y validación de las implicaciones prácticas de estas aplicaciones.

1.2. OBJETIVOS

La presente tesis doctoral fue iniciada con el objetivo de avanzar la investigación turística sobre la tecnología blockchain. Teniendo en cuenta los escasos estudios sobre el tema la presente tesis aspira a echar luz sobre el potencial de la tecnología blockchain para la industria turística y la forma de que la tecnología blockchain puede ser adoptada en el turismo.

En la presente tesis doctoral se han planteado dos objetivos principales:

1. La elaboración de un modelo conceptual para la adopción de la tecnología blockchain en turismo. Este objetivo se ha desarrollado en el capítulo 2 de la presente tesis: "Adopción de la tecnología Blockchain en turismo: modelo conceptual basado en teoría fundamentada".

2. El estudio de los beneficios de la tecnología blockchain para el turismo se ha dividido en dos subobjetivos:

a. Caracterización de los beneficios de la tecnología blockchain para los destinos del turismo de salud: desarrollado en el capítulo 3 "Los beneficios de la tecnología blockchain para el turismo de salud";

b. Caracterización de los beneficios de la tecnología blockchain para los destinos turísticos inteligentes: desarrollado en el capítulo 4 "La tecnología blockchain para los destinos turísticos inteligentes".

La presente tesis doctoral pretende contribuir a la literatura sobre blockchain, turismo y la tecnología de información explorando los beneficios de tecnología blockchain para el turismo de salud y el turismo inteligente y definiendo los factores imprescindibles que afectarían la adopción de la tecnología blockchain en el sector turístico. Además, la tesis pretende aportar las contribuciones prácticas a los profesionales en la industria turística sobre qué es lo que hay que hacer para adoptar e implementar la tecnología blockchain. Teniendo en cuenta los resultados sobre las posibilidades de la tecnología blockchain para los destinos turísticos los interesados pueden decidir si vale la pena invertir en la adopción de la tecnología blockchain o no.

1.3. ESTRUCTURA DE LA TESIS

La estructura de la tesis es la siguiente:

Capítulo1: Introducción – introduce el contexto de la tesis, propone los objetivos generales y describe la estructura de la tesis;

Capítulo 2: Adopción de la tecnología Blockchain en turismo: modelo conceptual basado en teoría fundamental — propone el modelo conceptual para la adopción de la tecnología blockchain en turismo categorizando las condiciones que afectan a la adopción blockchain y los efectos de la misma sobre el sector turístico.

Capítulo 3: Los beneficios de la tecnología blockchain para el turismo de salud — explora los efectos positivos de la tecnología blockchain para el turismo de salud;

Capítulo 4: La tecnología blockchain para los destinos turísticos inteligentes — elabora las contribuciones posibles de la tecnología blockchain para los destinos turísticos inteligentes;

Capítulo 5: Conclusión — resume las conclusiones de todas las contribuciones y propone las direcciones para la futura investigación.

2. ADOPCIÓN DE LA TECNOLOGÍA BLOCKCHAIN EN TURISMO: MODELO CONCEPTUAL BASADO EN TEORÍA FUNDAMENTADA

El primer estudio titulado "Adopción de la tecnología Blockchain en turismo: modelo conceptual basado en teoría fundamentada" contribuye a elevar el nivel de conocimiento sobre la adopción de blockchain en el sector turístico. El objetivo principal de este estudio es proponer un modelo conceptual para la adopción de blockchain en el sector turístico. Para alcanzar el dicho objetivo hay que encontrar las respuestas a las siguientes preguntas:

1) ¿Qué condiciones influyen la adopción de la tecnología blockchain?;

1) ¿Qué condiciones son imprescindibles para la adopción de la tecnología blockchain?;

2) ¿Qué interacciones pueden ser obtenidas de la adopción de la tecnología blockchain?, y

3) ¿Cómo la adopción de la tecnología blockchain impacta el sector turístico?.

Este estudio ha aplicado como metodología de investigación la revisión bibliográfica basada en el método de la teoría fundamental. Al realizar la revisión bibliográfica sistemática el estudio siguió el procedimiento de cinco pasos introducido por Wolfswinkel et al. (2013) (Figura 2).

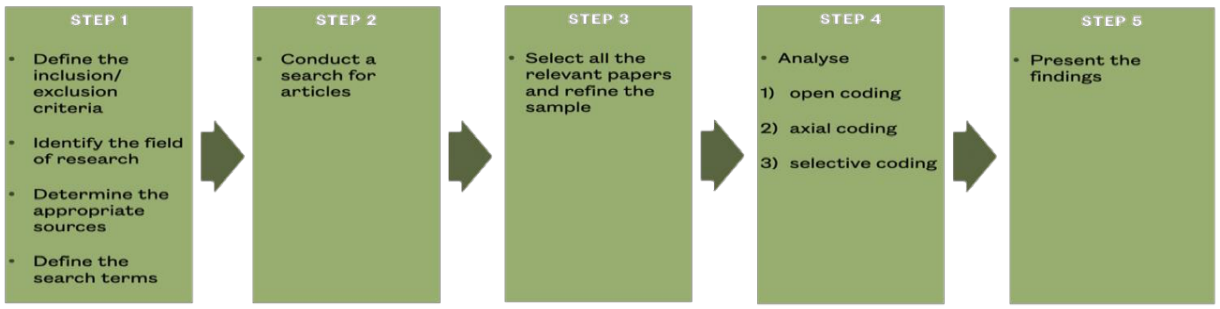

Figura 2. Procedimiento de cinco pasos para la revisión bibliográfica. Fuente: Wolfswinkel et al. (2013)

Basándose en dicha revisión bibliográfica, el estudio ha desarrollado un modelo conceptual para la adopción de la tecnología blockchain en turismo, definiendo como las condiciones casuales, contextuales e intermedias que tienen efecto en la adopción de blockchain tanto las consecuencias de la adopción de blockchain en el sector turístico (Figura 3).

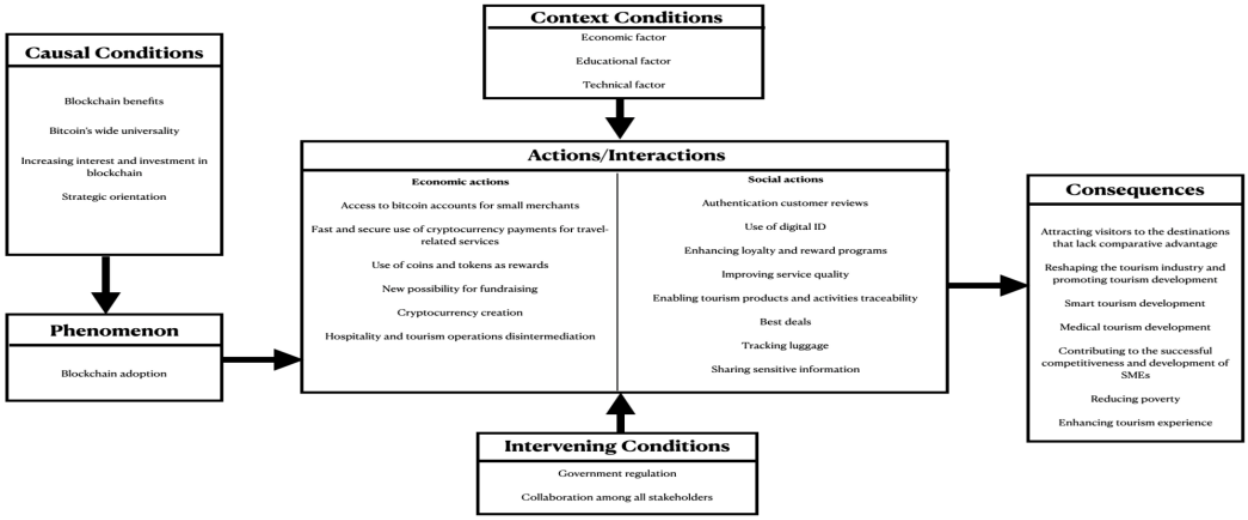

Figura 3. Modelo conceptual para la adopción de blockchain.
Fuente: Elaboración propia

En el modelo propuesto el fenómeno principal es la adopción de blockchain. Los conceptos relacionados con la adopción de blockchain se agrupan como las condiciones casuales. Todas las interacciones obtenidas de la adopción de blockchain en el sector turístico se agrupan como las acciones/interacciones. Las condiciones contextuales e intermedias afectan las interacciones. Los efectos de la adopción de blockchain se agrupan como las consecuencias.

Un análisis de los artículos reveló las siguientes condiciones casuales que tienen efecto en la adopción de blockchain en el sector turístico: los beneficios de blockchain, la amplia universalidad de bitcoin, los crecientes intereses e inversiones en los proyectos de turismo basados en blockchain y el posicionamiento estratégico de las empresas turísticas. Entre las condiciones intermedias de la adopción de blockchain se destacan: una regulación estatal y colaboración entre todas las partes interesadas incluidas los gobiernos, las organizaciones de gestión de destinos, los proveedores de los servicios turísticos y los investigadores. Una falta de las políticas reguladoras retrasa la adopción de blockchain en muchos países. Además, hay que enfocar en las condiciones contextuales para acelerar la adopción de blockchain en

el sector turístico. Los factores económicos, académicos y técnicos son las condiciones imprescindibles para la adopción de blockchain. Los altos costos operativos y alto consumo energético se clasifican como las condiciones económicas; falta de conocimiento sobre la seguridad de datos y sobre la tecnología blockchain se clasifican como las condiciones académicas; el acceso a Internet vía teléfonos móviles, las cuestiones técnicas de blockchain y la infraestructura de red se clasifican como las condiciones técnicas. La adopción de blockchain en el sector turístico será un proceso lento y complicado sin satisfacer las dichas condiciones. Un análisis destacó las siguientes acciones económicas y sociales que pueden ser obtenidas de la adopción de blockchain: el acceso a las cuentas de criptomonedas para los pequeños negocios que no tienen las cuentas bancarias tradicionales; los pagos rápidos y seguros para los servicios turísticos; el uso de monedas y tokens como recompensas; posibilidades para recaudación de fondos; la creación de criptomonedas por los propios destinos turísticos; la desintermediación que trae la reducción de costes; la autenticación de las opiniones de clientes; identificación y verificación rápidas usando los documentos de identidad digitales; mejora de los programas de fidelidad y recompensas; mejora de la calidad de servicios trazabilidad de los productos y actividades turísticos; creación de las mejores ofertas para los turistas; la gestión de los equipajes; el cambio de los datos de los turistas. Por último, entre las consecuencias de la adopción de blockchain son la reestructuración de la industria turística y la promoción del desarrollo de turismo; la captación de los visitantes a los destinos menos competitivos; desarrollo del turismo inteligente y del turismo de salud; la contribución a la competitividad exitosa de las pequeñas y medianas empresas; la reducción de pobreza y la mejora de las experiencias turísticas.

3. LOS BENEFICIOS DE LA TECNOLOGÍA BLOCKCHAIN PARA EL TURISMO DE SALUD

El segundo estudio titulado "Los beneficios de la tecnología blockchain para el turismo de salud" enfoca en el turismo de salud y analiza como la tecnología blockchain puede ser usada para generar un impacto real y consecuencias positivas para el turismo de salud.

El turismo de salud es la tendencia en auge que recientemente ha ganado una gran popularidad. Cada año más y más turistas viajan fuera para recibir los servicios de salud. Asimismo, el número de los países que promocionan sus destinos como los destinos del turismo de salud ha crecido significativamente porque esta nueva tendencia representa una oportunidad lucrativa para estos destinos (Hopkins et al., 2010).

Las investigaciones previas han confirmado que las tecnologías de la información desempeñan un papel importante en la industria turística. Los destinos del turismo de salud cuentan con las tecnologías innovadoras para ofrecer los servicios personalizados y captar a nuevos turistas. La tecnología blockchain llamó la atención de los investigadores en el área del turismo de salud. Algunos investigadores abordaron las cuestiones de la confianza entre el médico y el paciente, de la transparencia de los procedimientos y riesgos y de la privacidad de los expedientes médicos (Rejeb et al., 2019). Otros enfocaron en el uso de criptomonedas y confirmaron estadísticamente la correlación positiva entre el uso de criptomonedas y la intención de los turistas a visitar los destinos del turismo de salud (Çapar, 2020).

Teniendo en cuenta que pocas investigaciones exploraron los beneficios de la tecnología blockchain para el turismo de salud, el presente estudio trata de añadir más conocimiento a la literatura exigente. En el presente estudio se ha hecho

hincapié sobre todo en dos fases del turismo de salud: pre-procedimiento y post-procedimiento.

El pre-procedimiento es la primera fase del turismo de salud que implica la preparación del turista a recibir los servicios de salud (Keckley, 2008). En esta etapa el turista busca la información sobre el destino y el proveedor de los servicios médicos y realiza pagos. El post-procedimiento es la segunda fase del turismo de salud que implica la atención postoperatoria y la atención de seguimiento.

La tecnología blockchain es capaz de facilitar distintas fases del turismo de salud. Precisamente, la tecnología blockchain permite la desintermediación, concede los pagos en criptomonedas, garantiza el cambio de datos y la privacidad y faculta los sistemas de revisión fiables (Figura 4).

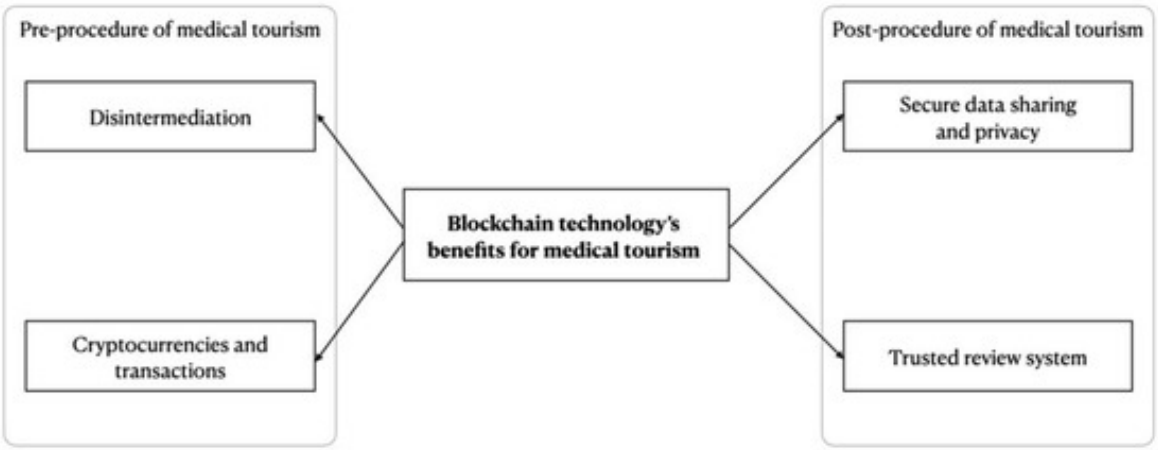

Figura 4. Beneficios de la tecnología blockchain para el turismo de salud.

3.1 Los beneficios de blockchain para el pre-procedimiento del turismo de salud

Desintermediación. El crecimiento del mercado del turismo de salud resulta en el creciente número de las compañías de turismo de salud que desempeñan un papel de los intermediarios entre los proveedores de los servicios médicos y los turistas (Connell, 2006). Los turistas tienen que encontrar y confiar en la empresa intermediaria porque a menudo no pueden evaluar la idoneidad y la calidad del destino (Rejeb et al., 2019). La empresa intermediaria suele colaborar con los ciertos hospitales, así que los turistas pueden elegir las ofertas entre las opciones limitadas (Herrick, 2007) y al precio más alto. Además, nadie puede asegurar que el intermediario va a ser responsable por algún fallo derivado de los servicios médicos (Connell, 2011). La tecnología blockchain puede abordar estas cuestiones. Debido a sus posibilidades de crear confianza, asegurar el cambio de información más seguro, reducir los costes y habilitar la transparencia, la tecnología blockchain puede disminuir el poder de los intermediarios o eliminarlos. Así, la tecnología blockchain permite la comunicación directa entre los turistas y los proveedores de los servicios médicos. Además, la tecnología blockchain proporciona las oportunidades iguales de captar a los nuevos turistas tal para los mayores hospitales como para las clínicas y hospitales nuevas y menos populares. La tecnología blockchain garantiza el origen, la calidad y la transparencia de los datos, por lo que los turistas pueden verificar las calificaciones y los certificados de los proveedores de los servicios médicos y también pueden estar seguros de que los precios son iguales para todos.

Criptomonedas y transacciones. Criptomonedas facilitan las transacciones fáciles, directas y seguras entre los individuales sin necesidad de tener la tercera parte (Kizildag et al., 2019). Por lo tanto, los turistas y los proveedores de los servicios médicos se pueden beneficiar del uso de criptomonedas que resulta en los pagos seguros, el uso fácil y el tiempo de espera reducido (Çapar, 2020). Las

criptomonedas son beneficiosas para los turistas por traer la eficiencia en las transferencias internacionales sin gastos de almacenamiento ni gastos de transferencia y para los proveedores de los servicios médicos por aportar las ventajas competitivas (Till et al., 2017).

3.2 Los beneficios de blockchain para el post-procedimiento del turismo de salud

Cambio de datos seguro y privacidad. El cambio de los registros médicos eficaz y seguro es muy importante para la atención postoperatoria (post-operative care) y atención de seguimiento (follow-up care) de los turistas médicos. La tecnología blockchain puede facilitar un cambio eficaz y rápido de los datos médicos entre los turistas médicos, los proveedores de los servicios médicos extranjeros y locales (Linn & Koo, 2016). La tecnología blockchain puede ser usada como una base de datos ideal para el registro, mantenimiento y gestión de los registros médicos y medicamentos recetados. La interoperabilidad de los sistemas blockchain facilita el acceso a la historia médica y los registros vía un sistema descentralizado. Además, los hospitales y clínicas pueden compartir los datos para mantener la atención continúa de los turistas médicos (Stephano, 2019). Gracias a sus características como inmutabilidad y trazabilidad, la tecnología blockchain garantiza la integridad de la información médica. Ni el hospital ni el turista puede modificar o eliminar los registros insertados. A parte de esto, la tecnología blockchain permita a los turistas médicos el control de sus datos garantizando la privacidad (Alleman et al., 2010). Así, los turistas médicos deciden cuál información y con quién ellos quieren compartir (Lenz, 2019). Los turistas médicos tienden que reducir las inquietudes acerca de la privacidad ya que tienen el conocimiento sobre los movimientos y uso de su información personal (Milne, 2000).

Sistema de reseñas fiable. Los futuros turistas médicos a menudo buscan las reseñas sobre el destino o el hospital. Mientras tanto, los turistas quienes ya recibieron algunos servicios médicos tienden a dejar las reseñas sobre sus experiencias. Al capacitar un sistema de reseñas fiable la tecnología blockchain tiene potencial de asegurar la credibilidad y la autenticidad de las reseñas. La tecnología blockchain es capaz de proporcionar una única clave privada para cada identidad con unos cuantos procesos de verificación independientes integrados en los sistemas de reseñas (Kizildag et al., 2019). Esto podría garantizar las frecuencias reducidas de la manipulación o duplicados de las reseñas (Tyan et al., 2021). En algunos casos, los turistas no quieren escribir las reseñas por no querer que alguien pueda reconocerlos. blockchain puede proporcionar una resolución por su capacidad de asegurar el anonimato. Además, los sistemas de reseñas basados en blockchain pueden alentar a los individuales a dejar las reseñas y compartir sus experiencias premiándolos con las monedas y tokens.

3.3. Oportunidades para el uso de blockchain debido a la pandemia de COVID-19

La pandemia de COVID 19 afectó a toda la gente y a todos los sectores e industrias incluido el turismo de salud. No obstante, la situación actual puede crear algunas oportunidades para el uso de blockchain.

Primero, es probable que la tecnología blockchain será usada como una base de datos segura para guardar y compartir los registros médicos de los pacientes. La pandemia ha forzado la digitalización de la industria del turismo de salud fomentando la telemedicina. Usando las herramientas de videollamadas los doctores de todo el mundo pueden consultar, atender y tratar los pacientes nacionales y extranjeros. A veces, hay casos que exigen las opiniones de unos médicos o la sustitución del

médico. En estos casos el paciente puede enviar la información necesaria a los médicos por vía segura y rápida.

Segundo, la tecnología blockchain puede ser usada para la expedición y la verificación de las certificaciones digitales confirmando la acreditación de la calidad alta de los proveedores de los servicios médicos. En el marco de la pandemia los turistas médicos probablemente preferirán a los proveedores de los servicios médicos que cuentan con la acreditación que garantiza el cumplimiento de las normas de la Organización Mundial de Salud y de las autoridades sanitarias nacionales (Ramos & Untong, 2014). Las plataformas basadas en blockchain verificarán los emisores y los recibidores de las certificaciones, garantizarán la autenticidad de las mismas y revelarán las certificaciones falsas.

Tercero, la tecnología blockchain puede ser usada para la emisión de los certificados de pruebas PCR que hasta hace poco tiempo han sido uno de los requerimientos obligatorios para viajar. La tecnología blockchain puede eliminar el fraude y la manipulación de los dichos certificados y afirmar su autenticidad.

Cuarto, la tecnología blockchain puede ser usada para la emisión de los visados para los turistas médicos. Los turistas médicos a menudo necesitan el visado para viajar a un destino del turismo de salud. Los trámites de visado tardan tiempo, pero en los casos urgentes los turistas no pueden esperar mucho. La tecnología blockchain puede reducir el tiempo de espera por la gestión eficaz de los documentos gubernamentales necesarios para el viaje incluidos los visados.

4. LA TECNOLOGÍA BLOCKCHAIN PARA LOS DESTINOS TURÍSTICOS INTELIGENTES

El tercer estudio titulado “La tecnología blockchain para los destinos turísticos inteligentes” centra su atención en los destinos inteligentes. El desarrollo de los destinos turísticos inteligentes enfrenta algunos retos y demanda el cumplimiento de los ciertos requisitos. Entre los objetivos de los destinos turísticos inteligentes son: el mejoramiento de las experiencias turísticas, la prestación de una plataforma más inteligente para la colección y la distribución de la información en los destinos, la facilitación de la distribución eficiente de los recursos turísticos y el aseguramiento de los beneficios para las comunidades locales China Economic Net (2012). Usando las tecnologías innovadoras, los destinos turísticos inteligentes se esfuerzan por aumentar la competitividad, alcanzar el crecimiento y desarrollo sostenible y mejorar las experiencias turísticas. El estudio trata de explorar el papel de la tecnología blockchain en la contribución al desarrollo de los destinos turísticos inteligente desde la perspectiva holística de la sostenibilidad. El artículo enfatiza que la tecnología blockchain es capaz de ayudar a los destinos turísticos inteligentes a alcanzar sus metas y destaca los efectos posibles de la adopción de blockchain para la promoción y el desarrollo del turismo inteligente. Según el artículo, el uso de la tecnología blockchain puede resultar en el mejoramiento de las experiencias turísticas, la recompensa de la conducta sostenible, el aseguramiento de los beneficios para las comunidades locales y la reducción de las inquietudes por la privacidad (Figure 5).

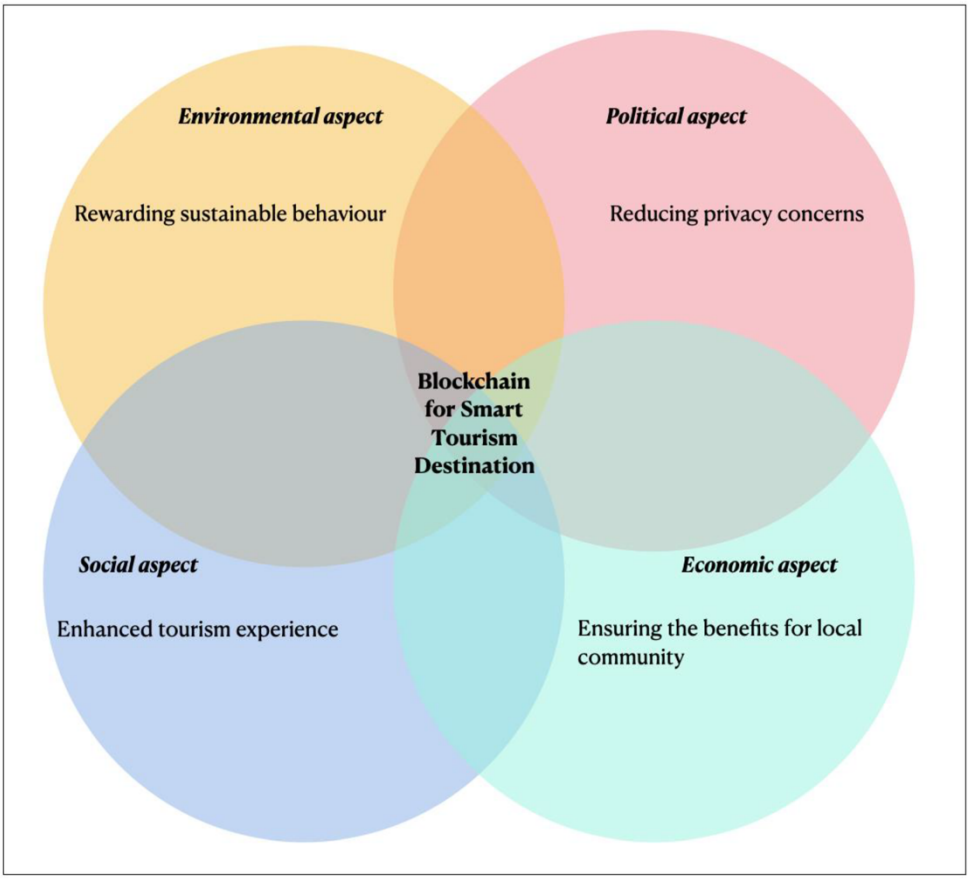

Figura 5. Beneficios del Destino Turístico Inteligente habilitado para blockchain desde la visión holística de sostenibilidad.

Mejoramiento de las experiencias turísticas. Antes de todo, la tecnología blockchain tiene capacidad de crear confianza, asegurar el intercambio de información más seguro, reducir los costos y habilitar la transparencia, por lo que puede eliminar los intermedios y distribuir los poderes similares a los proveedores de los servicios turísticos y a los turistas (Filimonau & Naumova, 2020). Junto con grandes negocios turísticos, las empresas pequeñas y los proveedores locales pueden ofreces sus servicios y bienes dentro de los destinos turísticos inteligentes. Así, los turistas recibirán la información en tiempo real sobre todos los servicios turísticos disponibles y accederán a las experiencias auténticas lo que resultará en las

experiencias turísticas mejoradas. Además, los destinos turísticos inteligentes pueden usar la tecnología blockchain para habilitar tales servicios como la localización de turistas, el seguimiento de equipaje, la gestión del equipaje perdido, el registro y facturación rápidos y la facilitación de los seguros de viaje en caso de la suspensión o cancelación del vuelo, asimismo mejorando la experiencia turística (Dogru et al., 2018). Adicionalmente, los turistas podrán usar las criptomonedas como método de pago al realizar las compras dentro de los destinos Camilleri (2020). Los sistemas de reseña basados en blockchain benefician a los turistas habilitando a algunos a dejar las reseñas sobre sus experiencias y a otros a buscar las reseñas auténticas y fiables. En general, la tecnología blockchain es capaz de proporcionar la información precisa y fiable permitiendo los servicios personalizados y asimismo mejorando las experiencias turísticas y asegurando la satisfacción de los turistas.

Recompensa del comportamiento sostenible. Aunque la misma tecnología blockchain plantea inevitablemente las cuestiones sobre su sostenibilidad en términos del alto nivel del consumo de energía, los destinos turísticos inteligentes pueden aprovechar la tecnología para animar y recompensar los comportamientos sostenibles de los turistas y residentes. Los individuales no suelen prestar mucha atención al impacto sus conductas pueden tener al ambiente del destino, pero los incentivos pueden cambiar positivamente sus actitudes y comportamientos (Negruşa et al., 2015). Implementando la tecnología blockchain los destinos turísticos inteligentes pueden crear un sistema de recompensa basado en criptomonedas el cual distribuiría las recompensas a los turistas y residentes con los comportamientos sostenibles. Por ejemplo, el sistema ofrecería las recompensas a los residentes que pudieran alcanzar el cierto nivel de ahorro de electricidad o agua durante un cierto período de tiempo o compartieran las bicicletas u otros modos de transporte con los turistas (Scekic et al., 2018). Las recompensas podrían ser canjeadas por algunos

servicios o productos. Asimismo, la tecnología blockchain puede remodelar favorablemente los comportamientos de los turistas y residentes dentro de un destino inteligente y contribuir a la sostenibilidad.

Aseguramiento de los beneficios para las comunidades locales. Abordando las cuestiones de la sostenibilidad los destinos turísticos inteligentes hacen hincapié en la provisión de los beneficios para las comunidades locales. Como había mencionado en el artículo anterior, en virtud de las características específicas de la tecnología blockchain integrada en los destinos turísticos inteligentes, las comunidades locales pueden tener acceso igualitario a los datos públicos abiertos y comunicar directamente a los turistas ofreciéndoles los servicios y productos turísticos. Además, la tecnología blockchain puede habilitar las distintas criptomonedas en los destinos turísticos inteligentes concediendo a los turistas y los locales la posibilidad de realizar pago de forma segura y eficiente (Nam et al., 2019). Por otra parte, la comunidad local puede crear su propia criptomoneda y usarla en el mercado turístico local asimismo impulsando la economía local.

Reducción de las inquietudes por privacidad. Los destinos turísticos inteligentes deben dar acceso abierto a la información en tiempo real a todos los ciudadanos y evitar el monopolio de un proveedor (Zygiaris, 2013). Mientras tanto, alguna información sobre los turistas y sus actividades puede ser altamente personal lo que plantea las cuestiones sobre privacidad (Vanolo, 2013). Especialmente dentro de los destinos turísticos inteligentes los turistas médicos pueden tener más preocupaciones sobre su privacidad (Singh, 2013). A pesar de que el uso de las tecnologías innovadoras permite facilitar la retención de la información sobre las intervenciones médicas y tratamientos, también puede agravar las preocupaciones de los turistas médicos sobre su privacidad y crear desconfianza. Los destinos deben aplicar las diferentes técnicas para distorsionar los datos con el objetivo de evitar la vinculación

directa entre los turistas y su información personal (Buhalis & Amaranggana, 2013). Pero, este método enfrenta al reto de encontrar el balance correcto entre la pérdida de información y el riesgo de divulgación (Martínez-Ballesté et al., 2013). La tecnología blockchain es capaz a de abordar estos problemas al ser solución de 'intimidad en la concepción' para los problemas de privacidad causados por la digitalización de la información de los turistas (Benchoufi & Ravaud, 2017). Los mecanismos de la privacidad y la protección de datos están integrados en el sistema blockchain desde la misma creación del diseño de sistema (Rejeb et al., 2019). El control y la propiedad de los datos por los turistas mismos reducen sus preocupaciones sobre privacidad (Milne, 2000).

5. CONCLUSIÓN

Así, la tesis trata de aportar los valores prácticos para los profesionales y académicos en el ámbito de la aplicación de la tecnología blockchain en la industria turística. Es imprescindible comprender cuales son los factores favorables y las condiciones necesarias para adoptar dicha nueva tecnología con éxito. El modelo conceptual elaborado en esta tesis ayuda a comprenderlos y aporta el valor práctico para los interesados en adoptar la tecnología blockchain en los negocios de turismo o los destinos turísticos. Además, es muy importante saber cuáles son los beneficios que aporta la adopción y la aplicación de la tecnología blockchain. La tesis describe los beneficios potenciales explorando cómo la tecnología blockchain afecta el turismo de salud y el turismo inteligente.

La tesis propone las siguientes direcciones para los estudios futuros:

1)El modelo conceptual de la adopción de blockchain elaborado en esta tesis debe ser evaluada para confirmar la importancia y la validez de los factores y

condiciones que afectan la adopción de blockchain en el sector turístico. Ya que la industria turística incluye diferentes sectores, sería muy útil evaluar el modelo por separado en los sectores de la hospitalidad, las aerolíneas, las empresas turísticas, etc. Además, los estudios futuros podrían modificar y/o extender el modelo propuesto eliminando o añadiendo los nuevos factores y condiciones para la adopción de la tecnología blockchain en turismo.

2)Sería útil el estudio empírico que evalúa y valida los beneficios del uso de la tecnología blockchain para los destinos turísticos inteligentes y los destinos del turismo de salud. Sería beneficioso llevar a cabo las entrevistas y encuestas entre los turistas, académicos y profesionales sobre sus percepciones respecto a las ventajas de la tecnología blockchain para el turismo inteligente y el turismo de salud.

3)Los estudios de simulación y los casos de estudios serían muy aconsejables para evaluar el nivel de la implementación de la tecnología blockchain y las intenciones a usar el blockchain en el sector turístico y hospitalario.

REFERENCES

Alleman, B.W., Luger, T., Reisinger, H.S., Martin, R., Horowitz, M.D., & Cram, P. (2010). Medical Tourism Services Available to Residents of the United States. *Journal of General Internal Medicine*, *26*, 492–497.

Baralla, G., Ibba, S., Marchesi, M., Tonelli, R., & Missineo, S. (2018). A blockchain based system to ensure transparency and reliability in food supply chain. In *European conference on parallel processing* (pp. 379-391). Springer, Cham.

Benchoufi, M. & Ravaud, P. (2017). Blockchain technology for improving clinical research quality. *Trials*, *18*, 335.

Buhalis, D. & Amaranggana, A. (2013). Smart Tourism Destinations. In *Information and Communication Technologies in Tourism 2014*; Xiang, Z., Tussyadiah, I., Eds.; Springer: Cham, Switzerland; pp. 553–564.

Camilleri, M.A. (2020). The use of data-driven technologies for customer-centric marketing. *International Journal of Big Data Management*, *1*, 50–63.

Çapar, H. (2020). Using cryptocurrencies and transactions in medical tourism. *Journal of Economic and Administrative Sciences*, *37*, 677–693

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics*, *36*, 55-81.

China Economic Net. (2012). Available online: **http://en.ce.cn/Insight/201204/12/t20120412_23235803.shtml** (accessed on 16 September 2020).

Chokun, J.(2016). Who accepts bitcoins as payments? Available online: **https://99bitcoins.com/who-accepts-bitcoins-payment-companies-stores-take-bitcoins/** (accessed on 24 July 2020).

Connell, J. (2006). Medical tourism: Sea, sun, sand and. surgery. *Tourism Management*, *27*, 1093–1100.

Connell, J. (2011). *Medical Tourism.* Cabi: Wallingford, UK.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. *Applied Innovation Review*, 2, 6-19.

Dogru, T., Mody, M., & Leonardi, C. (2018). Blockchain technology & its implications for the Hospitality Industry. Boston University.

Filimonau, V., & Naumova, E. (2020). The blockchain technology and the scope of its application in hospitality operations. *International Journal of Hospitality Management*, 87, 1-8.

Froystad, P., and J. Holm. 2016. "Blockchain: Powering the Internet of Value." EVRY Labs.

Gao, Z., Fan, Y., Wu, C., Zhang, J., & Chen, C. (2018). DSES: A Blockchain-Powered Decentralized Service Eco-System. In *Proceedings of the IEEE 11th International Conference on Cloud Computing (CLOUD)* (pp. 25–32). San Francisco, CA, USA.

Garay, A.K., Juan A. and Leonardos, N. (2015). The Bitcoin Back- bone Protocol: Analysis and Applications. In *Proceedings of the 34th Annual International Conference on the Theory and Applications of Cryptographic Techniques (EUROCRYPT)* 2015 (pp. 281–310).

Gupta, M. (2017). Blockchain for dummies. IBM Limited edition. Hoboken : John Wiley & Sons, Inc.

Herrick, D.M.(2007). *Medical Tourism: Global Competition in Health Care.* National Center for Policy Analysis: Dallas, TX, USA; pp. 1–35.

Hopkins, L., Labonté, R., Runnels, V., & Packer, C. (2010). Medical tourism today: What is the state of existing knowledge? *Journal of Public Health Policy*, *31*, 185–198.

Keckley, P.H. (2008). *Medical Tourism: Consumers in Search of Value.* Deloitte Center for Health Solutions: Washington, DC, USA.

Kizildag, M., Dogru, T., Zhang, T. C., Mody, M. A., Altin, M., Ozturk, A. B., & Ozdemir, O. (2019). Blockchain: A paradigm shift in business practices. *International Journal of Contemporary Hospitality Management*, 32(3), 953-975.

Lenz, R. (2019). Managing Distributed Ledgers: Blockchain and Beyond. Available online: **https://www.chedteb.eu/media/attachments/2019/09/02/managingdistributedledgers-blockchainandbeyond.pdf** (accessed on 1 November 2021).

Leung, D. & Dickinger, A. (2017). Use of Bitcoin in online travel product shopping: The European perspective. In *Information and communication technologies in tourism 2017* (pp. 741-754). Springer, Cham.

Linn, L.A. & Koo, M.B. (2016). Blockchain for health data and its potential use in health it and health care related research. In *ONC/NIST Use of Blockchain for Healthcare and Research Workshop* (pp. 1–10). ONC: Gaithersburg, MD, USA; NIST: Gaithersburg, MD, USA.

Martínez-Ballesté, A., Pérez-Martínez, P.A., & Solanas, A. (2013). The pursuit of citizens ' privacy: A privacy-aware smart city is possible. *IEEE Communications Magazine*, *51*, 6.

Milne, G.R. (2000). Privacy and Ethical Issues in Database/Interactive Marketing and Public Policy: A Research Framework and Overview of the Special Issue. *Journal of Public Policy Marketing*, *19*, 1–6.

Mougayar, W. 2016. The business blockchain: Promise, practice, and application of the next internet technology. Hoboken, NJ: John Wiley & Sons.

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. Available online: https://bitcoin.org/bitcoin.pdf (accessed on 26 July 2020).

Nam, K., Dutt, C. S., Chathoth, P., & Khan, M. S. (2019). Blockchain technology for smart city and smart tourism: latest trends and challenges. *Asia Pacific Journal of Tourism Research*, 1-15.

Negruşa, A.L., Toader, V., Sofică, A., Tutunea, M.F. & Rus, R.V. (2015). Exploring gamification techniques and applications for sustainable tourism. *Sustainability*, *7*, 11160–11189.

Ozdemir, A. I., Ar, I. M., and Erol, I.(2019). Assessment of blockchain applications in travel and tourism industry. *Quality and Quantity*, 1-15.

Ramos, V. & Untong, A. (2014). Spa tourism. In *Encyclopedia of Tourism*; Jafari, J., Xiao, H., Eds.; Springer: Cham, Switzerland.

Rejeb, A., G Keogh, J., & Treiblmaier, H. (2019). The impact of blockchain on medical tourism. In *Workshop on E-Business* (pp. 29-40). Springer, Cham.

Scekic, O., Nastic, S., & Dustdar, S. (2018). Blockchain-supported smart city platform for social value co-creation and exchange. *IEEE Internet Computing*, *23*, 19–28.

Shrestha, A. K., and Vassileva, J. (2017). User-controlled privacy-preserving user profile data sharing based on blockchain. In P*roceedings of the Future Technologies Conference (FTC)*, Vancouver, Canada. IEEE (Vol. 266).

Singh, N. (2013). Exploring the factors influencing the travel motivations of US medical tourists. *Current Issues in Tourism*, *16*, 436–454.

Sixtin, E. (2017). TUI tourism group will adopt Ethereum blockchain technology. Available online: **https://btcmanager.com/tui-tourism-group-to-adopt-ethereums-blockchain/** (accessed on 24 July 2020).

Stephano (2019). Blockchain Technology: A Total Game-Changer in Medical Tourism. Available online: **https://www.magazine.medicaltourism.com/article/blockchain-technology-medical-tourism** (accessed on 26 October 2021).

Swan, M. (2015). *Blockchain: Blueprint for a New Economy*; O'Reilly Media, Inc.: Sebastopol, CA, USA.

Tapscott, D., and Tapscott, A. (2016). How blockchain will change organizations. Available online: **https://sloanreview.mit.edu/article/how-blockchain-will-change-organizations/**(accessed on 26 July 2020).

Till, B.M., Peters, A.W., Afshar, S., & Meara, J.G. (2017). From blockchain technology to global health equity: Can cryptocurrencies finance universal health coverage? *BMJ Global Health*, *2*, e000570.

Treiblmaier, H. & Beck, R. (2019a). Eds.*Business Transformation through Blockchain* (Vol. 1.). Palgrave Macmillan: Cham, Switzerland.

Treiblmaier, H. and Beck, R. (2019b). Eds. *Business Transformation through Blockchain* (Vol. 2.). Palgrave Macmillan: Cham, Switzerland.

Tyan, I., Yagüe, M.I., & Guevara-Plaza, A. (2021). Blockchain Technology's Potential for Sustainable Tourism. In *Information and Communication Technologies in Tourism 2021* (pp. 17–29). Springer International Publishing: Cham, Switzeralnd.

Udegbe, S. E. (2017). Impact of blockchain technology in enhancing customer loyalty programs in airline business. *International journal of innovative research and advanced studies*, 4(6), 257-263.

Valeri, M. (2020). Blockchain technology: Adoption perspectives in tourism. In *Entrepreneurship and Organizational Change* (pp. 27-35). Springer, Cham.

Vanolo, A. (2013). Smartmentality: The smart city as disciplinary strategy. *Urban Studies*, 1–16.

Wang, Y., Singgih, M., Wang, J., and Rit, M. (2019). Making sense of blockchain technology: (How) will it transform supply chains? *International Journal of Production Economics, 211*, 221–236.

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems*, 22(1), 45–55.

Zhao, J.L., Fan, S., & Yan, J. (2016). Overview of business innovations and research opportunities in blockchain and introduction to the special issue. *Financial Innovation*, 2(1),28.

Zignuts. (2018). How Blockchain Architecture Works? Basic Understanding of Blockchain and Its Architecture. Available online: **https://www.zignuts.com/blogs/how-blockchain-architecture-works-basic-understanding-of-blockchain-and-its-architecture/** (accessed on 11 February 2021).

Zygiaris, S. (2013). Smart city reference model: Assisting planners to conceptualize the building of smart city innovation ecosystems. *Journal of the Knowlegde Economy*, *4*, 217–231.

CHAPTER 1

INTRODUCTION

1.1 MOTIVATION

The tourism industry is one of the largest and fastest-growing industries in the world, contributing significantly to economic growth and employment opportunities. However, the industry faces several challenges, including data management, security, and privacy concerns, that hinder its growth and development. Blockchain technology, with its decentralized and immutable nature, has the potential to revolutionize the tourism industry and address these challenges. Blockchain technology can enable secure and transparent transactions, decentralized data storage, and facilitate trust among stakeholders. Despite the potential benefits of blockchain technology, there is limited research on its application in the tourism industry, particularly in the context of Medical Destinations and Smart Tourism Destinations. Therefore, there is a need for further research to explore the potential use cases and impacts of blockchain technology in tourism and identify the key factors that influence its adoption. This thesis aims to fill this research gap and provide insights into the potential benefits and challenges of using blockchain technology in Medical Destinations and Smart Tourism Destinations.

1.2 THESIS CONTEXT

The Fourth Industrial Revolution has brought significant changes into many industries and has modified the existing societal patterns and processes. Tourism industry, tourists' decisions, behaviors, and experiences have been changed owing

to adopting and using innovative technologies like artificial intelligence, internet of things, blockchain, augmented reality, virtual reality, etc. Compared to other smart technologies, which reached high research and implementation levels, blockchain seems to be less researched and implemented technology. This thesis was undertaken with the aim to foster blockchain research through proposing a theoretical model for blockchain adoption and exploring its possible contributions for the tourism industry.

1.2.1 WHAT IS BLOCKCHAIN

Distributed ledger technology comprises blockchain and is a common name for all technologies that spread data across different locations, institutions, or nations (Valeri 2020). Blockchain technology was first presented in a white paper named 'Bitcoin: A Peer-to-Peer Electronic Cash System' published in October 2008 by Satoshi Nakamoto. Nakamoto (2008) introduced blockchain in the Bitcoin protocol as a protocol of open, transparent, and secure distributed ledger technology that doesn't need a trusted third party. Blockchain technology runs on top of the Internet protocol and records transactions in an immutable and trusted way using cryptographic techniques and distributed consensus algorithms among all users of the network (Tapscott & Tapscott, 2016). Blockchain in itself is the result of other technologies including software development, cryptographic technology, and database technology, and therefore, it can be seen as meta-technology (Mougayar 2016).

Up to date, three generations of blockchain technology can be distinguished (Zhao et al., 2016). First generation, Blockchain 1.0, includes cryptocurrency development. Second generation, Blockchain 2.0, includes smart contracts and a set of applications extending beyond cryptocurrencies. Third generation, Blockchain 3.0, includes

applications in areas beyond the previous two versions, such as government, health, science, tourism, and IoT.

A blockchain can be seen as a distributed database of records, or transactions, or all digital events that have been realized and shared among the participating members (Crosby et al. 2016). Every member is connected via a point-to-point network and receives a pair of public and private keys that are used by others when encrypting information and for signing blockchain transactions respectively (Wong et al. 2020). Once a transaction takes place, it is deposited in a block. Every single block is connected to the previous block and subsequent to it. Each transaction is verified by consensus of a majority of the participants in the system. The members of the network should agree on whether transactions should be added to block or not. Once the blocks added to a chain, they are immutable and verified using automation and governance protocols (Swan, 2015). Additionally, the verification process coupled with encryption techniques ensures the data security against unauthorized access (Wang et al., 2019) and trust.

Based on the network's management and permissions, there are three categories of blockchain networks:

- Public blockchain. In public blockchains anyone can be a member and contribute to the consensus-making process. Public blockchain is maintained across peer-to-peer network in a completely decentralized and anonymous manner (Nakamoto, 2008). The most well-known example of public blockchain is Bitcoin (Nakamoto, 2008). To determine which block to add to the ledger, the members have to execute Proof-of-Work consensus (Garay et al., 2015). Public blockchain has advantages in terms of enabling the ledger to be curated anonymously and willing

of the members to hold a copy of the ledger and attempt to create new blocks (Gao et al., 2018).

- Private blockchain. In a private blockchain only specific communities or organizations are allowed to join the network. Private blockchain is widely used in creating blockchain-based underlying systems between several specific organizations (Gao et al., 2018). Private blockchains can avoid expensive Proof-of-Work mechanisms and accept a wider range of consensus protocols based on disincentives (Casino et al., 2019).

- Permissioned blockchain. In a permissioned blockchain only authorized members can join the network. Permissioned blockchain requires a set of trusted nodes to create new blocks. Permissioned blockchains have advantages in terms of spending less resources and reaching smaller transaction latency and higher throughput. In addition, permissioned blockchains are able to control the set of the participants whose task is to maintain the ledger; this increases its popularity among industrial communities (Gao et al., 2018).

Among core features of blockchain technology are disintermediation, immutability, transparency, security, automation, trust, costs, consensus (Table 1).

Table 1. Core features of blockchain

Feature	Explanation
Disintermediation	The peer-to-peer nature of the network means that there is no need for a central authority.
Immutability	The data on the network is linked to preceding data that means that in order to change one piece of data, the changes need to be done in multiple areas.
Transparency	All data can be accessed by everyone in the network.
Security	The use of public key cryptography enables a high level of security. Also, the networked nature provides a more resilient system with no single failure point.
Automation	Blockchain is able to facilitate greater autonomous actions (smart contracts, increasing efficiency and accuracy).
Trust	With no third parties required to be involved in a transaction, greater trust is possible and parties can deal directly with one another.
Costs	Costs can be cut because of the removal of the intermediaries.
Consensus	A consensus mechanism is applied to achieve agreement on the state of a network including the validity of transaction the the way the decisions can be made.

Despite its advantages, blockchain technology has also some challenges and limitations that need to be addressed for its successful implementation and wide adoption (Swan 2015, Filimonau & Naumova 2020, Nam et al. 2019):

• Security: There is a possibility of hacking attack.

• Wasted resources: Mining in blockchain wastes large amounts of energy.

• Latency: Much time is required to make a block and confirm the transaction, while maintaining security.

• Awareness level: There is a lack of knowledge and expertise around blockchain.

Overall, blockchain is argued as next digital revolution and is often compared with the evolution of the internet in the beginning of 90s (Tapscott and Tapscott, 2017). It is argued that blockchain is able to transform the society from trust-based to truth-based trustless society (Shrestha and Vassileva, 2017). Blockchain technology is viewed as having potential to bring a shift from 'Internet of Information' to 'Internet of Values' (Froystad and Holm 2016) and is expected to have a tremendous impact on diverse sectors and industries including tourism (Treiblmaier & Beck, 2019a,b, Valeri 2020).

1.2.2 TOURISM INDUSTRY AND BLOCKCHAIN

Tourism industry seems to have a great interest in adopting blockchain technology with enormous amounts of money being invested in blockchain based start-ups. However, compared to other sectors that have found a wide range of application of blockchain technology, tourism sector still lacks real cases of blockchain implementation. Few examples that have started to adopt blockchain technology in tourism include TUI adopting the technology in its booking, reservation, and payment systems (Sixtin, 2017), CheapAir, Expedia, One Shot Hotels, and Webjet accepting bitcoins as a payment method (Chokun, 2016). The latest application of blockchain is DApps, which are developed by tourism businesses to better interact with the customers. Some of the most popular tourism related DApps are shown in the Table 2. Nevertheless, not many tourists use these DApps that limits statistical

research, which could bring some insights regarding tourists' attitudes towards adoption of blockchain technology.

Table 2. Tourism related DApps

DApp name	Description
Winding Tree	Using smart contracts and ERC827 protocols, connects travelers directly with service providers, thus providing best savings for the travel industry and reducing the fees associated to the booking process.
Sandblock	Aims to improve customer loyalty programs; is creating a much more customizable token for all travel companies to make their loyalty scheme more effective.
Accenture	Introduces the Traveler Digital Identity System thanks to which airports can accelerate the process of document verifications and, therefore, reduce the lines in the airports.
Travelchain	Intents to create an open-source system to manage the data of the tourists. The systems will monitor and protect all travel data and users will get tokens for sharing their data.
Trippki	Aims to develop better customer loyalty schemes.
ShoCard and SITA	Aims to better identity management in the tourism industry.
Lockchain	Enables a direct marketplace for hotels, airlines; uses the decentralized system for payment, property management, and booking processes.

Academic research on blockchain in tourism is a novel topic. This fact is supported by the limited number of articles. Despite bitcoin popularity, there is only one study conducted on intention to use bitcoin in online travel shopping (Leung and

Dickinger, 2017). Most of the existing articles discuss the potential development of blockchain (Nam et al., 2019) and its implications in the tourism and hospitality industry (Dogru et al., 2018; Udegbe, 2017). Several studies confirmed that blockchain can be successfully implemented to ensure transparency and reliability in food supply chains (Baralla et al., 2018) and to guarantee the user-controlled user profile data sharing (Shrestha et al., 2017). Ozdemir et al. (2019) in their research proposed a blockchain basics criteria set for comparing different distributed applications. Despite the different research focuses, the researchers agree that there is a need of more profound research on tourism-related blockchain applications and assessment of practical implications of such applications.

1.3. THESIS OBJECTIVE

This thesis was initiated with the objective to move forward a blockchain tourism research. Due to the limited number of studies on the topic, this research aims to shed light on the potentials of blockchain technology for tourism industry and the ways how blockchain technology can be adopted in tourism.

Generally, the thesis has two main purposes:

3. To elaborate a conceptual model for blockchain adoption in tourism: pursued in the Chapter 2 of this thesis: "Blockchain adoption in tourism: Grounded theory-based conceptual model",

4. To explore the benefits of blockchain technology for tourism, which is divided into two sub purposes:

d. To explore the benefits of blockchain technology for medical tourism: pursued in the Chapter 3 "The benefits of blockchain technology for medical tourism";

e. To explore the benefits of blockchain technology for smart tourism: pursued in the Chapter 3 “Blockchain technology for smart tourism destinations”.

More specifically, the thesis addresses the following research questions:

RQ1: What conditions contribute to blockchain adoption?

RQ2: What conditions are needed for blockchain adoption?

RQ3: What interactions can be obtained from blockchain adoption?

RQ4: How blockchain adoption can impact the tourism industry?

RQ5: What benefits can blockchain adoption provide for medical tourists and medical tourism destinations?

RQ6: What benefits can blockchain adoption provide for smart tourism destinations?

This thesis aims to theoretically contribute to blockchain, tourism, and information technology literature by exploring the potential of this innovative technology for smart tourism destinations, medical tourism destinations as well as defining the important factors that could affect blockchain adoption in tourism. In addition, the researcher hopes to provide practical contributions to the industry professionals on what should be done in order to adopt the blockchain technology. Besides, based on the results regarding positive effects of blockchain technology on smart tourism and medical tourism, the tourism marketers and destination managers can decide whether they should invest in blockchain adoption or not.

1.4. METHODOLOGY

To reach the objectives, the author wrote three papers.

In *Paper 1* the aim was to elaborate a conceptual model of adoption of blockchain technology in tourism industry. A systematic literature review was carried out to

explore the different aspects of blockchain technology and to find out the key factors affecting blockchain adoption in tourism. A grounded theory method was applied for conducting a systematic literature review. When carrying out a systematic literature review, the study followed a five-stage process: 1) defining the inclusion/exclusion criteria, identifying the field of research, determining the appropriate sources, and defining the search terms; 2) conducing a search for papers; 3) selecting all the relevant papers and refining the sample; 4) analyzing; 5) presenting the findings. As essential criteria included papers should be full-text English written academic journal papers, conference proceedings, book chapters published between 2017 and 2020 within a blockchain tourism research domain and with a close semantic relationship with tourism. The search of publications was performed in Google Scholar database using the following combinations: blockchain in tourism/hospitality/airline/food/service industry, blockchain adoption in tourism/hospitality/airline/food/service industry. 34 publications were chosen for the analysis.

Paper 2 and *Paper 3* represent instrumental case studies, which aim at providing insights into blockchain adoption and helping understand its possible benefits for tourism industry, specifically, medical tourism and smart tourism. *Paper 2* focused on medical tourism. Its main goal was to conceptualize the benefits of blockchain technology for pre-treatment and post-treatment stages of medical tourism. The paper extended the previous research and added to the existing literature regarding the benefits of blockchain technology for medical tourism.

In *Paper 3*, the aim was to conceptualize the benefits of blockchain technology for smart tourism with specific focus on smart tourism destinations. Based on the previous literature, the paper conceptualized the benefits of blockchain technology for the development of smart tourism destinations from a holistic view of

sustainability. The paper advanced current knowledge in the domain of applying blockchain systems to assist Smart Tourism Destinations.

1.5. MAIN RESULTS AND CONTRIBUTION TO LITERATURE

Paper 1 elaborated a conceptual model for blockchain adoption in the tourism industry. The model included the casual, contex and intervening conditions that affect blockchain adoption in the tourism industry, interactions and consequences that come from blockchain adoption. Among the causal conditions that contribute to blockchain adoption in the tourism industry were blockchain benefits, bitcoin′s wide universality, increasing interest and investment in blockchain tourism projects, and strategic orientation of the tourism enterprises. Among intervening conditions of blockchain adoption were government regulation and collaboration among all stakeholders including governments, destination management organizations, tourism service providers, and researchers. Among the context conditions were economic, educational, and technical factors. Among the interactions were economic and social actions. Among the outcomes of blockchain adoption were reshaping the tourism industry and promoting tourism development, attracting visitors to less competitive destinations, developing smart tourism and medical tourism, contributing to the successful competitiveness of small and medium tourism enterprises, reducing poverty, and enhancing tourists ′experiences. From a theoretical perspective, the model contributes to the body of knowledge within a blockchain tourism research and enhances understanding regarding important factors affecting blockchain adoption. Additionally, the model summarizes the consequences resulting from the adoption of blockchain technology, and therefore, extends the few existing studies, which addressed the possible effects of blockchain adoption in the hospitality and tourism sectors (Valeri, 2015). Also, by defining the

casual, contextual, and intervening conditions, this research enabled the academics to understand the necessary conditions for fostering blockchain adoption within the tourism industry.

Paper 2 focused on the possible strategic role of blockchain technology in medical tourism and conceptualizes the benefits of blockchain technology for pre-procedure and post-procedure stages. The paper argued that the application of blockchain technology can benefit medical tourists and healthcare providers in terms of an easier way to find a healthcare provider, fast and secure payment method, ensured data security and privacy, and trusted review systems. The paper extended the current literature within tourism research on blockchain by proposing the possible implications of this innovative technology for the medical tourism sector. Overall, the paper contributes to the understanding of the potential benefits of blockchain technology for the medical tourism sector and highlights the need for further research on this topic.

Paper 3 conceptualized the role of blockchain technology in supporting the achievement of several main goals of Smart Tourism Destinations, such as enhancing tourism experience, rewarding sustainable behavior, and ensuring benefits for local community. The paper argued that combining blockchain technology with other innovative technologies such as the Internet of Things or artificial intelligence can foster the development of Smart Tourism Destinations and positively contribute to their goals. The paper advanced current knowledge in the domain of applying blockchain systems to assist Smart Tourism Destinations and highlights the potential impacts of blockchain technology in changing the way the data are being collected, validates, owned, and managed to co-create value. Also, the paper outlined the major challenges that Smart Tourism Destinations need to overcome to successfully implement blockchain technology and highlighted the

risks related to blockchain adoption. The contribution of the paper lies in adding to the understanding of the potential benefits and challenges of blockchain technology for Smart Tourism Destinations.

1.6. THESIS STRUCTURE

This thesis is based on compendium of three publications.

Chapter 2 presents the first publication titled "Blockchain adoption in tourism: Grounded theory-based conceptual model". This article contributes to the existing literature on adoption of innovative technologies and develops a theoretical model on blockchain adoption in the tourism industry. The model includes the major consequences of blockchain technology for the tourism industry.

To provide better understanding on the positive effects of blockchain adoption for the tourism industry, Chapter 3 and Chapter 4 explore the potential of blockchain technology for different niches of tourism as medical tourism and smart tourism.

Precisely, Chapter 3 presents the second publication titled "The benefits of blockchain technology for medical tourism". This article focuses on medical tourism since medical tourism is a new niche in the tourism industry that brings high incomes for medical tourism destinations. The article explores how blockchain technology can be used to provide effective impacts for medical destinations.

And Chapter 4 presents the third publication titled "Blockchain technology for smart tourism destinations". This article focuses on smart tourism destinations, which with help of information technologies strive to increase their competitiveness, reach sustainable development and growth, and enhance tourists' experiences. The article stresses that blockchain technology can assist the smart tourism destinations to

achieve their goals and highlights the possible impacts of blockchain adoption on smart tourism development.

The structure of the thesis is as follows:

Chapter 1: Introduction – describes the background of the thesis, its context, proposes main objectives, and depicts the thesis structure.

Chapter 2: Blockchain adoption in tourism: Grounded theory-based conceptual model — proposes a conceptual model of blockchain technology adoption in tourism describing the casual, context, intervening conditions that affect blockchain adoption and the effects of blockchain adoption on the tourism sector.

Chapter 3: The benefits of blockchain for medical tourism — explores the positive effects of blockchain technology for medical tourism.

Chapter 4: Blockchain technology for smart tourism destinations — discusses the possible implications of blockchain technology within smart tourism destinations.

Chapter 5: Conclusion — provides the summary of the conclusions of all contributions and outlines the avenues for future research.

CHAPTER 2

BLOCKCHAIN ADOPTION IN TOURISM: GROUNDED THEORY-BASED CONCEPTUAL MODEL

2.1. INTRODUCTION

The tourism industry is constantly embracing technological innovations for its sustainability and future growth and development. The last innovation in the tourism sector puts a great emphasis on the blockchain technology, which can totally revolutionize the industry, affect operational efficiency, and strengthen competitiveness of tourism enterprises (Kizildag et al. 2019) as well as reduce poverty of local communities at disadvantageous tourism destinations (Barreto et al.2019) and increase tourists ′experiences. The blockchain market is estimated to be worth approximately USD 2.3 Billion by 2021 (Kastelein, 2016), yet widespread blockchain adoption might take long time because of lack of understanding and expertise about the technology itself (Damani, 2017).

Global tourism and hospitality companies are facing tough digitalization competition and disruption to their operations that force them to adopt blockchain technology (Magovan, 2017; Treiblmaie & Önder, 2019). Thus, many hospitality and tourism enterprises have started to invest in adoption of blockchain systems (Pilkington et al., 2017). Yet, some companies have proved the immatureness of blockchain technology. For example, FlightChain, decentralised platform that logged more than two million flight changes between Geneva Airport, Heathrow Airport, and Miami International Airport, turned out to be more sophisticated to use

in comparison with the cloud-based data services (Magas, 2020). Furthermore, some blockchain-based travel projects failed to materialise, for instance, Beenest, with some cases showing no relationship between decentralised travel solutions and real application of blockchain technology in the tourism sector (Magas, 2020). Nevertheless, the tourism industry has witnessed the successful implementations of blockchain technology by large travel companies. Among the early adopters of blockchain technology that successfully adopted the technology are TUI that uses blockchain technology in its booking, reservation, and payment systems (Marr, 2018), CheapAir, Expedia, and airBaltic that accept payments in bitcoins (Kerr, 2018), and S7 Airlines that deploys blockchain infrastructure for issuing and selling tickets (Magas, 2020).The tourism blockchain solutions are emerging exponentially, yet among the most popular ones are WindingTree, LockTrip, TravelChain, Tripago (Antoniadis et al., 2020; Nam et al., 2019).

Meanwhile, the tourism academic communities also demonstrate a strong interest in developing a deep understanding of blockchain technology and its possible impacts on the travel and tourism industry. Nevertheless, despite several studies on blockchain there is still a lack of knowledge and understanding around blockchain technology, the factors facilitating its adoption, and real consequences of blockchain adoption for the tourism companies and the whole tourism sector (Kizildag et al., 2019). This sets back not only academic research, but also practical application in the entire tourism sector. Some scholars agree that deeper and rigorous research on the topic, as well as development of solid theoretical frameworks, is in need in order to push blockchain adoption. A careful evaluation of the context, conditions, peculiarities of blockchain technology and the environment that plans to use this technology should be done in order to provide answer on whether to adopt blockchain technology or not (Valeri & Baggio, 2020).

This research was initiated with the objective to move forward a blockchain tourism research. Due to the limited number of studies on the topic, this research intends to shed light on how blockchain technology can be adopted by the tourism businesses and how blockchain adoption will affect the tourism sector. Therefore, the main goal of this research is to propose a conceptual model for blockchain adoption in the tourism industry. In order to achieve the goal, we seek the answers to the following research questions:

1) What conditions contribute to blockchain adoption?;

2) What conditions are needed for blockchain adoption?;

3) What interactions can be obtained from blockchain adoption?, and

4) How blockchain adoption can impact the tourism industry?.

To find answers, we decided to conduct a thorough literature review of previous work related to blockchain technology use and its possible implications for the tourism industry. To specify, a grounded theory methodology is applied in this study. The number of qualitative research in the tourism literature is very limited (Stumpf et al., 2016) despite the benefits of qualitative research on tourism (Cohen, 1998; Jamal & Hollinshead, 2001) and incremented use of grounded theory approach in complex issues. Using grounded theory as an analytic framework can assist in identifying and classifying various topics of interest, theoretical perspectives, and methodologies in the blockchain tourism research. To achieve progress in tourism research, it is crucial to develop modern theoretical insights (Stumpf et al., 2016).

This research attempts to find an answer on a critical question regarding the antecedents and consequences of blockchain adoption in the tourism industry. The study aims to theoretically contribute to blockchain, tourism, and information technology literature by exploring the important factors affecting the blockchain

adoption in tourism. In addition, the authors hope to provide practical contributions to the industry professionals on what should be done in order to adopt the blockchain technology. Additionally, based on the results of the research the tourism marketers and destination managers can decide on whether they should invest in blockchain adoption or not.

The rest of the paper is structured as follows. The next section presents an overview of blockchain technology and reviews the existing literature. Section 3 explains the research methodology and proposes a conceptual model for blockchain adoption in tourism. Finally, the paper discusses implications and concludes.

2.2. LITERATURE REVIEW

2.2.1 OVERVIEW OF BLOCKCHAIN

In 2008 there was released a paper named "Bitcoin: A Peer-To-Peer Electronic Cash System" written by Satoshi Nakamoto. In this paper there were proposed that online payments could take place between two parties directly without going through a financial institution (Nakamoto, 2008). The well-known cryptocurrency Bitcoin is the first successful realization of this concept. After bitcoin's success, a crypto market has been expanding exponentially with newly emerging cryptocurrencies. However, underlying blockchain technology is finding new range of applications beyond finance (Crosby et al., 2016). Different sectors and industries including health, governance, and tourism show a huge interest in the adoption and implementation of this innovative technology.

The aim of blockchain technology is to develop a decentralized environment with no third party that controls the transactions and data (Yli-Huumo et al., 2016). Blockchain is a distributed database of records or public ledger of all transactions that have been realized (Crosby et al., 2016). The information about each transaction is shared among all participants, called nodes; this attribute ensures system's transparency (Yli-Huumo et al., 2016). Every transaction in the public ledger is confirmed by agreement of most of the nodes in the system, and once entered, the information cannot be easily deleted or modified (Crosby et al., 2016).

One of the key leading features of blockchain technology lies in its ability to trace transactions within the decentralized databases and thus excluding counterfeiting and fraud (Kostakis & Giotitsas, 2014). Other two important features of blockchain technology are distributed consensus and anonymity (Crosby et al., 2016). All nodes in blockchain system are anonymous, that makes it more secure for other nodes to confirm the transactions (Yli-Huumo et al., 2016). Blockchain is able to support trustworthy transactions via networked computation instead of human monitor and control (Zhao et al., 2016). Meanwhile, blockchain itself can be conceptualized as meta- technology since it presents the integration of other technologies as software development, cryptography, database technology, etc. (Mougayar, 2016).

There are three generations of blockchain technology's development: the first one is the development of Bitcoin, the second generation is smart contracts, and the third one is decentralized applications (DApps), which allow interaction with blockchain technologies on smartphones or browsers (Nam et al., 2019). There is a big number of DApps in the tourism market; using smart contracts and cryptocurrencies, they can facilitate the creation of new business models that will benefit both citizens and travellers.

Despite strengths and benefits of blockchain technology as disintermediation, security, automation, immutability, trust, costs, and traceability (Boucher et al., 2017; Seffinga et al., 2017), there are challenges to overcome regarding the possibility of hacking (Zheng et al., 2018), high operating costs and energy consumption (Deloitte, 2016), difficulty to understand the technology (Ksehtri, 2017a). Overall, blockchain technology is viewed to have a possibility to revolutionize the global domain of both financial transactions and information exchange by making them more transparent, flexible, and secure (Filimonau & Naumova, 2020). Also, blockchain technology can disrupt many industries, eliminate the need for a trustworthy intermediary, and reduce operational costs. Regarding the downsides, there is a hope that they will be overcome in the future due to the continuous technological and conceptual development of blockchain technology (Filimonau & Naumova, 2020).

2.2.2 BLOCKCHAIN IN TOURISM

Tourism industry can benefit from blockchain technology, however, research on the topic is very scarce. Table 3 summarizes the main research focuses addressed in the existing studies within a blockchain tourism research domain.

Current literature mainly focuses on the impacts of blockchain on the tourism industry and the implementation of blockchain technology in the tourism and hospitality sectors. The studies have discussed the potential of the technology to optimize the business distribution channels (Calvaresi et a., 2019; Önder & Treiblmaier, 2018) and contribute to the tourism development in the small island economies (Kwok & Koh, 2018).

Table 3. Previous literature within blockchain tourism research. Source: Own elaboration

Research focus	Reference
Bitcoin use	Leung & Dickinger, 2017
Impacts of blockchain	Barreto et al., 2019; Di Vaio & Varriale, 2020; Dogru et al., 2018; Calavresi et al., 2019; Korze, 2019; Nam et al., 2019; Pilkington, 2017; Rejeb et al., 2019; Tham & Sigala, 2020; Treiblmaier & Önder, 2019; Varelas et al., 2019; Ying et al., 2018
Loyalty program	Udegbe, 2017
Blockchain applications	Antoniadis et al., 2020; Ozdemir et al., 2019; Zeren & Demirel, 2020
Blockchain adoption	Bolici et al., 2019; Nurryev et al., 2020; Valeri, 2020; Valeri & Baggio, 2020
Blockchain implementation	Filimonau & Naumova, 2020; Flecha-Barrio et al., 2020; Kizildag et al., 2019
Disintermediation	Rashideh, 2020

A theory-based understanding of possible impacts of blockchain technology on the tourism industry has been also provided. Thus, based on transaction cost theory, Treiblmaier & Önder (2019) reveal that blockchain technology will at the same time yield cost reduction in some areas and increases in others that will lead to the adaption of organizational and market structures. From the perspective of the resource-based view, blockchain technology is able to impact inter- and intra-

organizational functions and management structures that could finally affect an organization′s competitiveness (Treiblmaier & Önder, 2019). Several studies have addressed the impacts of blockchain technology on medical tourism (Rejeb et al., 2019), smart tourism (Korze, 2019; Nam et al., 2019), and sustainable tourism goals (Tham & Sigala, 2020).The recent studies have examined the scope of potential integration of blockchain technology into the hospitality operations (Filimonau & Naumova, 2020) and have empirically confirmed the low level of blockchain implementation in the hospitality management (Flecha-Barrio et al., 2020). From a view of the diffusion of innovation theory, hospitality and tourism companies are likely to be slow in implementation and adoption of blockchain technology unless "co-creation and sharing platforms business culture with various stakeholders become more and more integral part "of their core operations (Kizildag et al., 2019, p.966).

Due to the possibility of blockchain applications to enhance tourism in different fields (Dogru et al., 2018), some studies have provided a review of the existing DApps and blockchain-based projects in the tourism industry (Antoniadis et al., 2020; Zeren & Demirel, 2020) as well as have proposed a measurement tool for assessing and comparing different applications (Ozdemir et al., 2019).

Empirical research has explored the cryptocurrency adoption from the perspective of both travelers and tourism enterprises. Regarding travelers' ′perceptions towards cryptocurrency use, it was found that travelers did not tend to use bitcoins for online travel product shopping (Leung & Dickinger, 2017). In terms of intention to adopt cryptocurrency payments by the small and mid-sized tourism enterprises, it was revealed that effect of social influence, company′s strategic orientation, and individual characteristics of a manager had a significant effect on the intention to adopt cryptocurrency payments (Nyrryev et al., 2020).

Some studies have empirically confirmed the role of blockchain technology in enhancing a customer loyalty program (Udegbe, 2017), whereas other studies have provided a theoretical framework for the role of blockchain technology in increasing the level of disintermediation in the tourism industry (Rashideh, 2020). Based on the major postulations of agency theory, Kizildag et al. (2019) argue that blockchain technology can facilitate trustworthy business relations between different stakeholders in digital platforms.

Despite different focuses addressed by the studies, the scholarly research on blockchain in tourism is limited in scope and extent (Treiblmaier, 2020). From review of existing literature, it is evident that most studies bear exploratory nature and focus on generically characteristics and possible implications of blockchain technology on the tourism sector. A lack of empirical research is also obvious.

Furthermore, despite its importance, the phenomenon of blockchain adoption receives little attention among the tourism scholars with only few works discussing the possible effects of blockchain adoption in the tourism and hospitality industries (Valeri & Baggio, 2020).

2.3. METHODOLOGY

This research aims at developing a conceptual model of blockchain technology adoption in the tourism sector. Applying the grounded theory method, this study performed a systematic literature review to explore the different aspects of blockchain technology and to reveal the main factors affecting blockchain adoption in tourism. A systematic literature review is acknowledged to be a comprehensive method for identifying, synthesizing, and evaluating the existing studies on a particular topic (Fink, 2005). The scholars proposed different procedures for the

review process (Bandara et al., 2015; Sylvester et al., 2013), yet the most important condition is to find the most appropriate research tool, which helps obtain a comprehensive summary of the literature (Confente, 2015). Recent tourism scholars applied a systematic review to investigate topics such as sustainable smart tourism destinations (Shafiee et al., 2019), virtual reality and augmented reality in tourism (Yung&Khoo-Lattimore, 2019), trust in tourism via blockchain technology (Calvaresi et al., 2019).

This research employed the grounded theory method for conducting a systematic review. Grounded theory is a qualitative research design, which enables to investigate a certain phenomenon through an inductive process that usually produces a theoretical understanding of that phenomenon (Strauss & Corbin, 1990). The method is useful for conducting a comprehensive and theoretical analysis on a specific topic (Wolfswinkel et al., 2013). The grounded theory aims at explaining the phenomenon based on the concepts, categories and propositions, and the correlations between them (Strauss & Corbin, 1990). In this type of research design, a data analysis consists of three main steps: first, open coding that identifies categories, propositions, and dimensions; second, axial coding that examines strategies, conditions, and consequences; and third, selective coding that builds a theory.

Some researchers agree that an effective review produces a solid foundation for the progress of knowledge (Webster & Watson, 2002). Grounded theory was found to be useful not only for describing raw data or theory testing, but also for developing a theory-based or concept-centric framework (Wolfswinkel et al., 2013). Besides, grounded theory lets the researchers build a new theory where the research is limited or new insight is required (Matteucci & Gnoth, 2017).

When conducting a systematic literature review, this study followed a five-step process introduced by Wolfswinkel et al. (2013) (see Figure 1).

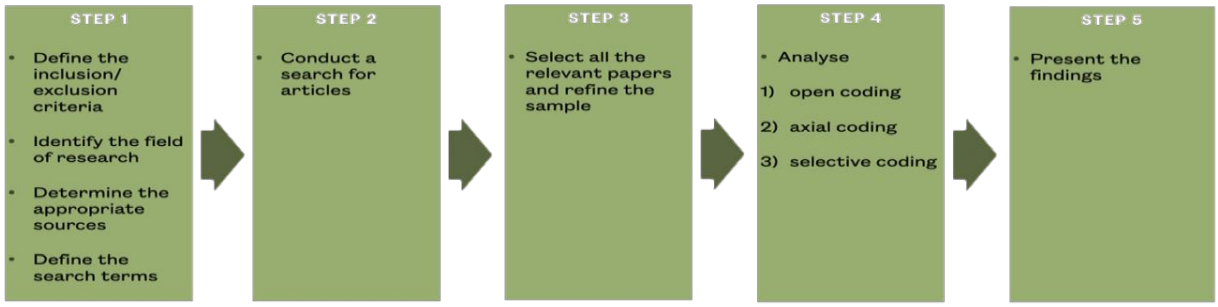

Figure 1. A five-step grounded theory method for literature review. Source: Wolfswinkel et al. (2013)

STEP 1

First of all, the authors defined the criteria for which papers should be included and which papers should be excluded from the analysis. The authors agreed on the following inclusion criteria: 1) papers written in English; 2) papers published from 2017 to 2020 (there were not papers published on the topic prior 2017); 3) papers within a blockchain tourism research domain and with a close semantic relationship with tourism; 4) academic journal papers, conference proceedings, and book sections; 5) full-text papers. Second, the authors identified the fields of research. Due to the limited research on blockchain adoption in the tourism industry, the papers with focus on blockchain technology in general as well as on blockchain adoption and implementation in tourism, hospitality, airline, food, and service industries were included in the further analysis. Third, Google Scholar database was chosen for selection of the relevant articles. Lastly, the search terms were defined. The following search terms were used to find the relevant articles: blockchain in tourism/hospitality/airline/food/service industry, blockchain adoption in

tourism/hospitality/airline/food/service industry. The search was conducted applying the keywords existing in the title, abstract, or body of the papers.

STEP 2

In the second step, a search of articles was conducted. The initial search yielded 55 publications.

STEP 3

In the third step, the titles, abstracts, and keywords were reviewed to select the relevant papers. The irrelevant papers were excluded based on the inclusion/exclusion criteria. After reading full body articles, a final sample of 34 papers was selected for further analysis. The search and selection process is depicted in Figure 2.

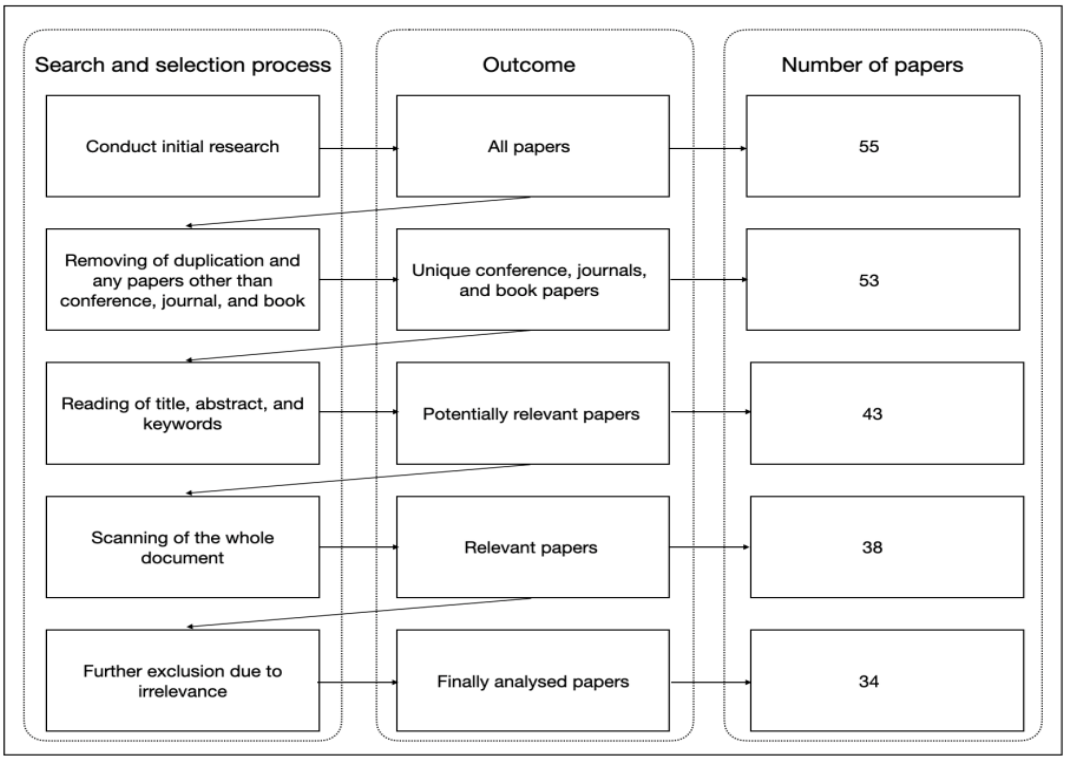

Figure 2. Search and selection process. Source: Own elaboration

STEP 4

In this step all selected papers were analyzed based on the grounded theory method. Three stages of coding - open coding, axial coding, and selective coding - were performed. Atlas.ti was applied for extracting the data and coding.

First, an open coding was conducted in order to identify the core concepts and their characteristics and dimensions. Open coding is applied for identifying, labelling, or making a group of concepts and insights based on the extracted codes (Wolfswinkel et al., 2013). The initial categories of the blockchain adoption in tourism were extracted.

Second, the authors performed an axial coding that is a process through which concepts are disaggregated into their components. Hence, the concepts extracted during the open coding process were selected as categories and other synonymous concepts were linked to them. The categories in axial coding were developed systematically and related to the subcategories. Axial coding results in building a model that will identify the relationship between each of the categories (Shafiee et al., 2019). Based on Strauss and Corbin (1990) we identified the following categories: causal conditions, context conditions, intervening conditions, core phenomenon, actions/interactions, and consequences. In the coding model, the core phenomenon is affected by the causal conditions. The core phenomenon, context conditions, and intervening conditions affect the interactions that have impact on the consequences (Creswell, 2005). Given the research aim, blockchain adoption was selected as core phenomenon. The categories and their related concepts are presented in Table 4.

Table 4. The category, concept, and final codes extracted.

Source: Own elaboration.

Category	Final code extracted	References
Causal conditions	Blockchain benefits	Barrio et al. (2020),Dogru et al. (2018), Pilkington et al. (2017), Karamchandani et al. (2020), Rashideh (2020), Tham and Sigala (2020), Treiblmaier and Önder (2019)
	Bitcoin's wide universality	Leung and Dickinger (2017)
	Increasing interest and investment in blockchain	Kizildag et al. (2019)
	Strategic orientation	Filimonau and Naumova (2020), Nurryev et al. (2020)
Context conditions	High operating cost	Di Vaio and Varriale (2020), Filimonau and Naumova (2020), Korze (2019), Kizildag et al. (2019), Nam et al. (2019), Valeri (2020)
	High energy consumption	Korze (2019), Nam et al. (2019), Tham and Sigala (2020), Valeri (2020)
	Lack of awareness about data security	Erceg et al. (2020), Tham and Sigala (2020)

	Lack of knowledge and expertise about blockchain	Barrio et al. (2020), Calvaresi et al. (2019), Di Vaio and Varriale (2020), Karamchandani et al. (2020), Kizildag et al. (2019), Korze (2019), Leund and Dickinger (2017), Nam et al. (2019)
	Access to the internet via mobile telephony	Barreto et al. (2019)
	Blockchain technical issues	Barrio et al. (2020), Filimonau and Naumova (2020), Kizildag et al. (2019),Korze (2019), Nam et al. (2019), Valeri (2020)
	Network infrastructure	Barreto et al. (2019), Di Vaio and Varriale (2020), Erceg et al. (2020), Filimonau and Naumova (2020), Kizildag et al. (2019), Pilkington (2017)
Intervening conditions	Government regulation	Barreto et al. (2019), Ćirić and Ivanišević (2018), Erceg et al. (2020), Filimonau and Naumova (2020), Kizildag et al. (2019), Varelas (2019)
	Collaboration among all stakeholders	Antoniadis et al. (2020), Barreto et al. (2019), DI Vaio and Varriale (2020), Kizildag et al. (2019), Tham and Sigala (2020)

Actions/Interactions	Access to bitcoin account for small merchants	Barreto et al. (2019)
	Fast and secure use of cryptocurrency payments for travel-related services	Antoniadis et al. (2020), Barrio et al. (2020), Bodkhe et al. (2019), Erceg et al. (2020), Dogru et al. (2018),Filimonau and Naumova (2020), Karagoz Zeren and Demirel (2020), Kizildag et al. (2019), Kocic and Popovic (2018), Korze (2019), Leung and Dickinger (2017), Nam et al. (2019), Pilkington (2017),Rashideh (2020), Rejeb and Rejeb (2019), Valeri (2020), Willie (2019)
	Use of coins and tokens as rewards	Nam et al. (2019), Pilkington et al. (2017)
	Possibility of fundraising	Antoniadis et al. (2020), Tham and Sigala (2020)
	Cryptocurrency creation	Kocić and Popović (2018),Ying et al. (2018)
	Authenticate customer reviews	Bodkhe et al. (2019), Filimonau and Naumova (2020), Kizildag et al. (2019), Pilkington (2017), Rejeb and Rejeb (2019)
	Avoid overbooking and double booking	Bodkhe et al. (2019), Varelas (2019)

Use of digital ID	Bodkhe et al. (2019), Dogru et al. (2018), Kizildag et al (2019), Korze (2019)
Enhance loyalty programs and reward systems	Antoniadis et al. (2020), Bodkhe et al. (2019), Dogru et al. (2018), Erceg et al. (2020), Filimonau and Naumova (2020),Karagoz Zeren and Demirel (2020), Kizildag et al. (2019), Korze (2019), Nam et al. (2019), Pilkington (2017), Rejeb and Rejeb (2019),Udegbe (2017), Valeri (2020)
Improve service quality	Karamchandani et al. (2020), Kizildag et al. (2019), Korze (2019), Willie (2019)
Enable tourism products and activities traceability	Baralla et al. (2018), Dogru et al. (2018), Filimonau and Naumova (2020),Pilkington (2017), Rejeb and Rejeb (2019),Tham and Sigala (2020), Willie (2019)
Track luggage	Bodkhe et al (2019), Korze (2019), Rejeb and Rejeb (2019), Valeri (2020)
Share sensitive informations	Kocić and Popović (2018), Pilkington (2017), Shrestha (2017), Willie (2019)

	Provide best deals	Pilkington et al. (2017), Rejeb et al. (2019), Varelas (2019)
	Disintermediate hospitality and tourism operations	Antoniadis et al. (2020), Filimonau and Naumova (2020), Kizildag et al. (2019), Polukhina et al. (2019), Rejeb et al. (2019), Rejeb and Rejeb (2019), Ying et al. (2018)
Consequences	Attracting visitors to the destinations that lack comparative advantage	Antoniadis et al. (2020)
	Reshaping the tourism industry and promoting tourism development	Antoniadis et al. (2020), Kizildag et al. (2019), Korze (2019), Rashideh (2020), Rejeb and Rejeb (2019), Treiblmaier and Önder (2019), Willie (2019)
	Medical tourism development	Pilkington (2017), Rejeb et al. (2019)
	Smart tourism development	Antoniadis et al. (2020), Kizildag et al. (2019)
	Contributing to the successful competitiveness and development of SMEs	Nurryev et al. (2020), Treiblmaier and Önder (2019)
	Reducing poverty	Barreto et al. (2019), Pilkington et al. (2017)

Enhancing tourist experience	Dogru et al. (2018), Erceg et al. (2020), Rejeb and Rejeb (2019), Willie (2019

Third, a selective coding, where the categories are integrated and improved to formulate a theory (Shafiee et al., 2019), was performed. The authors integrated the categories, secondary categories, and their relationships and developed the primary theoretical model based on the obtained data. A summary of three coding processes is shown in Table 5.

Table 5. A summary of coding processes. Source: Own elaboration.

Step	Coding type	Process	Result
1	Open coding	Primary coding of papers	Registering 209 open codes
2	Axial coding	Identifying and determining main categories	Developing six main categories
		Making relationships between main categories and sub-categories	Developing 35 sub-categories
		Extracting the main categories and defining the relationships	Primary structure of the model

3	Selective coding	Evolution and interpretation of the theory	Proposing the model

STEP 5

In this step we present the findings. The authors elaborated a conceptual model for blockchain adoption in the tourism industry based on the analysis of the blockchain characteristics and impacts on the tourism sector. Figure 3 depicts a conceptual model for blockchain adoption in tourism.

In the present model, the core phenomenon is blockchain adoption. The concepts related to blockchain adoption are grouped in the causal conditions section. All the interactions that are obtained from blockchain adoption in tourism are classified in the actions/interactions section. The context and intervening conditions affect the interactions. The results of blockchain adoption are defined in the consequences section.

An analysis of the articles revealed the following causal conditions that contribute to blockchain adoption in the tourism industry: blockchain benefits, bitcoin′s wide universality, increasing interest and investment in blockchain tourism projects, and strategic orientation of the tourism enterprises. Among intervening conditions of blockchain adoption are government regulation and collaboration among all stakeholders including governments, destination management organizations, tourism service providers, and researchers. The lack of regulatory policies slows the adoption of blockchain in many countries. In addition, the focus should be emphasized on the context conditions for adopting blockchain in the tourism industry. Economic, educational, and technical factors have been found to be the

most important conditions for blockchain adoption. High operating cost and high energy consumption are classified as economic conditions; lack of awareness about data security and lack of knowledge and expertise about blockchain are categorized as educational conditions; access to the internet via mobile telephony, blockchain technical issues, and network infrastructure are categorized as technical conditions. Without meeting these conditions, adoption of blockchain technology in tourism will be quite a slow process. According to analysis, the interactions obtained from blockchain adoption were classified as economic and social actions. Regarding economic actions, blockchain adoption enables access to cryptocurrency accounts for small merchants who don′t have a traditional bank account; fast and secure payments for travel-related services; use of coins and tokens as rewards; possibilities for fundraising; cryptocurrency creation by the tourism destinations themselves; hospitality and tourism disintermediation that results in cost reduction. Regarding social actions, blockchain adoption makes it possible to authenticate customer reviews, fast identification and verification using digital ID, enhance loyalty and rewards programs, improve service quality, trace tourism products and activities, provide best deals for the tourists, track luggage, and share sensitive information about the tourists. Finally, blockchain adoption will result in reshaping the tourism industry and promoting tourism development, attracting visitors to less competitive destinations, developing smart tourism and medical tourism, contributing to the successful competitiveness of small and medium tourism enterprises, reducing poverty, and enhancing tourists ′experiences.

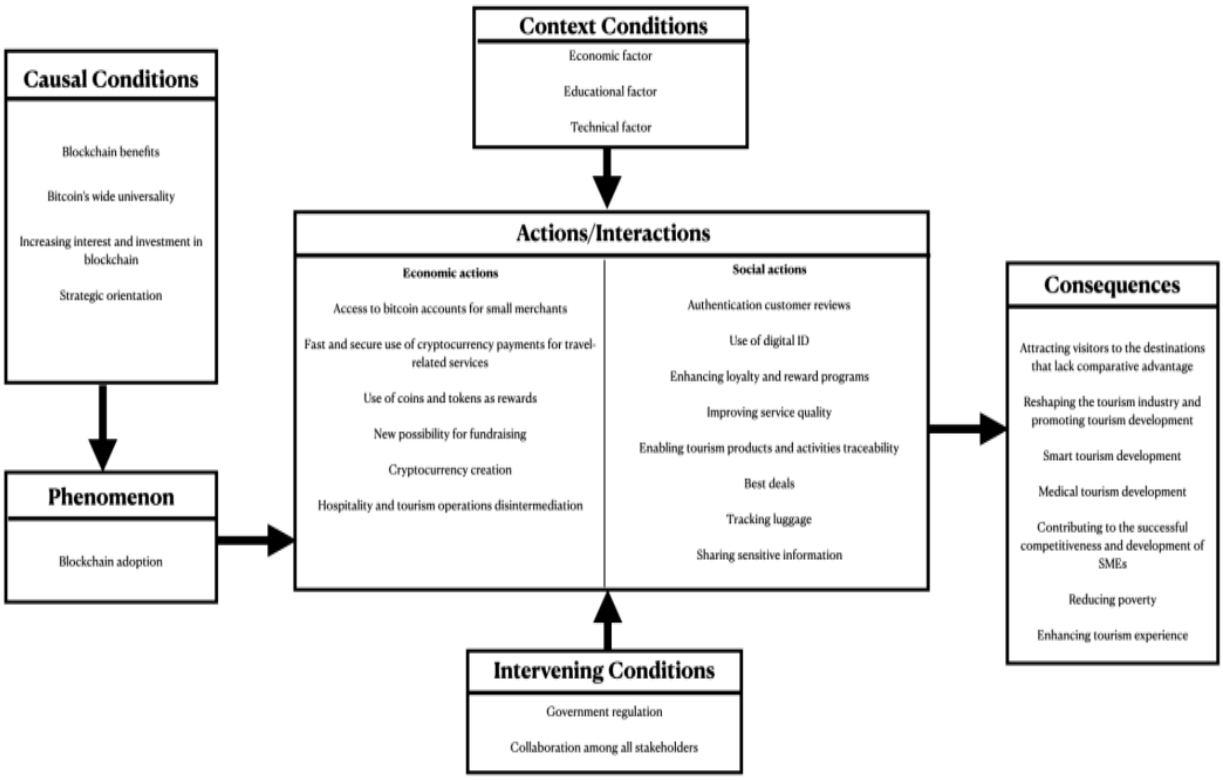

Figure 3. Conceptual model of blockchain adoption. Source: Own elaboration

2.4. IMPLICATIONS

Kizildag et al. (2019) admit that a conceptualization of the functionalities of blockchain adoption is valuable to both academics and practitioners. Addressing this issue, our study makes significant theoretical and practical contributions. From a theoretical perspective, the main contribution lies in presenting a conceptual model for blockchain adoption in the tourism industry. Our model contributes to the body of knowledge within a blockchain tourism research and enhances understanding regarding important factors affecting blockchain adoption. Additionally, our model summarizes the consequences resulting from the adoption of blockchain technology, and therefore, extends the few existing studies, which addressed the possible effects of blockchain adoption in the hospitality and tourism sectors (Valeri, 2015). Also, by defining the casual, contextual, and intervening conditions, this research enables

the academics to understand the necessary conditions for fostering blockchain adoption within the tourism industry. Furthermore, our proposed model provides avenues for future academic research. As such, the researchers can explore the impact of each factor influencing adoption of blockchain technology and empirically test the model to validate it.

From a practical perspective, the model provides value to the stakeholders, including destination managers, tourism enterprises managers, tourism marketers, and policymakers. Identifying the factors influencing blockchain adoption may help develop a necessary infrastructure for embracing blockchain technology within the tourism sector. Understanding the importance of government support and regulatory policies, the policymakers may issue laws favorably regulating cryptocurrency use that will affect widespread adoption of blockchain technology. Defining the advantages and benefits resulted from blockchain adoption, not only major companies, but also small and mid-sized tourism enterprises can decide whether they should invest in blockchain adoption or not.

2.5. CONCLUSION

This study tries to move forward blockchain tourism research and primarily focuses on blockchain adoption. The study conducted grounded theory method-based literature review of the studies within a blockchain tourism domain and through identifying causal, contextual, intervening conditions, actions, and consequences proposed a conceptual model for blockchain adoption in tourism.

The research provides value for both academics and practitioners providing venues for future research and highlighting the important conditions necessary for blockchain adoption. Based on the proposed model, the stakeholders interesting in

blockchain adoption can enhance the awareness and understanding regarding the technology, its benefits, and crucial factors affecting its adoption.

Since the research on the topic is very scarce, the study extends the existing literature. Regarding future studies, the scholars can analyze the causal relationships between variables and assess real benefits of blockchain adoption.

However, this study bears some limitations. First, the research used data from the selected papers only. Second, the results were obtained through a qualitative systematic review, and were not confirmed quantitatively. Third, a theoretical model was proposed without empirical testing and validating. Therefore, future studies are encouraged to empirically validate the proposed model as well as investigate other conditions, actions, and consequences that have not been explored in the present research because of practical limitations.

CHAPTER 3

THE BENEFITS OF BLOCKCHAIN FOR MEDICAL TOURISM

3.1. INTRODUCTION

Medical tourism is a rapidly boomed trend in tourism that has recently gained enormous popularity. Each year more and more individuals travel abroad to receive health care services. Despite the difficulty to confirm exact statistics for medical tourism, the number of medical tourists worldwide in 2019 was estimated at 23,043 thousand and was expected to reach 70,359 thousand by 2027 (Allied Market Research, 2020). According to a report published by (Allied Market Research, 2020), the global medical tourism market was valued at USD 104.68 billion in 2019 and was projected to reach USD 273.72 billion by 2027. However, these projections are likely to go down in light of the COVID-19 pandemic. Among the dominant factors contributing to the recent growth of the medical tourism industry are affordable health care technologies (Connell, 2013), cost-effective transportation facilities (Fetscherin & Stephano, 2016) as well as an increased level of promotion by countries as medical tourism destinations (Moghavvemi et al., 2017). The number of countries marketing themselves as medical tourism destinations has significantly grown since this new sector represents a lucrative economic opportunity for such destinations (Hopkins et al., 2010).

The important role of information technologies in the tourism industry is undeniable (Koo et al., 2015). With the rapid digitization of healthcare, medical tourism destinations and medical service providers may use technological innovations for

providing personalized healthcare delivery services and attracting new tourists. Internet has been revealed as playing an important role in providing information for the prospective medical tourists and connecting them with the healthcare providers (Lunt & Carrera, 2011). Prior research has confirmed that there are information systems that can be profitably integrated into medical tourism, such as destination management organizations websites (Qi, Law, & Buhalis, 2008), electronic health record systems (Rezaei-Hachesu et al., 2017), or point-of-sale systems for cosmetic services (Cosmetisuite, 2019).

Blockchain technology is perceived as a foundational technology since potentially new social and economic systems can be based on blockchain (Iansiti & Makhani, 2017). Recently, blockchain technology and cryptocurrencies have become hot topics in tourism and hospitality research. However, in regard to medical tourism research, there exists only a handful of published articles analyzing the impacts of blockchain technology on medical tourism. Focusing on several blockchain's features, (Rejeb, Keogh, & Treiblmaier, 2019) address some open questions in medical tourism regarding patient-doctor trust, procedure and risk transparency, and medical record privacy. Innovative technology such as blockchain can enable the continuous growth of medical tourism. Pilkington (2017) states that blockchain technology can allow promotion of decentralized travel solutions and better management of electronic health record systems, help create smarter medical devices, and assist to issue tamperproof medical certificates. Esposito et al. (2018) study the potential of blockchain technology to protect healthcare data hosted in a cloud-based environment. Parekh et al. (2021) reveal that blockchain technology can ensure disintermediation in the medical tourism industry, increase clarity in communication, trust and transparency, mitigate a key challenge of cost rising, and facilitate collaboration between the stakeholders. Çapar (2020) focuses on the

importance of cryptocurrency use in the medical tourism industry and statistically confirms the positive correlation between the use of cryptocurrencies and intentions of medical tourists. Yet, further academic research is needed to provide full understanding of the impacts of blockchain technology on medical tourism. There are two main stages in medical tourism: pre-procedure and post-procedure. Ayuningtyas & Ariwibowo (2020) have emphasized the information technologies ' strategic role in medical tourism in terms of assisting the tourists in both the pre-procedure and post-procedure of medical tourism. However, the benefits of blockchain technology for pre-procedure and post-procedure have not been addressed in the previous literature.

Therefore, the authors of this paper intend to conceptualize the benefits of blockchain technology for the pre-procedure and post-procedure of medical tourism. Önder & Gunter (2020) emphasizes that it is crucial to focus on how blockchain technology can be used for the benefit of consumers and suppliers. This conceptual paper aims to extend the previous research and contribute to the existing literature regarding the benefits of blockchain technology for medical tourism, specifically for pre-procedure and post-procedure.

The rest of the paper is organized as follows. The second section provides a literature review on medical tourism, the role of information technology in medical tourism, and blockchain technology. The third section presents the possible benefits of blockchain technology for medical tourism. The fourth section resumes the challenges of medical tourism in light of the pandemic and outlines the opportunities for blockchain use. Finally, the last section presents main conclusions and future work.

3.2. LITERATURE REVIEW

3.2.1 MEDICAL TOURISM

Medical tourism, which included traveling abroad for healthcare benefits, existed several centuries ago. In the 18–19th century, many people from Europe traveled to remote locations to use spas regarded as having health-enhancing properties (Ramos & Untong, 2014; Smith & Puczkó, 2008). Travelers from different locations looking for health improvement have visited India in order to practice Yoga and Ayurveda healing techniques that have been popular for 5000 years. In Japan, mineral springs have attracted people travelling for medical purposes for over 1000 years (Pilkington, 2021). So far, as popularity of worldwide travel is growing, more and more people are traveling abroad and aligning their trips with healthcare services.

In early 2000s, medical tourism has emerged as a new niche in the tourism industry. Among the factors that favorably contributed to the emergence of a new form of tourism were high costs and long waiting lists at home country, innovative technologies and skills in destination countries, reduced transport costs, and Internet marketing (Connell, 2006). The concept of medical tourism is comparatively new and does not have a unique definition. Though different definitions of the concept have been provided (Table 6), the literature agrees that medical tourism takes place when an individual travel abroad in order to receive specific medical services.

Table 6. Definitions of medical tourism.

Reference	Definitions
Connell, 2006	"Medical tourism has emerged from the rapid growth of what has become an industry, where people often travel long distances to overseas countries to obtain medical, dental and surgical care while simultaneously being holidaymakers, in a more conventional sense"
Hung et al., 2010	"Vacation that involves travelling across international borders to obtain a broad range of medical services. Medical tourism usually includes leisure, fun, and relaxation activities as well as wellness and health-care service"
Keckley, 2008	"The act of travelling abroad to obtain medical care"
Lunt & Carrera, 2011	"Medical tourism takes place when individuals opt to travel overseas with the primary intention of receiving medical treatments"
Bookman & Bookman, 2007	"International travel with the aim of improving one's health"
Balaban & Marano, 2010	"Medical tourism refers traveling to a remote country with the purpose of availing medical facilities"

The scholars undertook research on medical tourism from different perspectives and within a variety of contexts. Goodrich & Goodrich (1987), in one of the earliest academic studies in the field, indicated that the concept of medical tourism could be used as an effective marketing strategy. Some studies attempted to explain the

importance of medical tourism. For example, Pocock & Phua (2011) identified medical tourism through a conceptual framework comparing implications for health sectors in Malaysia, Singapore, and Thailand. Connell (2006) argued that medical tourism would continue to grow because of privatization and cost differentials between states. Heung & Kucukusta (2010) proposed a theoretical framework for the study of medical tourism emphasizing demand and supply perspectives. Other studies expressed concern regarding potential biosecurity and nosocomial risks associated with international medical tourism (Hall & James, 2011; Hall, 2015). Empirical studies investigated the profiles of medical tourists and examined the behavioral intentions. For instance, Han & Hyun (2015) explored the links among perceived medical and service quality, satisfaction, trust, and price reasonableness and their effect on the medical tourists ′intentions. A recent study by (Cham et al., 2021) investigated the impacts of country-specific and social factors on perceived value and the intention to revisit of Chinese medical tourists.

Medical tourism literature highlights several crucial motivational factors affecting the individuals ′decision to seek medical treatment abroad as follows:

- Lower cost. Some medical services provided by overseas healthcare service providers may be cheaper than the services available in the tourist′s home country (Ferrer & Medhekar, 2017).

- Quality. Some healthcare service providers are perceived to be of high quality because they account for hospitals and doctors with global benchmarking and affiliation (Burns, 2014).

- Reduced waiting time. Within medical tourism destinations, the healthcare services are available in a timelier manner that attract the tourists who wish to avoid long waiting times (Macready, 2007; Parekh et al., 2021).

- Availability and accessibility. As the medical tourism market grows, new treatments become available for the tourists. In addition, some treatments that are illegal at the medical tourist′s home country, are accessible in a foreign medical tourism destination (Pilkington, 2021).

- Regulation. Existence of the legal jurisdictions regulating the access to healthcare procedures promotes medical tourism (Mudur, 2003).

Although medical tourism plays an important role in meeting the medical tourists ′ sensitive and critical needs and desires, uncertainty still resides in every stage of the medical tourism process including pre-procedure and post-procedure (Rejeb et al., 2019). For instance, at the pre-procedure stage, tourists usually look for medical tourism intermediaries who help prepare and arrange tourists ′itineraries. However, many intermediaries are not externally evaluated or officially authorized (Connell, 2006) and provide some unreliable, ineffective, and/or poor-quality medical services. At the post-procedure stage, tourists often have to follow up post-treatment routine either in the same international hospital or in a local one. As a result, the hospitals digitize medical records and share them with all interested parties. It is very important to emphasize privacy and security issues resulting from digitization and sharing of medical records (Rejeb et al., 2019). To ensure the sustainability of medical tourism, it is necessary to cultivate and advance the growth of a more trusted and transparent medical tourism segment. The stakeholders should re-design their medical tourism processes and acquire the full benefits of information technologies that can contribute to the better medical tourism experience (Kellermann & Jones, 2013).

3.2.2 MEDICAL TOURISM AND INFORMATION TECHNOLOGY

Medical tourism is deeply connected with globalization and the information technology revolution that has eased information availability to prospective medical tourists (Bookman & Bookman, 2007). Undoubtedly, the Internet plays an important role in the medical tourism industry through facilitating the access to relatively objective and trustworthy information (Lai & To, 2015). Recently, more and more tourists search Internet in order to collect information regarding medical tourism destination, healthcare provider, and available medical treatments before they decide to travel overseas (Zahra et al., 2013). Websites, informational pages, social media sites are among the most popular mediums of information about medical tourism and healthcare. Social media sites enable the creation and sharing of user-generated content (Karimov et al., 2021). Using social media, the individuals can share their medical tourism experiences; from the other side, the prospective tourists can find the necessary information, which they perceive as reliable and trustworthy.

Due to the development of innovative technologies, the medical tourism industry has turned into more customer-oriented industry, where healthcare service providers are constantly seeking new approaches to enhance customer satisfaction (Ring et al., 2018). Online medical tourism agencies have appeared in the market; they perform the role of middlemen between a medical tourist and healthcare service provider by offering transparency and security (Lee & Fernando, 2015) and are responsible for everything the tourists need or require during the different phases of medical tourism. Another innovation is electronic health records that provide doctor transparency to their medical tourists ′healthcare records regardless of their location. Moreover, information technologies are used for developing different applications,

for instance, application for remote monitoring the tourists ′condition or application for medicine reminding (Ayuningtyas & Ariwibowo, 2020).

Healthcare providers have to follow technological innovations in order to compete within the scope of medical tourism and facilitate compliance with them (Mazambani & Mutambara, 2019). Among the modern technologies are Internet of Things (IoT), automation, robotics, virtual reality, artificial intelligence, cloud solutions, big data analytics; these technologies enable the healthcare service providers to streamline processes, synthesize information, and provide updates in real time (Wong & Hazley, 2021). Blockchain technology is a new promising technology that is expected to significantly impact the medical tourism industry (Rejeb et al., 2019). Several medical tourism destinations have accepted blockchain based cryptocurrencies and their transactions as their priority to gain the competitive advantage in terms of security and transparency (Çapar, 2020).

The literature argues that blockchain technology has a potential to address some challenges within the sector of medical tourism. As such, Rejeb et al. (2019) point out that blockchain technology is able to change power relationships among key players of the medical tourism industry, enable informed decisions in the selection of the medical tourism destinations, improve and secure the flow of medical information, and ensure a permanent availability of the procedural interventions, transactions, and entire medical history. Furthermore, Esposito et al. (2018) focus on the secure keeping and management of healthcare data emphasizing that blockchain can be effectively used as a database for all medical data or as a storing place of all hashes of medical data that are kept outside blockchain in a conventional or distributed database. Çapar (2020). argues blockchain based cryptocurrencies and transactions positively affect medical tourism in terms of protecting stakeholders

from monetary risk, facilitating access to medical services, providing evidence in a possible malpractice case, and increasing competitive advantage.

3.2.3. OVERVIEW OF BLOCKCHAIN TECHNOLOGY

Blockchain technology has received enormous attention since its first application, the cryptocurrency Bitcoin, became successful and popular on the global marketplace. Proposed in 2008 by the presumed anonymous Satoshi Nakamoto, Bitcoin cost around $0.10 USD in 2009, reached the point of $20,000 USD in December 2017, and hit a new high of more than $44,000 in February 2021. In the paper "Bitcoin: A Peer-to-Peer Electronic Cash System" Nakamoto introduced electronic cash enabling online payments to be sent directly from one party to another without intermediaries (Nakamoto, 2008). Though many people see blockchain linked to Bitcoin, blockchain technology is applicable to any digital asset transaction exchanged via Internet (Crosby et al., 2016). Bitcoin′s success has led to the exponential growth of crypto market with more and more new cryptocurrencies. Although blockchain technology has been mainly implementing in the financial sector, it is finding new range of applications in other sectors and industries as health, governance, and tourism (Davidson et al., 2016).

Blockchain is a distributed database of chronological transactions stored on the blocks that are attached to each other. All information is duplicated and deployed among multiple computers, called nodes, in the blockchain network. All participants should agree in whether transactions are trustworthy and should be added in the blockchain (Davidson et al., 2016). Besides, all nodes are encouraged to check the correctness of each new transaction. Since modifying and deleting the already entered records require enormous efforts, the data can be deemed secure. Every

following block accommodates a hash number generated from the transaction information and also a hash number of the previous block. The hash number differs if any modifications are made, thus letting easily spot any alterations in the blocks and more accurately track the data (Seffinga et al., 2017). A typical blockchain work process is depicted at Figure 4.

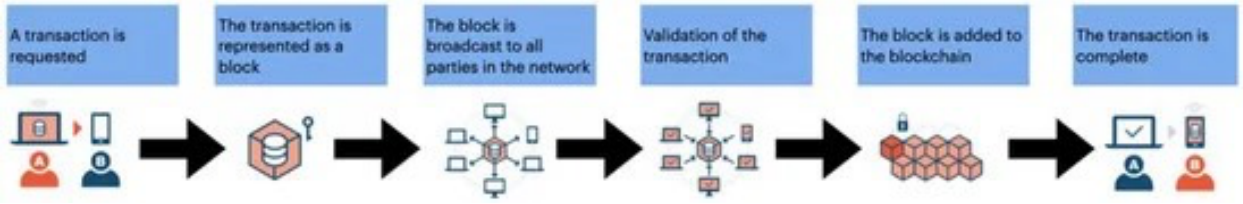

Figure 4. A typical blockchain work process (Zignuts, 2018).

When a transaction is requested, it is converted into a hashed block, which contains information regarding date/time, sender, receiver, asset type, and quantity, and stored as candidate to be printed on the ledger (Paschen & Boon, 2019). Then, the block is broadcast to a network of all nodes for its validation. Once validated, the block is added to the chain of blocks, which finalizes the transaction completion.

Blockchain technology has a potential to revolutionize many industries due to its specific characteristics. Among the key advantages of blockchain technology are:

- Disintermediation. The peer-to-peer nature of blockchain eliminates the need of having a central authority.
- Data integrity. Any data that is added to the blockchain cannot be modified or deleted, which finally provides a very high level of security.
- Traceability. All data can be traced to authenticate their origin and path.

- Security. The block encryption in the chain and providing a unique identity for each user of blockchain assure the high range of security.

- Faster processing. In comparison with the traditional banking process that usually takes around three days to process a transaction, blockchain technology significantly reduces the processing time, which can take only minutes or even seconds.

- Reduced costs. Costs can be cut because of the elimination of the intermediaries.

- Trust. All users of blockchain can trust each other and deal directly with each other.

Despite the advantages, blockchain technology also accounts for some disadvantages:

- Energy use. Mining blocks and keeping a real-time ledger consumes enormous amount of energy. The energy consumption of only Bitcoin miners in a particular year was more than the per capita energy consumption of an individual country.

- High operating costs. Small scale companies consider operating Bitcoin as unprofitable.

- Uncertain regulatory status. Lack of regulation hinders the acceptance and wide use of cryptocurrency by the preexisting financial institutions.

With regard to the types of blockchain, there are two types: public and private. Public blockchain is for everyone and anybody in the chain can participate in the consensus-making process. Private blockchain is for a closed community keeping the transactions that are of interest to only members of that chain. Another form of private blockchain is the federated or consortium model that is characterized by pre-

selected nodes, which control the consensus process. The major differences between public and private blockchain are summarized in the Table 7.

Table 7. Differences between public and private blockchain (Iredale, 2021).

	Public Blockchain	**Private Blockchain**
Access	Anyone	Single organization
Authority	Decentralized	Partially decentralized
Transaction	Slow	Fast
Consensus	Permissionless	Permissioned
Immutability	Full	Partial
Data handling	Read and Write access for anyone	Read and Write access for a single organization
Efficiency	Low	High

3.3. BENEFITS OF BLOCKCHAIN TECHNOLOGY FOR MEDICAL TOURISM

This section elaborates on the benefits of blockchain technology for pre-procedure and post-procedure of medical tourism. The benefits of blockchain technology for medical tourism are summarized in the Figure 5.

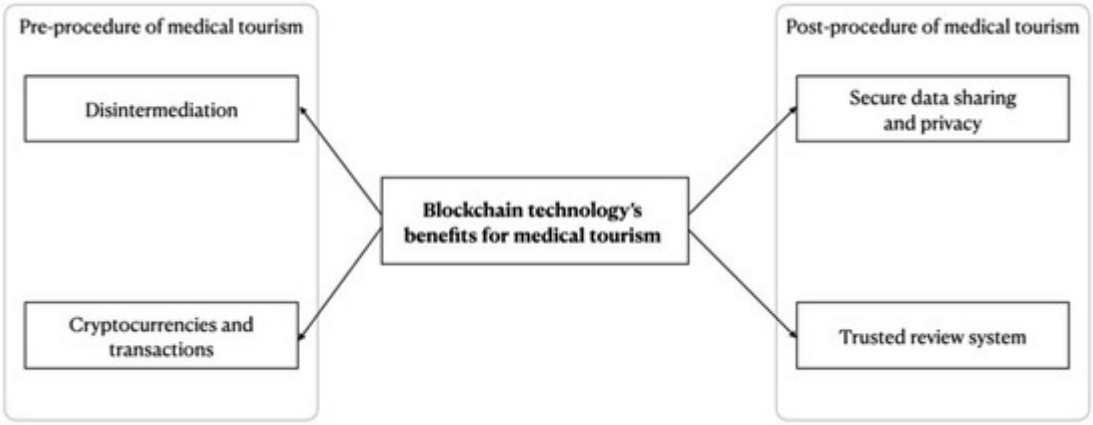

Figure 5. Benefits of blockchain technology for medical tourism.

3.3.1 BLOCKCHAIN BENEFITS FOR PRE-PROCEDURE OF MEDICAL TOURISM

Pre-procedure is the first phase of medical tourism, which involves preparation by a medical tourist to receive medical service (Keckley, 2008). The phase consists of several important stages as finding information, finding medical tourism facilitator, finalizing logistics and course of action, pre-medical check-up, and medical intervention. Blockchain enabled disintermediation and blockchain based cryptocurrencies and transactions can facilitate some stages of pre-procedure of medical tourism.

Disintermediation. With the growth of medical tourism market, many travel agencies turn into medical tourism facilitators that play the role of the intermediaries between the medical service providers and the medical tourists (Connell, 2006). The medical tourists often cannot assess the suitability and quality of a medical tourism destination, and therefore, have to find and rely on the medical tourism facilitators to answer queries and arrange their itineraries (Rejeb et al., 2019). Meanwhile, the

medical tourists have to contract the medical tourism packages at higher prices than actual cost of the medical service providers (Rejeb et al., 2019) and are limited to the available options due to the medical tourism facilitator's affiliation with certain medical providers (Herrick, 2007). Another question is related to whether the medical tourism facilitators are legally accountable for any failures resulted from medical services (Connell, 2011). Blockchain technology can significantly lessen the power of the medical tourism facilitators or effectively remove them due to its ability to build trust, ensure more secure information exchange, reduce costs, and enable transparency (Tyan et al., 2021). Hence, blockchain technology can enable the medical tourists to directly communicate with the medical service providers. As for the medical service providers, blockchain technology opens up equal possibilities for attracting the prospective medical tourists by the biggest hospitals as well as new and less popular medical service providers. Blockchain technology ensures the origin, quality, and transparency of the data, so the medical tourists could verify the medical service providers 'qualifications and certifications and be assured that the procedural costs are same for all.

Cryptocurrencies and transactions. Blockchain based cryptocurrencies and transactions can facilitate the logistics that has to be finalized in the pre-stage of medical tourism. Cryptocurrencies facilitate easy, direct, and safe peer-to-peer transactions without the need for a trusted third party (Kizildag et al., 2019). Therefore, both medical tourists and medical service providers could benefit from secure payments, easy use, rapid processing, reduced waiting times, and secure archiving of health records (Çapar, 2020). In addition, cryptocurrencies and transactions provide efficiency in international transfer with neither storage cost, nor transfer fee (Skiba, 2017)] to the medical tourists and a competitive advantage to the medical service providers (Till et al., 2017).

3.3.2 BLOCKCHAIN BENEFITS FOR POST-PROCEDURE OF MEDICAL TOURISM

Post-procedure is the second phase of medical tourism that involves post-operative care and follow-up care of the medical tourists (Keckley, 2008). This phase consists of the following stages: monitoring for complication, physical therapy and progress check, follow-up care, medicine instruction and post-treatment leisure, dues clearance and return home, and follow-up care by local healthcare provider. Blockchain technology can be used as a secure database for the medical tourists ′ health records as well as a trusted review system.

Secure data sharing and privacy. Effective and secure exchange of medical records is important for post-operative care and follow-up care of the medical tourists. Blockchain technology can enable an effective and fast sharing of health data among the medical tourists, foreign medical service providers, local medical service, and other stakeholders (Linn & Koo, 2016). Blockchain technology can be used as a perfect database for recording, maintaining, and managing the medical tourists ′health data as well as the prescribed medications. The interoperability of blockchain system enables the medical tourists to access their health history and records through the decentralized system. In addition, healthcare providers can share data concerning a medical tourist to maintain the continuum of care (Stephano, 2019). Due to its characteristics as immutability and traceability, blockchain technology ensures the integrity of medical information. Neither medical service provider, nor medical tourists can change or delete the inserted records. In addition, with regard to privacy issues, blockchain technology enables the medical tourists to maintain control over their medical records (Alleman et al., 2010). Therefore, the medical tourists decide on which information, with whom and how they want to share (Lenz, 2019). The medical tourists ′privacy concerns are likely to tend to

reduce, since they have full knowledge of the flow and use of their personal information (Milne, 2000).

Trusted review system. Prospective medical tourists often search reviews when selecting a medical tourism destination or medical service provider. Meanwhile, the medical tourists who already received a medical service tend to leave reviews regarding their experiences. Empowering trusted review system, blockchain technology has potential to assure the trustworthiness and authenticity of the reviews. Blockchain technology is able to provide a unique private key for each identity with several independent verification processes integrated into the review systems (Kizildag et al., 2019). This could ensure the reduced rates of manipulation or duplication of reviews (Tyan et al., 2021). Some medical tourists do not write reviews since they do not want somebody to recognize them. However, this issue can be tackled by blockchain technology, which is able to maintain anonymous the reviewers. In addition, blockchain based review systems can reward coins or tokens to the medical tourists who leave reviews and share their experiences.

3.4. LIMITATIONS OF BLOCKCHAIN TECHNOLOGY IN MEDICAL TOURISM

Blockchain technology has limitations that must be considered when applying in the medical tourism sector.

One of the major limitations is related to the storage and management of data. The data integrity characteristic of blockchain results in immutability, so any data, once entered blockchain, cannot be deleted or modified. However, since healthcare data are under the protection of privacy laws, they must be erased if the medical tourists request it (Esposito et al., 2018). Therefore, anyone intending to use blockchain to store healthcare data must think twice before doing it. In addition, while blockchain

can be perfectly used as a database recording the medical tourists ′data, it is not suitable for storing the large volumes of data or high velocity data because of the massive redundancy from many processing nodes holding a full copy of all data (Staples et al., 2017). To overcome this limitation, only a hash or other meta-data can be saved on blockchain, whereas primary data are stored off-chain (Esposito et al., 2018). In addition, if the hacker transactions take place, that will be very hard to undo (Irannezhad & Mahadevan, 2020).

Though blockchain preserves anonymity and privacy, the security of assets/data depends on protecting the private key, which is a form of digital identity. If one′s private key is lost or stolen, no third party can recover it, meaning assets/data vanishment (Efanov & Roschin, 2018). To protect a private key, it is necessary to interconnect the identity management of every chain with another blockchain-based biometric data set (Li et al., 2020).

Another limitation of blockchain use lies in lack of standardization of blockchain architectures. This can impede the establishment of business connections between healthcare providers by implementing blockchain architectures because of the difficulties of integrating different architectures (Paschen & Boon, 2019).

In addition, regulation constrains in medical applications prevent the rollout of smart contracts in several countries (Paschen & Boon, 2019).

Lastly, there is always a sustainability issue regarding the electricity waste. Blockchain systems will continue to require more electricity than a centralized, non-replicated database (Staples et al., 2017).

However, professionals and stakeholders are making efforts to overcome these limitations of blockchain technology. Recent developments in regulatory easing, collaborations between organizations, and the development of more efficient

blockchain architectures are some examples that can help foster blockchain adoption (Schatsky et al., 2018).

3.5. OPPORTUNITIES FOR BLOCKCHAIN USE DUE TO COVID-19 PANDEMIC

The outbreak of COVID-19 pandemic has tremendously affected the human population and almost every sector and industry. Medical tourism industry is impacted globally in different ways. Many countries have restricted the movements and have imposed lasting lockdowns, curfew, and other social distancing measures. Most flights, including those to the popular medical tourism destinations, have been canceled, local and intercity traffic has come to a halt, and many tourism-related businesses (hotels, restaurants, attractions) have been closed (Önder & Gunter, 2020). Healthcare system in the medical tourism destinations is also highly affected by COVID. Instead of providing hospital rooms or treatment units for the international medical tourists, many hospitals have had to treat COVID cases and develop COVID recovery units (Sharma et al., 2020). Most hospitals could perform only emergency procedures; other non-essential procedures have been postponed or canceled. Furthermore, the safety measures against COVID undertaken by a healthcare provider are crucial for the high reputation and competitiveness perceived by the international medical tourists (Milne, 2000).

However, despite the challenges of pandemic for the medical tourism industry, there may exist several opportunities for blockchain use. First, blockchain technology is more likely to be used as a secure database for keeping and sharing patients ′health records data among several doctors and patients. Pandemic forced the digitization of the medical tourism industry in terms of encouraging telemedicine. Using video-streaming and video-conferencing tools, the doctors from around the globe can

consult and treat both domestic and foreign patients. Sometimes, there are cases that require a discussion of opinions of several doctors, or substitution of a doctor. In such cases, the patient can securely and quickly send the necessary information to the doctors.

Second, blockchain technology can be used for issuing and verification of the digital certificates confirming high-quality accreditation of the medical tourism service providers. In the context of pandemic, medical tourists are more likely to prefer such medical tourism service providers, which account for accreditation that ensures compliance with World Health Organization guidelines and national health regulatory standards (Ramos & Untong, 2014). Blockchain based platforms will verify the issuers and recipients of the certificates, ensure the authenticity of the certificates, and reveal fake certificates.

In addition, blockchain technology can be used for issuing digital certificates with PCR test results and other health related records. PCR test certificates are one of the compulsory requirements that must be met by a traveler when exiting and entering a certain country. Blockchain technology can eliminate the fraud and manipulation of such certificates and assure their authenticity. Also, the tourists will have full control of the records and will grant the access to the authorities who need it.

Finally, blockchain technology can be used for visa issuance for medical tourists. Medical tourists often need visas for visiting a medical tourism destination. Issuing visas takes time and in case of emergency the medical tourists do not have a lot of time for waiting a visa. Blockchain technology can significantly reduce the waiting times through effective managing all travel related government documents including visa issuance.

3.6. CONCLUSIONS

The major aim of this conceptual paper was to extend the previous research and add to the existing literature regarding the benefits of blockchain technology for medical tourism. Previous research (Ayuningtyas & Ariwibowo, 2020) explored the role of information technologies in pre-procedure and post-procedure of medical tourism; however, it did not focus on the positive role of blockchain technology. To add more knowledge, this paper primarily focused on the possible strategic role of blockchain technology and has conceptualized the benefits of blockchain technology for two main stages of medical tourism: pre-procedure and post-procedure. Therefore, the paper argues that medical tourists as well as healthcare providers may benefit from the application of blockchain technology in terms of an easier way to find a healthcare provider, fast and secure payment method, ensured data security and privacy, and trusted review systems. In addition, the paper extends the current literature within tourism research on blockchain, proposing the possible implications of this innovative technology for the medical tourism sector.

The paper is timely and appropriate considering the COVID-19 pandemic. The pandemic affected the whole tourism industry including the medical tourism sector. To address this issue, the paper has summarized several challenges the medical tourism industry is facing due to the pandemic and has outlined some opportunities for blockchain technology use in the current situation, such as the reduction in waiting times for all travel-related government documents including visa issuance and the authenticity guarantee of these documents.

While the paper has provided several insights for benefits and opportunities of blockchain technology for medical tourism, it has several limitations. The scope is limited as the paper only focused on several stages of pre-procedure and post-procedure of medical tourism. In addition, more thorough qualitative research and

empirical data are important for deeper understanding on the potential of blockchain technology for the medical tourism industry. It will be of great importance to conduct review studies to find out more possible domains of medical tourism that can be affected by application of blockchain technology. In addition, the researchers need to address the challenges of blockchain adoption and threat of application of blockchain technology in the medical tourism sector. Future studies are encouraged to explore the effects of blockchain technology on the increased competitiveness and reputation of the medical service providers or enhanced experience of the medical tourists.

CHAPTER 4

BLOCKCHAIN TECHNOLOGY FOR SMART TOURISM DESTINATIONS

4.1. INTRODUCTION

Over the last decade, the concept of ‘Smart Cities ’has gained enormous popularity that has resulted in the emergence of the topic of ‘Smart Tourism Destinations ’ (Buhalis & Amaranggana, 2013). Smart Tourism Destinations widely use information and communication technologies (ICTs) and promise to gain a market advantage and positively contribute to sustainable tourism development by implementing sustainability initiatives (Gretzel et al., 2015; Ratten et al., 2019). Previous research highlights that three forms of ICTs, Cloud Computing, Internet of Things, and End-User Internet Service System, are of the highest importance for developing Smart Tourism Destinations (Zhang et al., 2012).

Smart Tourism Destinations need to provide a technological platform through which all tourism data could be exchanged among all stakeholders (Buhalis & Amaranggana, 2013). Real-time information sharing is crucial to all in Smart Tourism Destinations, however, because of the existing oligarchy of global distribution system providers, small and local tourism businesses do not have access to data. This problem causes additional costs for the users, (both tourists and small tourism businesses), and enables providers to control prices (Korže, 2019). Smart Tourism Destinations also face challenges regarding privacy issues and struggle to find a solution to hide tourists ’real identities (Buhalis & Amaranggana, 2013). An

emerging cutting-edge technology, blockchain, may be used to address these challenges and assist in the development of Smart Tourism Destinations. However, there is limited research on possible effects of blockchain within the smart tourism domain, and especially Smart Tourism Destinations. Nam et al. (2019) discussed the possible links of blockchain technology with smart and sustainable tourism and made theoretical propositions on future development of this technology in the tourism industry. Koo et al. (2017) conducted an explorative study to investigate how blockchain technology had been implemented within the context of smart tourism.

To further academic debate around blockchain technology in smart tourism contexts, this conceptual paper aims to shed light on the potential of blockchain technology in Smart Tourism Destinations. Despite an increasing interest in blockchain in the global market, the role of blockchain technology in enabling Smart Tourism Destinations has not been explored yet. As such, this paper attempts to contribute to and expand the existing literature about blockchain in tourism by discussing how blockchain technology can help Smart Tourism Destinations achieve their major goals and address privacy issues.

The remainder of the paper is organized as follows. The second section provides introductory definitions and explanations about Smart Tourism Destinations and blockchain technology. The third section discusses the potential role of blockchain technology in achieving goals pursued by Smart Tourism Destinations as well as the possible challenges of blockchain implementation in Smart Tourism Destinations. Finally, the last section of the paper highlights implications and proposes avenues for future research.

4.2. LITERATURE REVIEW

4.2.1. SMART TOURISM DESTINATIONS

Smart tourism phenomena have emerged as a novel approach to tackle new realities in tourism caused by the impact of the innovative information and communication technologies (ICTs) over the destinations, travelers, and businesses Koo et al. (2017). Within the smart tourism research domain, the Smart Tourism Destinations have received the most attention. Previous research conceptualized the framework for Smart Tourism Destinations based on the development of smart cities (Buhalis & Amaranggana, 2013), explored the potential of Smart Tourism Destinations to enhance tourists ′experience through personalization of services (Buhalis & Amaranggana, 2015), developed a conceptual model for Smart Tourism Destination competitiveness (Koo et al., 2016), and examined the effects of smart destination strategy and solutions on the destination management processes and tourism experience (Femenia-Serra & Ivars-Baidal, 2018).

The concept of Smart Tourism Destination can be understood as a relevant contribution to the very concept of tourism destination Jovicic (2017), as well as a potential framework to manage the destinations (Ivars et al., 2017). Additionally, the concept is especially crucial for the destinations with one dominant attraction or with numerous attractions, where it is difficult to make marketing connections (Koo et al., 2016). The main aim of Smart Tourism Destinations is enhancing tourism experience and improving the effectiveness of resource management towards both destination competitiveness and tourists ′satisfaction, as well as ensuring sustainability over an extended period of time (Buhalis & Amaranggana, 2013).

There is no unique definition of a Smart Tourism Destination. Exploring the concept, the researchers define and conceptualize the term in different ways, however, most of them primarily emphasis the role of ICTs. For instance, the authors Wang et al., 2013 argue that Smart Tourism Destinations are destinations that apply different ICTs when developing and producing the tourism processes. In their first attempt to conceptualize Smart Tourism Destinations, the authors of (Buhalis & Amaranggana, 2013) put the emphasis on the interconnection of different stakeholders in a destination through ICTs. The authors Huang et al. (2012) argue that the real meaning of Smart Tourism Destinations is to focus and take care of tourists ′needs using ICTs, with the aim of promoting tourism service quality and improving tourism management. Furthermore, Boes et al. (2015) defines Smart Tourism Destinations as places that use available technologies in order to co-create value, pleasure, and experiences for tourists as well as provide benefits and profits for the tourism organizations and destination. Additionally, the literature regarding Smart Tourism Destinations characterizes them as destinations that intensively collect and use data to understand tourists ′needs and behavior, to eventually provide better services and experiences in a more real-time and context-aware form (Choe & Fesenmaier, 2017; Xiang & Fesenmaier, 2017). It is argued that the development of Smart Tourism Destinations would benefit the tourism industry by enabling open access to data for both tourism organizations and tourists through a common platform (Jasrotia & Gangotia, 2018; Zhu et al., 2014).

Overall, Smart Tourism Destinations differ from traditional tourism destinations in their ability to encompass cutting-edge technologies and use large amounts of information to develop interconnections among stakeholders, smart decision-making, and finally provide enhanced tourism experiences and improved destination competitiveness (Boes et al., 2016; Buhalis & Amaranggana, 2015; Wang et al.,

2016). Table 8 outlines several differences between a traditional tourism destination and a Smart Tourism Destination.

Table 8. Differences between traditional and smart tourism destinations (based on Buhalis & Amaranggana, 2013; Jovicic, 2017; Ruhanen, 2009).

Characteristics	Traditional Tourism Destination	Smart Tourism Destination
Concept	Agglomeration of attractions and services	Destinations that apply different ICTs
Collaboration	Negligence of collaboration with the destination	Collaboration among all stakeholders
Tourists	Consume tourism products and services	Co-create experience; demand personalized services
Government	Government authority has stronger influence than any other stakeholder group and does not incorporate community participation	Participatory governance; information governance that supports data openness and regulates data privacy
Local community	Non-participatory local community	Constantly connected; knowledgeable and technology savvy; creative and empowered

Some technologies are especially important for the development of Smart Tourism Destinations (Koo et al., 2016), as depicted in Table 9.

Table 9. Examples of Smart Tourism Destinations and adopted ICTs.

Smart Tourism Destination	Adopted ICTs
Venice	Introduced the applications VeneziaUnica, which enables the tourists to directly communicate with service providers and share opinions and photos with others.
Salzburg	Developed the application Salzburger Mittagdplaner that empowers the users to gather data on food service providers, including menus, prices, and locations, and lets them select seats and decide what to eat in advance.
Weimar	Using a map application that is developed through the combined use of Internet of Things and augmented reality, the tourists can find the famous landmarks and view historical photos on the screen of the mobile device.
Barcelona	Uses IoT including smart sensors to reduce energy costs and increase road safety.
Gothenburg	Local government with local tourism service providers makes use of all digital channels to enhance the tourists' experiences. Additionally, the city's website allows the tourists to find any information about the city and if some information cannot be found, the tourists can connect with the visitor center using a chat function.

Cloud computing, Internet of Things, and end-user internet service systems account for main values in interacting at all levels of stakeholder in the tourism context (Gretzel et al., 2015). Blockchain technology may be another cutting-edge

technology which can help address some challenges of data processing in Smart Tourism Destination (Korže, 2019).

4.2.2. BLOCKCHAIN TECHNOLOGY

Blockchain is a new disruptive technology with improved ability to verify and record the exchange of assets among an interconnected set of users (Camilleri, 2020). A blockchain can be considered as a disseminated database of records of all digital events that have been performed and shared among all participating members (Crosby et al., 2016). Blockchain technology enables a distributed peer-to-peer network, in which non-trusting members can verifiably interact with each other without a trusted authority (Christidis & Devetsikiotis, 2016).

Blockchain can be viewed as a set of interconnected mechanisms that provide specific features to the architecture, as depicted in Figure 6. At the lowest layer, there are signed transactions that are grouped into blocks (Casino et al., 2019). The second layer, the consensus layer, is responsible for ensuring that all nodes agree on which transactions must be saved in the blockchain, to ensure the absence of corrupt branches and divergences (Vukolić, 2015). The third layer, compute interface, is responsible for executing the smart contracts. Last, the governance layer extends the blockchain architecture to cover the human interactions in the physical world (Casino et al., 2019) and deals with how diverse actors join effort to produce, maintain, and change the inputs that make up a blockchain (Oxford Internet Institute, 2017).

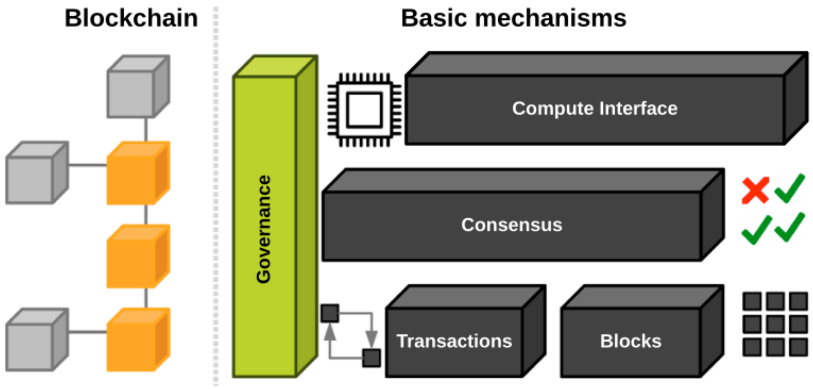

Figure 6. A blockchain architecture (Casino et al., 2019).

Figure 7 demonstrates a typical blockchain process. When the transaction is made, a block appears. Then, the block is broadcast to all nodes in the network. One of the nodes validates the block and broadcasts it back to the network. If the block is verified, all nodes add it to their chain of blocks. Each following block correctly references the previous block. In this process, each transaction receives a unique sequence and timestamp. This guarantees more accuracy in data tracking (Seffinga et al., 2017). Moreover, once the transaction is validated, it cannot be easily changed or deleted. Transparency is strengthened because the transactions are shared across the network, and everybody in the network can have access to data in due time. At the same time, this helps to ensure security and trigger trust (Queiroz & Wamba, 2019.

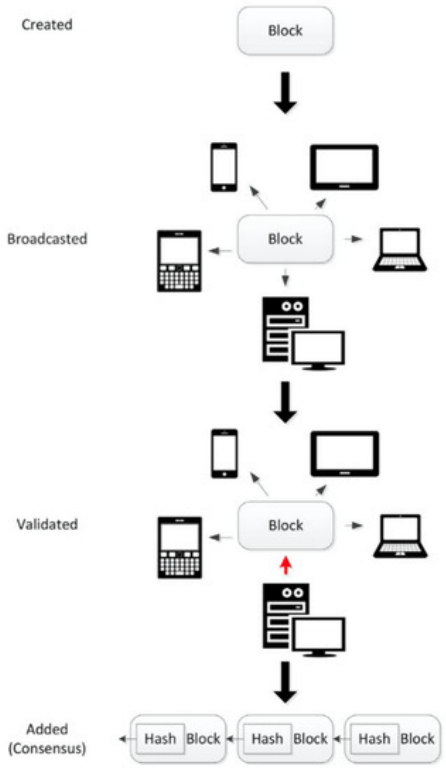

Figure 7. A typical blockchain work flow (Banerjee et al., 2018).

The current literature argues that there are three generations of blockchain technology development (Nam et al., 2019). The first generation is the development of Bitcoin, the first digital currency. The second generation is smart contracts, blockchain-based code that facilitate self-executing and self-enforcing contracts (Boucher et al., 2017; Coin Insider, 2021). The third generation is the current technology characterized by DApps, which allow the users to interact with blockchain technology through smartphones or browsers.

According to the literature, there are three types of blockchains: public, private, and permissioned. Public blockchains are kept across peer-to-peer networks in a completely decentralized and anonymous manner, and anyone can join the network (Nakamoto, 2008). Private blockchains are characterized by the fact that only certain organizations can join the networks (Gao et al., 2018).

Permissioned blockchains require a set of trusted nodes responsible for creating the blocks, and only authorized organizations can join the network (Gao et al., 2018).

Due to blockchain technology′s specific features, the governments and organizations of different industries have started to develop blockchain platforms to assess and potentially integrate the technology into mainstream use (Dogru et al., 2018). The tourism industry also showed the intention to implement blockchain technology. Along with the big tourism companies applying blockchain technology to manage the distribution of inventories and assets, or facilitate payments, the academic interest in exploring the potential of this innovative technology in the tourism sector grows as well. Current research has examined the role of blockchains and cryptocurrencies in achieving tourism related sustainable development goals (Tham & Sigala, 2020).

It has also explored the impacts of blockchain technology on the tourism industry from the lens of agency theory, transaction cost theory, a resource-based view of the firms, and actor network theory (Treiblmaier & Önder, 2019). Additionally, research has focused on the blockchain′s potential for medical tourism (Rejeb et al., 2019). Although most of the studies bear descriptive or conceptual character, several studies provide empirical evidence regarding the level of blockchain implementation in hospitality management (Flecha-Barrio et al., 2020) and the intention to use cryptocurrency by both travelers, and small and medium tourism businesses.

4.3. BLOCKCHAIN FOR SMART TOURISM DESTINATION

The development of Smart Tourism Destinations needs to meet some requirements and faces several challenges. The Smart Tourism Destinations aim at enhancing travelers' ′experience, providing a more intelligent platform for gathering and

distributing information within the destinations, facilitating efficient distribution of tourism resources, and ensuring the benefits for local community (China Economic Net, 2012). Based on the previous literature, this section will discuss, from a holistic view of sustainability, the role of blockchain technology in contributing to the development of Smart Tourism Destinations through assisting the achievement of their main aims, precisely, enhancing tourism experience, rewarding sustainable behavior, ensuring the benefits for local community, and reducing privacy concerns (Figure 8).

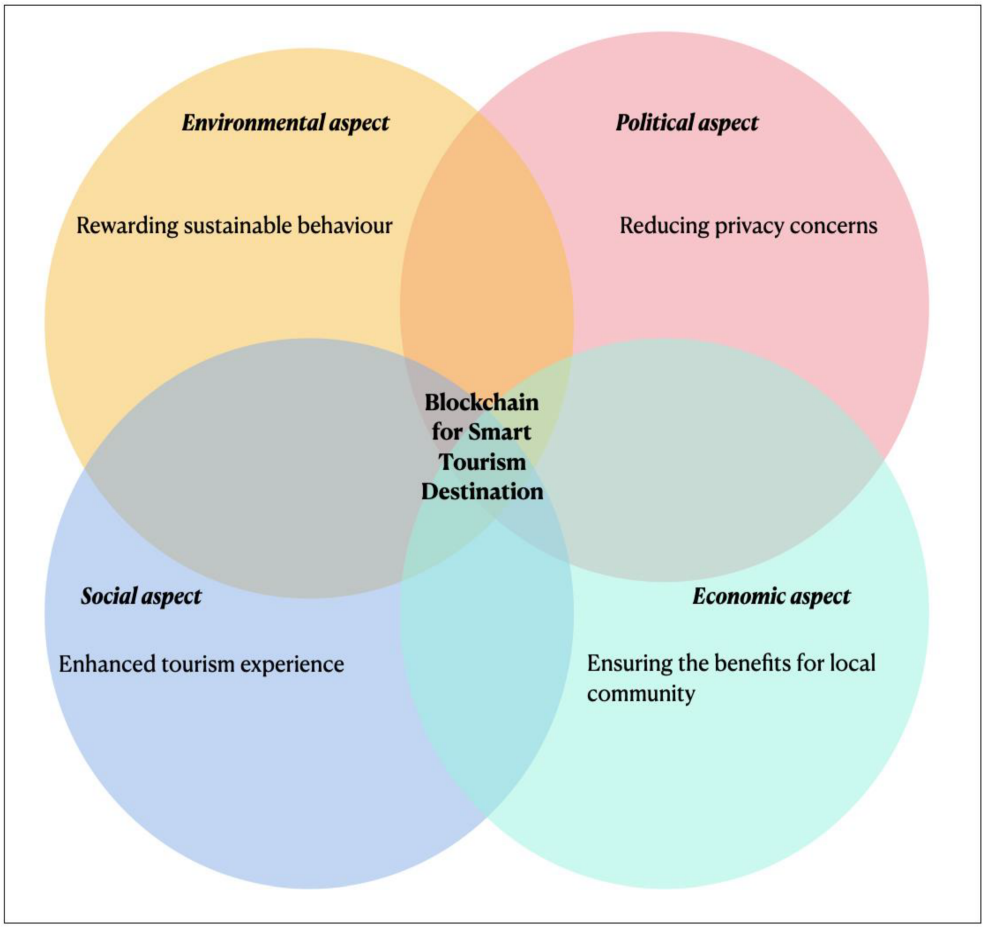

Figure 8. Benefits of blockchain-enabled Smart Tourism Destination from a holistic view of sustainability.

4.3.1. ENHANCING TOURISM EXPERIENCE

Smart Tourism Destinations aim at enhancing tourism experience through advance feedback loop, open access to real-time information, and better customer service, to address factors that potentially cause negative experiences (i.e., lost luggage, security concerns, delay, and long queues) (Buhalis & Amaranggana, 2015). To enhance tourism experience, Smart Tourism Destinations are expected to provide a number of personalized services, namely: providing all relevant real-time information based on user profiling to support planning phase before trip, ensuring access to real-time information to assist tourists in exploring the destination, and enabling a decent feedback system that allows the tourists to review their experiences (Buhalis & Amaranggana, 2015). Blockchain technology has a high potential to assist Smart Tourism Destinations in achieving their goals and providing personalized services.

First of all, because of its ability to build trust, ensure more secure information exchange, reduce costs, and enable transparency, blockchain technology can effectively remove the intermediaries and distribute similar powers to both providers and consumers of tourism services (Filimonau & Naumova, 2020). Along with major tourism businesses, small companies and local tourism service providers can offer their products and services within Smart Tourism Destinations. The tourists will receive real time information about all available tourism services and can access the authentic travel experiences that will possibly result in an enhanced tourism experience. Moreover, Smart Tourism Destinations can use blockchain technology for such guest services as tracking tourists, tracking luggage, managing lost luggage, providing fast check-in procedures, and facilitating travel insurance in case of flight delay or cancellation, therefore greatly enhancing the tourism experience (Dogru et al., 2018). Additionally, as blockchain-based cryptocurrencies enable simple, direct,

and safe peer-to-peer transactions without the need for trusted third parties (Kizildag et al., 2019), some tourists may prefer to use cryptocurrency when paying for the tourism services in the Smart Tourism Destination (Camilleri, 2020). Additionally, tourists can leave genuine reviews and ratings on their experiences in the blockchain embedded ranking and review systems and be sure that nobody can manipulate their reviews since blockchain technology can create a unique private key for each identity with several independent verification processes (Kizildag et al., 2019). From the other side, other tourists that seek genuine and trustworthy reviews can gain benefits from such blockchain embedded review systems as well. Overall, blockchain technology is capable of providing more accurate and trustworthy information enabling personalized services, and therefore, enhancing the tourism experience and tourists ′satisfaction.

4.3.2. REWARDING SUSTAINABLE BEHAVIOUR

Sustainability is the main focus of Smart Tourism Destinations. Although blockchain technology itself raises questions regarding its sustainability in terms of high energy consumption, Smart Tourism Destinations can apply the technology for encouraging and rewarding sustainable behaviors of both tourists and residents. Some people do not pay much attention to the impacts their behavior could have on the destinations ′environment, however incentives may positively change their attitudes and behaviors (Negruşa et al., 2015). Implementing blockchain technology Smart Tourism Destinations can create a cryptocurrency-based reward system, which would allocate rewards to the tourists and residents with sustainable behaviors. Thus, it can be assumed that tourists who would be rewarded for their sustainable behavior would be more likely, for example, to save water and energy in the accommodation premises, clear the beaches, collect plastic from the sea for

established recycles centers to throw into special bins, or choose walking and biking over driving when at the destination. A cryptocurrency-based reward system would offer rewards to the residents who could achieve specified energy or water savings over a determined period or would share their bikes with tourists (Scekic et al., 2018). The rewards could be used for purchasing certain goods and services, or investing into destinations ′infrastructure, boosting the local economy. Therefore, blockchain technology can favorably reshape the behaviors of both tourists and residents in the Smart Tourism Destination and contribute to its sustainability.

4.3.3. ENSURING THE BENEFITS FOR LOCAL COMMUNITY

Addressing sustainability issues, Smart Tourism Destinations put emphasis on providing economic benefits to local communities. As mentioned in the previous section, by virtue of specific characteristics of blockchain technology embedded in Smart Tourism Destinations, local communities can have an equal access to open data as well as directly reach the tourists and offer them different tourism services and goods. Additionally, blockchain technology will enable diverse cryptocurrencies in Smart Tourism Destinations, allowing both tourists and locals the possibility to make payments in a secure and efficient way (Nam et al., 2019). Moreover, local community can invent its own cryptocurrency and use it on local tourism market, thus boosting local economy.

4.3.4. REDUCING PRIVACY CONCERNS

The Smart Tourism Destinations must provide open access of real-time information to all citizens and avoid vendor monopolies (Zygiaris, 2013). Meanwhile, some information about the tourists and their activities could be highly personal; which

raises issues regarding privacy (Vanolo, 2013). Especially within Smart Tourism Destinations, medical tourists may have higher concerns regarding their privacy (Singh, 2013). Despite enabling facilitation of the recall of information on medical procedures and details, the use of innovative ICTs by Smart Tourism Destinations can aggravate medical tourists ′privacy concerns and create distrust. The destinations should apply different techniques for distorting data with the aim to avoid direct linkage between the tourists and their private information (Buhalis & Amaranggana, 2013). However, this approach faces another challenge in finding the right balance between information loss and disclosure risk (Martínez-Ballesté et al., 2013). Blockchain technology is capable of addressing these challenges, as it is regarded as a ′privacy-by-design ′solution for many privacy issues resulting from digitization of tourists ′information (Benchoufi & Ravaud, 2017). Privacy and data protection mechanisms are built in the blockchain system from the inception of the system′s design (Rejeb et al., 2019). With the use of blockchain-based digital ID, the tourists have more control over their personal information and decide themselves which information, and with whom, they want to share (Kizildag et al., 2019). The control and ownership over data reduces tourists ′privacy concerns as the tourists are aware of the flow and use of their personal information (Milne, 2000).

4.4. KEY CHALLENGES TO OVERCOME

Despite promising benefits, the adoption of blockchain technology in Smart Tourism Destinations could face several challenges. First, blockchain technology′s conceptual complexity and excessive market novelty impose the biggest challenge towards its adoption by Smart Tourism Destinations (Gatteschi et al., 2018). Some tourism organizations and tourism service providers are not ready to implement the

technology because of lack of expertise and knowledge about this new disruptive technology (Flecha-Barrio et al., 2020). Tourists ′understanding about the technology and the availability of the merchants implementing blockchain technology is more important than technology efficiency or ease of use (Leung & Dickinger, 2017). The use of blockchain systems by tourists and residents within Smart Tourism Destinations are limited to those who are tech-savvy and knowledgeable about its mechanism (Kwok & Koh, 2019). Therefore, Smart Tourism Destination managers and policymakers must provide expert training and industry workshops on blockchain technology use in order to facilitate knowledge sharing, enhance business agility, promote business innovation, and educate both tourists and residents.

Other challenges are related to security concerns and lack of awareness regarding data security (Lin & Liao, 2017). Among the barriers that need to be addressed are potential hacks, identity theft, loss of private keys, misplacement of tokens, and safeguarding the privacy of personal records (Swan, 2015). Additionally, due to blockchains ′characteristics, it is almost impossible to cancel or reverse the realized transactions, thus there is no recourse for mistakes (Kwok & Koh, 2019). Though blockchain technology intends to reduce corruption and collusion, it could be used for money laundering (Ross, 2017).

Further challenges that would confront the adoption of blockchain technology in Smart Tourism Destinations are related to the cost of its operation (Karame & Androulaki, 2016) and energy consumption. While Smart Tourism Destinations aim at providing equal benefits for all stakeholders including local businesses, operating blockchain technology like Bitcoin is currently considered unprofitable, especially for small scale business ventures (Buy Bitcoin Worldwide, 2020). Moreover, ensuring privacy and security of blockchain transactions as well as cryptocurrency

mining demand a lot of energy (Li et al., 2019). It has been argued that blockchain technology can consume more electricity than some countries (BBC News, 2019).

4.5. CONCLUSIONS

This paper has conceptualized the role that blockchain technology can play within smart tourism with special focus on supporting the achievement of the main goals of Smart Tourism Destinations. Given the highly competitive and innovative trends confronting tourism destinations, blockchain technology may present a viable solution to enhance tourism experience, reward sustainable behavior, ensure benefits for local communities, as well as reduce privacy concerns. Nevertheless, it needs to be mentioned that this paper does not aim to diminish the role of other innovative technologies but argues that combining blockchain technology with such technologies as Internet of Things or artificial intelligence will foster the development of Smart Tourism Destinations and positively contribute to their goals.

Also, given the limited research on potential impacts of blockchain technology, the paper has advanced current knowledge in the domain of applying blockchain systems to assist Smart Tourism Destinations. Blockchain technology can change the way data are being collected, validated, owned, and managed to co-create value (Treiblmaier & Önder, 2019). Blockchain technology allows an equal, open access to data for small and medium enterprises as well as enables tourists to own and control their data.

Additionally, the paper has outlined the major challenges that Smart Tourism Destinations need to overcome to successfully implement blockchain technology. Knowing about risks related to blockchain adoption, the managers of Smart Tourism

Destinations can come to a more reasonable decision whether to invest in this technology or not, and make efforts to protect the interests of all stakeholders.

While this paper has shed some light on the possible implications of blockchain technology for Smart Tourism Destinations, it bears some limitations. First, this study did not provide a critical discussion of blockchain technology itself as the main aim of the research was to explore positive benefits of the technology and downsides were out of the scope of this study. Second, this study theoretically elaborated on the benefits of blockchain, so case studies and empirical data are needed to test and confirm the propositions and further generate more in-depth understanding of the potentials of blockchain technology within the smart tourism domain. Future studies may conduct surveys among tourists and residents to assess and validate the impacts of blockchain technology on enhancing tourism experience and rewarding sustainable behavior within a particular Smart Tourism Destination, or compare the results obtained from several Smart Destinations. In addition, the researchers may further extend the propositions of this study by exploring other possible areas within Smart Tourism Destinations that can be influenced by blockchain implementation.

CHAPTER 5

CONCLUSIONS

5.1 SUMMARY OF THE RESULTS AND CONCLUSIONS

This dissertation aims to move forward blockchain research in tourism and encourage the tourism scholars to deeply investigate the blockchain technology's implications and contributions for the tourism sector. Blockchain technology has attracted a lot of attention and high interest since 2009, when first cryptocurrency Bitcoin became popular all over the world. Financial and banking sectors were among the first sectors, which succeeded in blockchain implementation. Tourism industry shows interest in adopting blockchain technology as well, however, a little progress is seen. Despite a lot of money being invested in numerous blockchain based applications and projects, there are still not any practical use cases. Also, a little research is done on the subject. There are few tourism scholars who explored the possible benefits and use of blockchain technology for tourists or tourism destinations. The researchers agree that there is a lack of knowledge and understanding regarding blockchain technology and that there is a need to provide some theoretical models of blockchain adoption.

In order to respond to this reality and bring more knowledge and understanding, this dissertation was undertaken. The dissertation elaborates a conceptual model for blockchain adoption in the tourism industry and explores the potential benefits of blockchain technology for medical tourism and smart tourism. The dissertation contains three independent papers, which altogether provide a broader picture of blockchain adoption and implementation in the tourism sector.

Firstly, the first paper ("Blockchain adoption in tourism: Grounded theory based conceptual model") used a grounded theory and proposed a conceptual model of blockchain adoption in tourism by defining casual, context, intervening conditions that affect blockchain adoption and outlining the consequences of blockchain adoption on the tourism sector.

The paper revealed the following causal conditions that contribute to blockchain adoption in the tourism industry: blockchain benefits, bitcoin's wide universality, increasing interest and investment in blockchain tourism projects, and strategic orientation of the tourism enterprises. Among intervening conditions of blockchain adoption are government regulation and collaboration among all stakeholders including governments, destination management organizations, tourism service providers, and researchers. Economic, educational, and technical factors have been found to be the most important conditions for blockchain adoption. According to the model, the interactions obtained from blockchain adoption were classified as economic and social actions. Regarding economic actions, blockchain adoption enables access to cryptocurrency accounts for small merchants who don't have a traditional bank account; fast and secure payments for travel-related services; use of coins and tokens as rewards; possibilities for fundraising; cryptocurrency creation by the tourism destinations themselves; hospitality and tourism disintermediation that results in cost reduction. Regarding social actions, blockchain adoption makes it possible to authenticate customer reviews, fast identification and verification using digital ID, enhance loyalty and rewards programs, improve service quality, trace tourism products and activities, provide best deals for the tourists, track luggage, and share sensitive information about the tourists. Finally, blockchain adoption will bring the following benefits: reshaping the tourism industry and promoting tourism development, attracting visitors to less competitive destinations, developing smart

tourism and medical tourism, contributing to the successful competitiveness of small and medium tourism enterprises, reducing poverty, and enhancing tourists' experiences.

To successfully adopt a new technology, it is very important to understand what factors beneficially contribute to its adoption and which conditions should be met for achieving success as well as to assess the consequences the adoption will bring in. Therefore, the elaborated conceptual model bears a practical value for those who pursue blockchain adoption for their tourism businesses or destinations.

The second paper ("The benefits of blockchain for medical tourism") primarily focused on medical tourism and revealed the benefits of blockchain technology for medical tourism. Medical tourism is an important niche of tourism. More and more people travel abroad to receive different types of medical and healthcare services. Medical tourism consists of two main stages: pre-procedure and post-procedure. Thus, medical tourists should pass different steps in each stage to receive a desirable medical service. The paper focused on the possible strategic role of blockchain technology and conceptualized the following benefits of blockchain technology for pre-procedure as providing disintermediation and using cryptocurrency and the following benefits for post-procedure as ensuring data security and privacy and proving a trusted review system. It can be concluded that both medical tourists and healthcare providers may benefit from the application of blockchain technology in terms of an easier way to find a healthcare provider, fast and secure payment method, ensured data security and privacy, and trusted review systems. Also, the paper addressed the COVID 19 pandemic situation and outlined some opportunities for blockchain technology use, such as the reduction in waiting times for all travel-related government documents including visa issuance and the authenticity guarantee of these documents.

And last, the third paper ("Blockchain technology for smart tourism destinations") focused on smart tourism and explored the benefits of blockchain technology for smart tourism destinations. Smart tourism is a hot topic among tourism scholars and practitioners. Governments, public and private institutions actively collaborate in creation and development of successful smart tourism destinations. given the limited research on potential impacts of blockchain technology, the paper advanced current knowledge in the domain of applying blockchain systems to assist smart tourism destinations. The paper conceptualized the role that blockchain technology can play within smart tourism with special focus on supporting the achievement of the main goals of Smart Tourism Destinations. Given the highly competitive and innovative trends confronting tourism destinations, blockchain technology may present a viable solution to enhance tourism experience, reward sustainable behavior, ensure benefits for local communities, as well as reduce privacy concerns. The paper argued that combining blockchain technology with such technologies as Internet of Things or artificial intelligence would foster the development of smart tourism destinations and positively contribute to their goals. Additionally, the paper outlined the major challenges that smart tourism destinations need to overcome to successfully implement blockchain technology. Among these challenges are lack of expertise about blockchain technology, data security concerns, cost of operations, and energy consumption. Knowing about risks related to blockchain adoption, the stakeholders can come to a more reasonable decision whether to invest in this technology or not, and make efforts to protect the interests of all stakeholders.

By exploring the potential benefits of blockchain technology for medical tourism and smart tourism, this dissertation attempts to reveal the contributing role of blockchain technology in the creation and development of the competitive tourism destinations.

Overall, this dissertation is significant because it contributes to the existing literature on blockchain adoption in the tourism industry. The dissertation provides a conceptual model and identifies the important conditions necessary for blockchain adoption, providing value for both academics and practitioners. Also, this dissertation provides insights into the potential benefits of blockchain technology in different areas of tourism, including medical tourism and smart tourism. While the dissertation sheds light on the possible advantages of blockchain technology, it also highlights the limitations and challenges that need to be addressed for successful implementation. Overall, this dissertation is significant as it extends the previous research and adds to the existing literature regarding the benefits of blockchain technology.

The research on blockchain technology in tourism is still in its early stages, and further empirical studies are needed to validate the proposed models and frameworks. Nevertheless, this dissertation provides valuable contributions to the tourism industry by identifying potential areas where blockchain technology can benefit, such as enhancing tourism experience, ensuring data security and privacy, allowing faster and secure payment methods, and rewarding sustainable behavior.

Future research on blockchain technology in tourism can expand on the proposed models and frameworks by exploring other areas and challenges related to blockchain adoption. Additionally, empirical studies can provide a deeper understanding of the effects of blockchain technology on enhancing competitiveness and reputation of service providers, improving tourist experiences, and promoting sustainable practices. Overall, the potential for blockchain technology to revolutionize the tourism industry is promising, and further research is necessary to explore its full potential.

5.2 FUTURE RESEARCH DIRECTIONS

This section suggests the following directions for future research:

6) A conceptual model of blockchain technology adoption elaborated in this dissertation should be empirically tested and evaluated to confirm the importance and validity of the factors affecting blockchain adoption in the tourism industry. Since the tourism industry includes various sectors, it would be very helpful to evaluate the model separately within hospitality, airline service, and travel agency sectors. Also, future studies could modify and/or extend the proposed model by eliminating and/or adding new factors and conditions affecting blockchain adoption in tourism. Future studies are encouraged to investigate other conditions, actions, and consequences that have not been explored in the present model.

7) Empirical research to validate the benefits of blockchain technology use for medical and smart tourism destinations would be beneficial. It would be very useful to conduct interviews and surveys among the tourists, academics, and professionals on their perceptions regarding the benefits of blockchain technology for medical tourism and smart tourism. Also, future studies are encouraged to explore the effects of blockchain technology on the increased competitiveness and reputation of the medical service providers or enhanced experience of the medical tourists. Future studies may conduct surveys among tourists and residents to assess and validate the impacts of blockchain technology on enhancing tourism experience and rewarding sustainable behavior within a particular Smart Tourism Destination, or compare the results obtained from several Smart Destinations. Researchers may further extend the propositions of this study by exploring other possible areas within Smart Tourism Destinations hat can be influenced by blockchain implementation.

8) Simulation studies and case studies would be very helpful to estimate the level of blockchain implementation and intentions to use blockchain technology in tourism and hospitality settings.

REFERENCES

Alleman, B.W., Luger, T., Reisinger, H.S., Martin, R., Horowitz, M.D., & Cram, P. (2010). Medical Tourism Services Available to Residents of the United States. *Journal of General Internal Medicine*, *26*, 492–497.

Allied Market Research. Medical Tourism Market by Treatment Type (Cardiovascular Treatment, Orthopaedic Treatment, Neurological Treatment, Cancer Treatment, Fertility Treatment, and Others)—Global Opportunity Analysis and Industry Forecast, 2019–2027. 2020. Available online: **https://www.alliedmarketresearch.com/medical-tourism-market** (accessed on 1 January 2021).

Antoniadis, I., Spinthiropoulos, K., & Kontsas, S. (2020). Blockchain applications in tourism and tourism marketing: A short review. In *Strategic Innovative Marketing and Tourism* (pp. 375-384). Springer, Cham.

Ayuningtyas, D. & Ariwibowo, D.A. (2020). The strategic role of information communication technology in succeeding medical tourism. *Enfermería Clínica*, *30*, 170–173.

Balaban, V. & Marano, C. (2010). Medical tourism research: A systematic review. *International Journal of Infectious Diseases*, *14*, e135.

Bandara, W., Furtmueller, E., Gorbacheva, E., Miskon, S., & Beekhuyzen, J. (2015). Achieving rigor in literature reviews: Insights from qualitative data analysis and tool-support. *Communications of the Association for Information Systems*, 37, 154–204.

Banerjee, M., Lee, J., & Choo, K.K.R. (2018). A blockchain future for internet of things security: A position paper. *Digital Communications & Networks*, *4*, 149–160.

Baralla, G., Ibba, S., Marchesi, M., Tonelli, R., & Missineo, S. (2018). A blockchain based system to ensure transparency and reliability in food supply chain. In *European conference on parallel processing* (pp. 379-391). Springer, Cham.

Barreto, P. I. B., Maggia, P. J. A. U., & Acevedo, P. S. I. (2019). Cryptocurrencies and blockchain in tourism as a strategy to reduce poverty. *Retos*, 9(18), 275-290.

BBC News. (2019). Available online: **https://www.bbc.com/news/technology-48853230** (accessed on 4 October 2020).

Benchoufi, M. & Ravaud, P. (2017). Blockchain technology for improving clinical research quality. *Trials*, *18*, 335.

Bodkhe, U., Bhattacharya, P., Tanwar, S., Tyagi, S., Kumar, N., & Obaidat, M. S. (2019, August). Blohost: Blockchain enabled smart tourism and hospitality management. In *2019 International Conference on Computer, Information and Telecommunication Systems (CITS)* (pp. 1-5). IEEE.

Boes, K., Buhalis, D. & Inversini, A. (2015). Conceptualising Smart Tourism Destination Dimensions. In *Information and Communication TechNologies in Tourism*; Springer: Cham, Switzerland; pp. 391–403.

Boes, K., Buhalis, D., & Inversini, A. (2016). Smart tourism destinations: Ecosystems for tourism destination competitiveness. *International Journal of Tourism Cities*, 2.

Bookman, M.Z. & Bookman, K.R. (2007). *Medical Tourism in Developing Countries*; Palgrave Macmillan: London, UK.

Boucher, P., Nascimento, S., & Kritikos, M. (2017). How blockchain technology could change our lives. In *European parliamentary research service, scientific foresight unit* (pp. 1–28). Brussels: European Parliament.

Buhalis, D. & Amaranggana, A. (2013). Smart Tourism Destinations. In *Information and Communication Technologies in Tourism 2014*; Xiang, Z., Tussyadiah, I., Eds.; Springer: Cham, Switzerland; pp. 553–564.

Buhalis, D. & Amaranggana, A. (2015). Smart Tourism Destinations Enhancing Tourism Experience through Personalisation of Services. In *Information and Communication Technologies in Tourism 2015*; Tussyadiah, I., Inversini, A., Eds.; Springer: Cham, Switzerland; pp. 377–389.

Burns, L.R. (2014). Medical tourism opportunities and challenges: Illustration from US–India trade*. *International Journal of Health Management*, *8*, 15–26.

Buy Bitcoin Worldwide (2020). Available online: **https://www.buybitcoinworldwide.com/mining/profitability/** (accessed on 13 October 2020).

Calvaresi, D., Leis, M., Dubovitskaya, A., Schegg, R., & Schumacher, M. (2019). Trust in tourism via blockchain technology: results from a systematic review. In *Information and communication technologies in tourism 2019* (pp. 304- 317). Springer, Cham.

Camilleri, M.A. (2020). The use of data-driven technologies for customer-centric marketing. *International Journal of Big Data Management*, *1*, 50–63.

Çapar, H. (2020). Using cryptocurrencies and transactions in medical tourism. *Journal of Economic and Administrative Sciences*, *37*, 677–693

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and Informatics*, *36*, 55-81.

Ćirić, Z., & Ivanišević, S. (2018).Blockchain and tourism development: Case of Malta. In *Modern management tools and economy of tourism sector in present era*, (pp.565- 575).

Cham, T.-H., Lim, Y.-M., Sia, B.-C., Cheah, J.-H., & Ting, H. (2021). Medical Tourism Destination Image and its Relationship with the Intention to Revisit: A Study of Chinese Medical Tourists in Malaysia. *Journal of China Tourism Research*, *17*, 163–191.

China Economic Net. (2012). Available online: **http://en.ce.cn/Insight/201204/12/t20120412_23235803.shtml** (accessed on 16 September 2020).

Choe, Y. & Fesenmaier, D.R. (2017). The Quantified Traveler: Implications for Smart Tourism Development. In *Analytics in Smart Tourism Design*; Xiang, Z., Fesenmaier, D.R., Eds.; Springer: Cham, Switzerland; pp. 65–77.

Chokun, J.(2016). Who accepts bitcoins as payments? Available online: **https://99bitcoins.com/who-accepts-bitcoins-payment-companies-stores-take-bitcoins/** (accessed on 24 July 2020).

Christidis, K. & Devetsikiotis, M. (2016). Blockchains and smart contracts for the internet of things. *IEEE Access*, *4*, 2292–2303.

Cohen, E. (1998). Traditions in the qualitative sociology of tourism. *Annals of Tourism Research*, 15(1), 29–46.

Coin Insider. (2021). What Are the Three Generations of Blockchain, and How Are They Similar to the Web? Available online: **https://www.coininsider.com/three-generations-of-Blockchain/** (accessed on 16 September 2020).

Confente, I. (2015). Twenty-five years of word-of- mouth studies: A critical review of tourism research. *International Journal of Tourism Research*, 17(6), 613–624.

Connell, J. (2006). Medical tourism: Sea, sun, sand and. surgery. *Tourism Management*, *27*, 1093–1100.

Connell, J. (2011). *Medical Tourism.* Cabi: Wallingford, UK.

Connell, J. (2013). Contemporary medical tourism: Conceptualisation, culture and commodification. *Tourism Management*, *34*, 1–13.

Cosmetisuite. (2019). Practice Management/EHR Software for Plastic, Cosmetic, Hand Surgeons, Aesthetic, Dermatology & Medical Spa. Available online: **https://www.cosmetisuite.com/cosmetisuite-point-of-sale.html** (accessed on 3 January 2021).

Creswell, J. (2005). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. New Jersey: Merrill Prentice Hall.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. *Applied Innovation Review*, 2, 6-19.

Damani, M. (2017). Blockchain in travel: A compelling case for adoption. Available online: **https://www.wns.com/insights/a rticles/articledetail/509/article--blockchain-in-travel-a-compelling-case- for-adoption/** (Accessed on 24 July 2020).

Davidson, S., De Filippi, P., & Potts, J. (2016). Disrupting Governance: The New Institutional Economics of Distributed Ledger Technology. Available online: **https://ssrn.com/abstract=2811995** (accessed on 11 February 2021).

Deloitte, L.L.P. (2016). Blockchain enigma. Paradox. Opportunity. *The created studio at Deloitte*, London J., 7969.

Di Vaio, A., & Varriale, L. (2020). Blockchain technology in supply chain management for sustainable performance: Evidence from the airport industry. I*nternational Journal of Information Management,* 52,102014. https://doi.org/10.1016/j.ijinfo mgt.2019.09.010

Dogru, T., Mody, M., & Leonardi, C. (2018). Blockchain technology & its implications for the Hospitality Industry. Boston University.

Efanov, D. & Roschin, P. (2018). The All-Pervasiveness of the Blockchain Technology. *Procedia Computer Science*, *123*, 116–121.

Erceg, A., Damoska Sekuloska, J., & Kelić, I. (2020). Blockchain in the Tourism Industry—A Review of the Situation in Croatia and Macedonia. In *Informatics* (Vol. 7, No. 1, p. 5). Multidisciplinary Digital Publishing Institute.

Esposito, C., De Santis, A., Tortora, G., Chang, H., & Choo, K.-K.R. (2018). Blockchain: A Panacea for Healthcare Cloud-Based Data Security and Privacy? *IEEE Cloud Computing*, *5*, 31–37.

Femenia-Serra, F. & Ivars-Baidal, J.A. (2018). Do Smart Tourism Destinations Really Work? The Case of Benidorm. *Asia Pacific Journal of Tourism Research*, 1–20.

Ferrer, M. & Medhekar, A. (2017). The factors impacting on the management of global medical tourism service supply chain. *GSTF Journal of Business Review (GBR)*, *2*, 206–211.

Fetscherin, M. & Stephano, R.-M. (2016). The medical tourism index: Scale development and validation. *Tourism Management*, *52*, 539–556.

Filimonau, V., & Naumova, E. (2020). The blockchain technology and the scope of its application in hospitality operations. *International Journal of Hospitality Management*, 87, 1-8.

Fink, A. (2005). Conducting research literature reviews: From the internet to paper. Sage.

Flecha-Barrio, M. D., Palomo, J., Figueroa- Domecq, C., & Segovia-Perez, M. (2020). Blockchain Implementation in Hotel Management. In I*nformation and Communication Technologies in Tourism 2020* (pp. 255-266). Springer, Cham.

Froystad, P., and J. Holm. 2016. "Blockchain: Powering the Internet of Value." EVRY Labs.

Gao, Z., Fan, Y., Wu, C., Zhang, J., & Chen, C. (2018). DSES: A Blockchain-Powered Decentralized Service Eco-System. In *Proceedings of the IEEE 11th International Conference on Cloud Computing (CLOUD)* (pp. 25–32). San Francisco, CA, USA.

Garay, A.K., Juan A. and Leonardos, N. (2015). The Bitcoin Back- bone Protocol: Analysis and Applications. In *Proceedings of the 34th Annual International Conference on the Theory and Applications of Cryptographic Techniques (EUROCRYPT)* 2015 (pp. 281–310).

Gatteschi, V., Lamberti, F., Demartini, C., Pranteda, C., & Santamaría, V. (2018). Blockchain and smart contracts for insurance: Is the technology mature enough? *Future Internet*, *10*, 20.

Gupta, M. (2017). Blockchain for dummies. IBM Limited edition. Hoboken : John Wiley & Sons, Inc.

Goodrich, J.N. & Goodrich, G.E. (1987). Health-care tourism—An exploratory study. *Tourism Management*, *8*, 217–222.

Gretzel, U., Sigala, M., Xiang, Z. & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic. Markets*, *25*, 179–188.

Gretzel, U., Werthner, H., Koo, C., & Lamsfus, C. (2015). Conceptual foundations for understanding smart tourism ecosystems. *Computers in Human Behaviour*, *50*, 558–563.

Hall, C.M. & James, M. (2011). Medical tourism: Emerging biosecurity and nosocomial issues. *Tourism Review*, *66*, 118–126.

Hall, C.M. (2015). The coming perfect storm: Medical tourism as a biosecurity issue. In *Handbook on Medical Tourism and Patient Mobility* (pp. 193–204). Edward Elgar Publishing: Cheltenham, UK.

Han, H. & Hyun, S.S. (2015). Customer retention in the medical tourism industry: Impact of quality, satisfaction, trust, and price reasonableness. *Tourism Management*, *46*, 20–29.

Heung, V.C.S., Kucukusta, D., & Song, H. A. (2010). Conceptual Model of Medical Tourism: Implications for Future Research. *Journal of Travel and Tourism Marketing*, *27*, 236–251.

Herrick, D.M.(2007). *Medical Tourism: Global Competition in Health Care.* National Center for Policy Analysis: Dallas, TX, USA; pp. 1–35.

Hopkins, L., Labonté, R., Runnels, V., & Packer, C. (2010). Medical tourism today: What is the state of existing knowledge? *Journal of Public Health Policy*, *31*, 185–198.

Huang, X.K., Yuan, J.Z., & Shi, M.Y. (2012). Condition and key issues analysis on the smarter tourism construction in China. In *Multimedia and Signal Processing* (pp. 444–450). Springer: Berlin/Heidelberg, Germany.

Iansiti, M. & Lakhani, K.R. (2017). The Truth about Blockchain. Harvard Business Review. Available online: **https://hbr.org/2017/01/the-truth-about-blockchain** (accessed on 4 January 2021).

Irannezhad, E. & Mahadevan, R. (2020). Is blockchain tourism's new hope? *Journal of Hospitality and Tourism Technology*, 1–16.

Iredale, G. (2021). Public vs. Private Blockchain: How Do They Differ?. Available online: **https://101blockchains.com/public-vs-private-blockchain/** (accessed on 11 February 2021).

Ivars, J.A., Celdrán, M.A., Mazón, J.;, & Perles, Á. (2017). Towards an ICT Roadmap for Smart Tourism Destinations Based on Prospective Analysis. *E-Rev. Tourism Research*, *8*, 1–5

Jamal, T., & Hollinshead, K. (2001). Tourism and the forbidden zone: The underserved power of qualitative inquiry. *Tourism Managemen*t, 22(1), 63–82.

Jasrotia, A. & Gangotia, A. Smart cities to smart tourism destinations: A review paper. *Journal of Tourism Intelligence and Smartness*, *1*, 47–56.

Jovicic, D.Z. (2017). From the traditional understanding of tourism destination to the smart tourism destination. *Current Issues in Tourism*, *22*, 276–282

Karamchandani, A., Srivastava, S. K., & Srivastava, R. K. (2020). Perception-based model for analyzing the impact of enterprise blockchain adoption on SCM in the Indian service industry. *International Journal of Information Management*, 52, 102019.

Karame, G. & Androulaki, E. (2016). *Bitcoin and Blockchain Security*; Artech House: London, UK.

Karimov, F.P., Brengman, M. & van Hove, L. (2021). The effect of website design dimensions on initial trust. *Journal of Electronic Commerce Research*, *12*, 272–301.

Kastelein, R. (2016). Blockchain market worth 2.3 Billion USD by 2021.Available online: **https://www.the- blockchain.com/2016/10/11/blockchain- market-worth-2-3-billion-usd- 2021/** (accessed on 24 July 2020).

Keckley, P.H. (2008). *Medical Tourism: Consumers in Search of Value.* Deloitte Center for Health Solutions: Washington, DC, USA.

Kellermann, A.L. & Jones, S. (2013). What It Will Take To Achieve The As-Yet-Unfulfilled Promises Of Health Information Technology. *Health Affairs*, *32*, 63–68.

Kerr, R. (2018).Airlines and Travel Agencies That Accept Bitcoin for Payment. Available online: **https://thepointsguy.com/guide/airlines- otas-accepting-bitcoin/ (a**ccessed on 14 July 2020).

Kizildag, M., Dogru, T., Zhang, T. C., Mody, M. A., Altin, M., Ozturk, A. B., & Ozdemir, O. (2019). Blockchain: A paradigm shift in business practices. *International Journal of Contemporary Hospitality Management*, 32(3), 953-975.

Kocić, B., & Popović, O. (2018, May). Cryptocurrencies–Opportunity, advantage or financial blunder and impact on tourism development–At glance. In *TISC- Tourism International Scientific Conference Vrnjačka Banja* (Vol. 3, No. 1, pp. 563-581).

Korže, S. Z. (2019). How smart tourism embrace blockchains and smart contracts. *Mednarodno inovativno poslovanje= Journal of Innovative Business and Management*, 11(2), 32-40.

Kostakis, V.& Giotitsas, C. (2014). The (a) political economy of bitcoin. tripleC: Communica- tion, Capitalism & Critique. *Open Access Journal for a Global Sustainable Information Society*, 12(2), 431–440.

Koo, C., Gretzel, U., Hunter, W.C., & Chung, N. (2015). Editorial: The Role of IT in Tourism. *Asia Pacific Journal of Information Systems*, *25*, 99–104.

Koo, C., Shin, S., Gretzel, U., Hunter, W.C. & Chung, N. (2016). Conceptualization of smart tourism destination competitiveness. *Asia Pacific Journal of Information Systems*, *26*, 561–576.

Koo, C., Park, J., & Lee, J.-N. (2017). Smart tourism: Traveler, business, and organizational perspectives. *Information Management*, *54*, 683–686.

Ksehtri, N., 2017a. Will blockchain emerge as a tool to break the poverty chain in the Global South? *Third World Q,* 38 (8), 1710–1732.

Kwok, A. O. & Koh, S. G. (2019). Is blockchain technology a watershed for tourism development?. *Current Issues in Tourism*, 22(20), 2447-2452.https://doi.org/10.1080/13683500.2 018.1513460

Lai, L.S.L. & To, W.T. (2015). Content analysis of social media: A grounded theory approach. *Journal of Electronic Commerce Research*, *16*, 138–152.

Lee, H.K. & Fernando, Y. (2015). The antecedents and outcomes of the medical tourism supply chain. *Tourism Management*, *46*, 148–157.

Lenz, R. (2019). Managing Distributed Ledgers: Blockchain and Beyond. Available online: **https://www.chedteb.eu/media/attachments/2019/09/02/managingdistributedledgers-blockchainandbeyond.pdf** (accessed on 1 November 2021).

Leung, D. & Dickinger, A. (2017). Use of Bitcoin in online travel product shopping: The European perspective. In *Information and communication technologies in tourism 2017* (pp. 741-754). Springer, Cham.

Li, X., Jiang, P., Chen, T., Luo, X.& Wen, Q. (2020). A survey on the security of blockchain systems. *Future. Generation Computer Systems*, *107*, 841–853.

Li, J., Li, N., Peng, J., Cui, H., & Wu, Z. (2019). Energy consumption of cryptocurrency mining: A study of electricity consumption in mining cryptocurrencies. *Energy*, *168*, 160–168.

Lin, I. & Liao, T. (2017). A survey of blockchain security issues and challenges. *International. Journal of Network Security*, *19*, 653–659.

Linn, L.A. & Koo, M.B. (2016). Blockchain for health data and its potential use in health it and health care related research. In *ONC/NIST Use of Blockchain for Healthcare and Research Workshop* (pp. 1–10). ONC: Gaithersburg, MD, USA; NIST: Gaithersburg, MD, USA.

Lunt, N. & Carrera, P. (2011). Systematic review of web sites for prospective medical tourists. *Tourism Review.*, *66*, 57–67.

Macready, N. (2007). Developing countries court medical tourists. *Lancet*, *369*, 1849–1850.

Magas, J. (2020, July). Destination blockchain: Shaking up travel industry and cutting costs.Available online: **https://cointelegraph.com/news/de stination-blockchain-shaking-up-travel- industry-and-cutting-costs/** (accessed on 24 July 2020).

Magovan, K. (2017). Blockchain technology moves into the hospitality industry. Available online: **www. itchronicles.com/technology/blockchain- technology-moves-hospitality- industry/** (accessed on 24 July 2020).

Martínez-Ballesté, A., Pérez-Martínez, P.A., & Solanas, A. (2013). The pursuit of citizens ′privacy: A privacy-aware smart city is possible. *IEEE Communications Magazine*, *51*, 6.

Marr, B. (2018). The awesome ways TUI uses blockchain to revolutionize the travel industry. Available online: **https://www.forbes.com/sites/bernard marr/2018/12/07/the-amazing-ways-tui- uses-blockchain-to-revolutionize-the-travel-industry/#7a6ecfcc1e7f/ (**accessed on 14 July 2020).

Matteucci, X., & Gnoth, J. (2017). Elaborating on grounded theory in tourism research. *Annals of Tourism Research*, 65, 49–59.

Mazambani, L. & Mutambara, E. (2019). Predicting FinTech innovation adoption in South Africa: The case of cryptocurrency. *African Journal of Economic and Management Studies*, *11*, 30–50.

Milne, G.R. (2000). Privacy and Ethical Issues in Database/Interactive Marketing and Public Policy: A Research Framework and Overview of the Special Issue. *Journal of Public Policy Marketing*, *19*, 1–6.

Moghavvemi, S., Ormond, M., Musa, G., Isa, C.R.M., Thirumoorthi, T., Bin Mustapha, M.Z., Kanapathy, K., Chandy, J.J.C. (2017). Connecting with prospective medical tourists online: A cross-sectional analysis of private hospital websites promoting medical tourism in India, Malaysia and Thailand. *Tourism Management.*, *58*, 154–163.

Morkunas, V.J., Paschen, J., & Boon, E. (2019). How blockchain technologies impact your business model. *Business Horizons*, *62*, 295–306.

Mougayar, W. 2016. The business blockchain: Promise, practice, and application of the next internet technology. Hoboken, NJ: John Wiley & Sons.

Mudur, G. (2003). India plans to expand private sector in healthcare review. *British Medical Journal*, *326*, 520.

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. Available online: https://bitcoin.org/bitcoin.pdf (accessed on 26 July 2020).

Nam, K., Dutt, C. S., Chathoth, P., & Khan, M. S. (2019). Blockchain technology for smart city and smart tourism: latest trends and challenges. *Asia Pacific Journal of Tourism Research*, 1-15.

Negruşa, A.L., Toader, V., Sofică, A., Tutunea, M.F. & Rus, R.V. (2015). Exploring gamification techniques and applications for sustainable tourism. *Sustainability*, *7*, 11160–11189.

Nuryyev, G., Wang, Y. P., Achyldurdyyeva, J., Jaw, B.S.,Yeh,Y.S.,Lin,H.T.,&Wu,L.F. (2020). Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: An empirical study. *Sustainability*, 12(3), 1256.

Önder, I. & Gunter, U. (2020). Blockchain: Is it the future for the tourism and hospitality industry? *Tourism Economy*, 1–9.

Oxford Internet Institute (2017). Understanding Public Blockchain Governance. Available online: **https://www.oii.ox.ac.uk/blog/understanding-public-blockchain-governance/** (accessed on 1 October 2020).

Ozdemir, A. I., Ar, I. M., and Erol, I.(2019). Assessment of blockchain applications in travel and tourism industry. *Quality and Quantity*, 1-15.

Parekh, J., Jaffer, A., Bhanushali, U., & Shukla, S. (2021). Disintermediation in medical tourism through blockchain technology: An analysis using value-focused thinking approach. *Information Technology and Tourism*, *23*, 69–96.

Pilkington, M. (2017). Can Blockchain Technology Help Promote New Tourism Destinations? The Example of Medical Tourism in Moldova. Available online: **https://ssrn.com/abstract=2984479** (accessed on 16 February 2021).

Pilkington, M. (2021). The Relation between Tokens and Blockchain Networks: The Case of Medical Tourism in the Republic of Moldova. *Journal of the British Blockchain Association*, *4*, 18156.

Pilkington, M., Crudu, R., & Grant, L. G. (2017). Blockchain and bitcoin as a way to lift a country out of poverty-tourism 2.0 and e- governance in the Republic of Moldova. *International Journal of Internet Technology and Secured Transactions*, 7(2), 115-143.

Pocock, N.S. & Phua, K.H. (2011). Medical tourism and policy implications for health systems: A conceptual framework from a comparative study of Thailand, Singapore and Malaysia. *Global Health*, *7*, 12.

Polukhina, A., Arnaberdiyev, A., & Tarasova, A. (2019, May). Leading technologies in tourism: using blockchain in TravelChain project. In *3rd International Conference on Social, Economic, and Academic Leadership (ICSEAL 2019).* Atlantis Press.

Queiroz, M.M. & Wamba, S.F. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. *International Journal of Information Management*, *46*, 70–82.

Qi, S., Law, C.H.R., & Buhalis, D. (2008). Usability of Chinese Destination Management Organization Websites. *Journal of Travel Tourism Marketing*, *25*, 182–198.

Ramos, V. & Untong, A. (2014). Spa tourism. In *Encyclopedia of Tourism*; Jafari, J., Xiao, H., Eds.; Springer: Cham, Switzerland.

Rashideh, W. (2020). Blockchain technology framework: Current and future perspectives for the tourism industry. *Tourism Management*, 80, 104125.

Ratten, V., Braga, V., Álvarez-García, J. & Del Río, M.D.L.C. (2019). (Eds.) *Tourism Innovation: Technology, Sustainability and Creativity*; Routledge: New York, NY, USA.

Rejeb, A., & Karim, R. (2019). Blockchain technology in tourism: applications and possibilities. *World Scientific News*, 137, 119-144.

Rejeb, A., G Keogh, J., & Treiblmaier, H. (2019). The impact of blockchain on medical tourism. In *Workshop on E-Business* (pp. 29-40). Springer, Cham.

Rezaei-Hachesu, P., Safdari, R., Ghazisaeedi, M., & Samad-Soltani, T. (2017). The Applications of Health Informatics in Medical Tourism Industry of Iran. *Iranian Journal of Public Health*, *46*, 1147–1148.

Ross, E. (2017). Nobody puts blockchain in a corner: The disruptive role of blockchain technology in the financial services industry and current regulatory issues. *Catholic U.J.L. & Tech*, *25*, 353–386.

Ruhanen, L. (2009). Stakeholder Participation in Tourism Destination Planning another Case of Missing the Point? *Tourism Recreation Research*, *34*, 283–294.

Scekic, O., Nastic, S., & Dustdar, S. (2018). Blockchain-supported smart city platform for social value co-creation and exchange. *IEEE Internet Computing*, *23*, 19–28.

Schatsky, D., Arora, A., & Dongre, A. (2018). Blockchain and the Five Vectors of Progress. Delloitte. Available online: **https://www2.deloitte.com/us/en/insights/focus/signals-for-strategists/value-of-blockchain-applications-interoperability.html** (accessed on 28 October 2021).

Seffinga, J., Lyons, L., & Bachman, A. (2017). The Blockchain (r)evolution - The Swiss perspective. Deloitte. Deloitte: Switzerland.

Shafiee, S., Ghatari, A. R., Hasanzadeh, A., & Jahanyan, S. (2019). Developing a model for sustainable smart tourism destinations: A systematic review. *Tourism Management Perspectives*, 31, 287-300.

Sharma, A., Vishraj, B., Ahlawat, J., Mittal, T., & Mittal, M. (2020). Impact of COVID-19 outbreak over medical tourism. *Journal of Dental and Medical Science*, *19*, 56–58.

Shrestha, A. K., and Vassileva, J. (2017). User-controlled privacy-preserving user profile data sharing based on blockchain. In P*roceedings of the Future Technologies Conference (FTC)*, Vancouver, Canada. IEEE (Vol. 266).

Singh, N. (2013). Exploring the factors influencing the travel motivations of US medical tourists. *Current Issues in Tourism*, *16*, 436–454.

Sixtin, E. (2017). TUI tourism group will adopt Ethereum blockchain technology. Available online: **https://btcmanager.com/tui-tourism-group-to-adopt-ethereums-blockchain/** (accessed on 24 July 2020).

Skiba, D.J. (2017). The potential of blockchain in education and health care. *Nurse Education Perspectives*, *38*, 219–221.

Smith, M. & Puczkó, L. (2008). *Health and Wellness Tourism*; Routledge: New York, NY, USA.

Staples, M., Chen, S., Falamaki, S., Ponomarev, A., Rimba, P., Tran, A.B., & Zhu, J. (2017). *Risks and Opportunities for Systems Using Blockchain and Smart Contracts. Data61*; CSIRO: Sydney, Australia.

Stephano (2019). Blockchain Technology: A Total Game-Changer in Medical Tourism. Available online: **https://www.magazine.medicaltourism.com/article/blockchain-technology-medical-tourism** (accessed on 26 October 2021).

Strauss, A. L., & Corbin, J. (1990). *Basics of qualitative research,* 15. Newbury Park, CA: Sage.

Stumpf, T., Sandstrom, J., & Swanger, N. (2016). Bridging the gap: Grounded theory method, theory development, and sustainable tourism research. J*ournal of Sustainable Tourism,* 24(12), 1691–1708.

Sylvester, A., Tate, M., & Johnstone, D. (2013). Beyond synthesis: Re-presenting heterogeneous research literature. *Behaviour and Information Technology*, 32(12), 1199– 1215.

Swan, M. (2015). *Blockchain: Blueprint for a New Economy*; O'Reilly Media, Inc.: Sebastopol, CA, USA.

Tapscott, D., and Tapscott, A. (2016). How blockchain will change organizations. Available online: **https://sloanreview.mit.edu/article/how-blockchain-will-change-organizations/**(accessed on 26 July 2020).

Tham, A., & Sigala, M. (2020). Road block (chain): bit (coin) s for tourism sustainable development goals?. *Journal of Hospitality and Tourism Technology*.https://doi.org/10.1108/JHTT -05-2019-0069

Till, B.M., Peters, A.W., Afshar, S., & Meara, J.G. (2017). From blockchain technology to global health equity: Can cryptocurrencies finance universal health coverage? *BMJ Global Health*, *2*, e000570.

Treiblmaier, H. (2020) Blockchain and tourism. In: Xiang Z, Fuchs M., Gretzel U., Höpken W (Eds) *Handbook of e-Tourism. Springer, Berlin.* https://doi.org/10.1007/978-3-030- 05324-6_28-1

Treiblmaier, H. & Beck, R. (2019a). Eds.*Business Transformation through Blockchain* (Vol. 1.). Palgrave Macmillan: Cham, Switzerland.

Treiblmaier, H. and Beck, R. (2019b). Eds. *Business Transformation through Blockchain* (Vol. 2.). Palgrave Macmillan: Cham, Switzerland.

Treiblmaier, H., & Önder, I. (2019). The impact of blockchain on the tourism industry: a theory-based research framework. In *Business transformation through blockchain* (pp. 3-21). Palgrave Macmillan: Cham, Switzerland.

Tyan, I., Yagüe, M.I., & Guevara-Plaza, A. (2021). Blockchain Technology's Potential for Sustainable Tourism. In *Information and Communication Technologies in Tourism 2021* (pp. 17–29). Springer International Publishing: Cham, Switzeralnd.

Udegbe, S. E. (2017). Impact of blockchain technology in enhancing customer loyalty programs in airline business. *International journal of innovative research and advanced studies*, 4(6), 257-263.

Valeri, M. (2015). Sustainability development and competitiveness of Rome as a tourist destination. *Tourism and Hospitality Managemen*t, 21(2), 203–218. https://doi.org/10.20867/thm.21.2.7

Valeri, M. (2020). Blockchain technology: Adoption perspectives in tourism. In *Entrepreneurship and Organizational Change* (pp. 27-35). Springer, Cham.

Valeri, M. and Baggio, R. (2020). A critical reflection on the adoption of blockchain in tourism. *Information Technology and Tourism*, 1-12.

Vanolo, A. (2013). Smartmentality: The smart city as disciplinary strategy. *Urban Studies*, 1–16.

Varelas, S., Georgitseas, P., Nechita, F., & Sahinidis, A. (2019). Strategic innovations in tourism enterprises through blockchain technology. In *Strategic Innovative Marketing and Tourism* (pp. 885-891). Springer, Cham.

Vukolić, M. (2015). The quest for scalable blockchain fabric: Proof-of-work vs. BFT replication. In *International Workshop on Open Problems in Network Security* (pp. 112–125). Springer: Cham, Switzerland.

Wang, D., Li, X., & Li, Y. (2013). China's smart tourism destination initiative: A taste of the service-dominant logic. *Journal of Destination Marketing Management*, *2*, 59–61.

Wang, X., Li, X.R., Zhen, F., & Zhang, J. (2016). How smart is your tourist attraction? Measuring tourist preferences of smart tourism attractions via a FCEM-AHP and IPA approach. *Tourism Management*, *54*, 309–320.

Wang, Y., Singgih, M., Wang, J., and Rit, M. (2019). Making sense of blockchain technology: (How) will it transform supply chains? *International Journal of Production Economics, 211*, 221–236.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, xiii-xxiii..

Willie, P. (2019). Can all sectors of the hospitality and tourism industry be influenced by the innovation of blockchain technology?. *Worldwide Hospitality and Tourism Themes*, 11(2), 112-120.

Wolfswinkel, J. F., Furtmueller, E., & Wilderom, C. P. (2013). Using grounded theory as a method for rigorously reviewing literature. *European Journal of Information Systems*, 22(1), 45–55.

Wong, B.K.M. & Hazley, S.A.S. (2021). The future of health tourism in the industrial revolution 4.0 era. *Journal of Tourism Futures*, *7*, 267–272.

Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G. W. H., & Ooi, K. B. (2020). Time to seize the digital evolution: Adoption of blockchain in operations and supply chain

management among Malaysian SMEs. *International Journal of Information Management*, *52*, 101997

Xiang, Z. & Fesenmaier, D.R. (2017). Big Data Analytics, Tourism. In *Analytics in Smart Tourism Design* (pp. 299–307); Xiang, Z., Fesenmaier, D.R., Eds. Springer: Cham, Switzerland.

Ying, W., Jia, S., & Du, W. (2018). Digital enablement of blockchain: Evidence from HNA group. *International Journal of Information Management*, 39, 1-4.

Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where Is current research on blockchain technology?—A systematic review. PLoS ONE 11(10): e0163477. doi:10.1371/journal. pone.0163477

Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism*, 22(17), 2056-2081.

Zahra, A., Alireza, J., Masoud, F., & Mahmoud, K. (2013). A systematic review of publications studies on medical tourism. *Journal of Education & Health Promotion*, *2*, 51.

Zeren, S. K., & Demirel, E. (2020). Blockchain based smart contract applications in tourism industry. In *Digital Business Strategies in Blockchain Ecosystems* (pp. 601-615). Springer, Cham.

Zhang, L., Li, N. & Liu, M. (2012). On the Basic Concept of Smarter Tourism and Its Theoretical System. *Tourism Tribune*, *5*, 66–73.

Zhao, J.L., Fan, S., & Yan, J. (2016). Overview of business innovations and research opportunities in blockchain and introduction to the special issue. *Financial Innovation*, 2(1),28.

Zheng, Z., Xie, S., Dai, H.-N., Chen, X., Wang, H.(2018). Blockchain challenges and opportunities: a survey. *International Journal of Web and Grid Services*, 14(4), 352–375.

Zhu, W., Zhang, L., & Li, N. (2014). Challenges, Function Changing of Government and Enterprises in Chinese Smart Tourism. IFITT: Dublin, Ireland.

Zignuts. (2018). How Blockchain Architecture Works? Basic Understanding of Blockchain and Its Architecture. Available online: **https://www.zignuts.com/blogs/how-blockchain-architecture-works-basic-understanding-of-blockchain-and-its-architecture/** (accessed on 11 February 2021).

Zygiaris, S. (2013). Smart city reference model: Assisting planners to conceptualize the building of smart city innovation ecosystems. *Journal of the Knowlegde Economy*, *4*, 217–231.

Annexes

These annexes represent the first pages of each article the thesis contains.

BLOCKCHAIN ADOPTION IN TOURISM: GROUNDED THEORY-BASED CONCEPTUAL MODEL

Inessa Tyan
Tourism Department, University of Malaga
Malaga, Spain
Mariemma Yagüe
Institute of Tourism Intelligence and Innovation, University of Malaga
Malaga, Spain
Antonio Guevara-Plaza Eurecat, Centre Institute of Tourism Intelligence and Innovation, University of Malaga
Malaga, Spain

Submitted: November 18th 2020; Resubmitted: December 21st 2020; Accepted: January 11th 2021

e-ISSN: 2014-4458

Abstract

This study aims to move forward a blockchain tourism research and add understanding regarding blockchain adoption in the tourism industry. Grounded theory method based literature review was applied as a research methodology. Based on the literature review, the authors developed a conceptual model of blockchain adoption in tourism by defining casual, context, intervening conditions that affect blockchain adoption and outlining the consequences of blockchain adoption on the tourism sector. This research will contribute to the blockchain adoption literature as well as will give answers to the industry practitioners on how this innovative technology can be adopted and whether it worth investments or not.

Resumen

Este estudio trata de avanzar la investigación sobre blockchain en turismo, y contribuir a elevar el nivel de conocimiento sobre la adopción de la tecnología blockchain en el sector turístico. Como metodología de investigación se ha aplicado la revisión bibliográfica basada en el método de la teoría fundamentad. Basándose en dicha revisión bibliográfica, se ha desarrollado un modelo conceptual para la adopción de la tecnología blockchain en turismo, definiendo las condiciones intermedias, casuales y contextuales que tienen efecto en la adopción de blockchain y han delimitado las consecuencias de la adopción de blockchain en el sector turístico. Esta investigación contribuirá a la literatura sobre la adopción de blockchain en el turismo y dará respuestas a los profesionales de la industria sobre cómo se puede adoptar esta tecnología innovadora y si vale la pena invertir o no.

sustainability

MDPI

Concept Paper

Blockchain Technology for Smart Tourism Destinations

Inessa Tyan [1,*], Mariemma I. Yagüe [2] and Antonio Guevara-Plaza [2]

[1] Faculty of Tourism, Campus of Teatinos, University of Malaga, s/n, 29071 Malaga, Spain
[2] Institute of Tourism Intelligence and Innovation, Campus of Teatinos, University of Malaga, s/n, 29071 Malaga, Spain; yague@uma.es (M.I.Y.); guevara@uma.es (A.G.-P.)
* Correspondence: inessa-jang@hotmail.com

Received: 20 October 2020; Accepted: 17 November 2020; Published: 21 November 2020

Abstract: This conceptual paper discusses the potential of blockchain technology for Smart Tourism Destinations. The main focus is placed on Smart Tourism Destinations' four major goals that can be achieved by using blockchain technology, namely: enhancing tourism experience, rewarding sustainable behaviour, ensuring benefits for local communities, and reducing privacy concerns. The paper also outlines the major challenges that need to be overcome to successfully implement this innovative technology. This paper attempts to further advance the current knowledge about the possible implications of blockchain technology within the smart tourism domain, and especially Smart Tourism Destinations.

Keywords: blockchain technology; smart tourism destinations; smart tourism

1. Introduction

Over the last decade, the concept of 'Smart Cities' has gained enormous popularity that has resulted in the emergence of the topic of 'Smart Tourism Destinations' [1]. Smart Tourism Destinations widely use information and communication technologies (ICTs) and promise to gain a market advantage and positively contribute to sustainable tourism development by implementing sustainability initiatives [2,3]. Previous research highlights that three forms of ICTs, Cloud Computing, Internet of Things, and End-User Internet Service System, are of the highest importance for developing Smart Tourism Destinations [4].

Smart Tourism Destinations need to provide a technological platform through which all tourism data could be exchanged among all stakeholders [1]. Real-time information sharing is crucial to all in Smart Tourism Destinations, however, because of the existing oligarchy of global distribution system providers, small and local tourism businesses do not have access to data. This problem causes additional costs for the users, (both tourists and small tourism businesses), and enables providers to control prices [5]. Smart Tourism Destinations also face challenges regarding privacy issues and struggle to find a solution to hide tourists' real identities [1]. An emerging cutting-edge technology, blockchain, may be used to address these challenges and assist in the development of Smart Tourism Destinations. However, there is limited research on possible effects of blockchain within the smart tourism domain, and especially Smart Tourism Destinations. The authors of [6] discussed the possible links of blockchain technology with smart and sustainable tourism and made theoretical propositions on future development of this technology in the tourism industry. The authors of [5] conducted an explorative study to investigate how blockchain technology had been implemented within the context of smart tourism.

To further academic debate around blockchain technology in smart tourism contexts, this conceptual paper aims to shed light on the potential of blockchain technology in Smart Tourism

sustainability

MDPI

Concept Paper

The Benefits of Blockchain Technology for Medical Tourism

Inessa Tyan [1,*], Antonio Guevara-Plaza [2] and Mariemma I. Yagüe [2]

[1] Faculty of Tourism, University of Malaga, 29071 Malaga, Spain
[2] Institute of Tourism Intelligence and Innovation, University of Malaga, 29071 Malaga, Spain; guevara@uma.es (A.G.-P.); yague@uma.es (M.I.Y.)
* Correspondence: inessatyan2021@gmail.com

Abstract: The paper discusses the benefits of blockchain technology for medical tourism. The major focus is placed on pre-procedure and post-procedure of medical tourism. The authors argue that blockchain technology can facilitate several stages of medical tourism by enabling disintermediation, allowing cryptocurrency payments, ensuring secure data sharing and privacy, and empowering trusted review systems. With regard to COVID-19 pandemic, the paper outlines the current challenges of the medical tourism industry and prop oses the opportunities for blockchain technology use. The paper attempts to provide important insights regarding the positive implications of blockchain technology use within the medical tourism industry as well as to further advance the current knowledge about blockchain technology's effects for medical tourism.

Keywords: disrupted technology; blockchain technology; medical tourism; COVID-19

Citation: Tyan, I.; Guevara-Plaza, A.; Yagüe, M.I. The Benefits of Blockchain Technology for Medical Tourism. *Sustainability* **2021**, *13*, 12448. https://doi.org/10.3390/su132212448

Academic Editors: Carlos Costa, Joana Alegria Quintela and Joaquim Gonçalves Antunes

Received: 25 August 2021
Accepted: 6 November 2021
Published: 11 November 2021

1. Introduction

Medical tourism is a rapidly boomed trend in tourism that has recently gained enormous popularity. Each year more and more individuals travel abroad to receive health care services. Despite the difficulty to confirm exact statistics for medical tourism, the number of medical tourists worldwide in 2019 was estimated at 23,043 thousand and was expected to reach 70,359 thousand by 2027 [1]. According to a report published by [1], the global medical tourism market was valued at USD 104.68 billion in 2019 and was projected to reach USD 273.72 billion by 2027. However, these projections are likely to go down in light of the COVID-19 pandemic. Among the dominant factors contributing to the recent growth of the medical tourism industry are affordable health care technologies [2], cost-effective transportation facilities [3] as well as an increased level of promotion by countries as medical tourism destinations [4]. The number of countries marketing themselves as medical tourism destinations has significantly grown since this new sector represents a lucrative economic opportunity for such destinations [5].

The important role of information technologies in the tourism industry is undeniable [6]. With the rapid digitisation of healthcare, medical tourism destinations and medical service providers may use technological innovations for providing personalized healthcare delivery services and attracting new tourists. Internet has been revealed as playing an important role in providing information for the prospective medical tourists and connecting them with the healthcare providers [7]. Prior research has confirmed that there are information systems that can be profitably integrated into medical tourism, such as destination management organizations websites [8], electronic health record systems [9], or point-of-sale systems for cosmetic services [10].

Blockchain technology is perceived as a foundational technology since potentially new social and economic systems can be based on blockchain [11]. Recently, blockchain technology and cryptocurrencies have become hot topics in tourism and hospitality research. However, in regard to medical tourism research, there exists only a handful of published articles analyzing the impacts of blockchain technology on medical tourism. Focusing