Could Blockchain Technology Strengthen the Growth of Medical Tourism?

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Abstract

Medical tourism has thrived over the past couple of decades witnessing a promising amount of growth. This modern phenomenon is a combination of medical services accompanied by tourism and hospitality. Despite its success, various setbacks have been identified indicating room for further development. New and improved technologies have also increasingly emerged, leaving their mark across different sectors. Blockchain has gained vast recognition in recent years after causing disruption in various industries. The technology has enjoyed great hype around revolutionizing medical tourism as this industry itself is highly dependent on trust, transparency, affordability and security. This paper explores whether Blockchain could potentially strengthen the growth of medical tourism using both primary and secondary research.

Could Blockchain Technology Strengthen the Growth of Medical Tourism?

Medical tourism is the primary term used to describe the process of people travelling abroad to receive medical treatment. The act of cross border healthcare has been around for centuries, going all the way back to 4000 BC, when the Sumerians created medical sites around hot springs by constructing spas and pools for neighboring civilians to visit. Throughout villages in India, different Yoga and Ayurveda treatments were practiced for over five thousand years and people would visit each other's villages and implement their own healing techniques (Bookman & Bookman, 2007). In Europe, Ancient Romans were known for building therapeutic sanctuaries like thermal health spas which were very popular amongst travelers. In Ancient Greece on the other hand, people used to travel to sacred cities to receive treatment from God (Mestrovic, 2018).

As urbanization advanced, particularly in the 16th and 17th century Europe, these ancient medical sites became hotspots for the modern traveler. In Somerset UK, for example, seaside resorts attracted people from all over the continent to receive treatment and learn about the different remedies that existed (for those who could afford the trip). Within no time, the number of spa towns rapidly increased throughout the country (Pilkington, 2017). As a result, the phrase ‘medical tourism’ became recognized. The word ‘tourism’ reflects the way in which travelers would decide to stay in a foreign country for an extra period of time after receiving their treatment. They would spend time and money studying and acknowledging different cultures within these areas.

Medical Tourism Drivers

Over the past couple of decades, medical tourism has been continuously thriving and is perceived by many as a modern phenomenon within both the hospitality and healthcare industry. Patients are seeking swifter and cheaper medical treatment (Lee & Fernando, 2015). The extent of medical tourism ranges from minor cosmetic and dental procedures to major surgeries such as an organ transplantation. Cosmetic procedures filled more than 40% of the medical tourism market in 2017 and is expected to continue to dominate and increase (Allied Market Research, 2019).

The advancement of globalization has facilitated world trade, international investment, global economic growth and the spur of different industries such as tourism and healthcare. Air travel, for instance, has significantly expedited the emergence of new industries. Airlines have gained vast recognition for their roles in globalization in both the private and public sector and receive large portions of investment (Czaika, 2017). In 2019, there were over four and a half billion scheduled passengers, more than two hundred million the year before. The main reasons behind airline growth is alluded to the increase of budget airlines, global rise of income levels and larger investment in airport infrastructure, enhancing travel capacity. (Mazareanu, 2020). Also, the construction and modernization of railways has rapidly increased the flow of tourists entering new countries, as it has become both easier and cheaper to do so (Waralee, 2018).

Global rising income levels have also enabled people's ability to travel. The middle class has stretched passed its tipping point and has become the greatest portion of demand within the global economy. Although it is difficult to explicitly define the middle class, the criterion used to pinpoint its characteristics is the ability to afford discretionary spending, such as on vehicles,

furniture, entertainment and most importantly holidays (Hofer & Baier, 2018). Businesses are shaping their target market in response to the middle class gaining larger shares of global income distribution. By 2018, there were 3.6 billion middle class people and it has been projected that this number will reach four billion people by the end of 2020 and over five billion by 2030 (The World Bank Group, 2019).

Lengthy waiting times and soaring prices from local health insurances drive consumer demand in seeking interventions abroad (Lee & Fernando, 2015). Other factors such as the lack of availability of procedures in a patient's country and the accessibility in another, drive customer choice for travelling. Inequalities to cancer treatments, for instance, is a rising concern to patients in the UK. Long waiting times on the NHS and huge private fees will leave a patient with no choice but to seek treatment abroad. In Poland, hospitals are not able to carry out treatments which are not authorized for reimbursement by the government- meaning that even if patients can pay for their treatment, they won't have access to a provider. (White, 2017). Primarily though, the main drivers of medical tourism are classified as affordability, accessibility and availability (Keogh & Treiblmaier, 2019).

Affordability, Accessibility and Availability

The number of low- income countries developing their hospitals and private clinics is considerably increasing due to rising interest in acquiring international medical accreditation (Deloitte, 2008). With that being said, medical treatments tend to have lower costs in lower income countries than the ones of higher income, ultimately, catching the eye of patients living in high GDP countries. Furthermore, the patients will take into account the benefits of a more favorable exchange rate between stronger and weaker currencies. This is particularly useful

when taking part in the more traditional tourist activities, such as dining, shopping or other miscellaneous expenses. For example, the average cost of a simple face lift in the USA is around $11,000 whereas a face lift in Thailand would be around $3,900; or perhaps something as serious as a knee replacement could cost well over $35,000 in the US but if the patient travelled to India it would cost them $6,500. To dig even deeper, a two- way flight to India from the US would cost on average $700-800, five- star hotels for $100 a day and even with generous daily spending money for a week, the patient would still save well over $20,000 (International Medical Travel Journal, 2017).

Countries such as Thailand, India, Brazil, Malaysia and Turkey are amongst the top medical tourism destinations assorted by their affordability, quality and credentials (Wotmed, 2019). Different countries set their own minimum level of accreditation which must be met, or in these countries' cases- exceeded. Significantly lower prices have the power to influence the decision of patients before travelling and are one of the reasons why many countries are competing in costs and devoting their attention to the sophistication of their healthcare (Munro, 2016).

There are various organizations which provide international objective assessments. The Joint Commission International (JCI), for instance, are the most recognized global leaders in health care accreditation. Clinics that manage to obtain certificates from organizations such as JCI may have a significant advantage over competitors (Laric & Pitta, 2009).

Innovative medical techniques are being increasingly used; however, they tend to be out of reach to patients due to healthcare insurers not yet approving them. Also, the soaring insurance costs and infuriatingly long waiting times are all drivers of a patient's desire to receive treatment away from their home country. Patients from countries such as the UK, USA and Canada are most

likely to come across such problems (DeMicco, 2017). The unavailability of procedures or the general absence of a given treatment may leave a patient with no option but to travel; sometimes this may be an even more expensive route. Scenarios like this tend to happen if a patient needs an organ donor and is unable to receive one in their home country (Lee & Fernando, 2015). Cost aside, accessibility and availability are therefore two crucial factors influencing consumer decision and driving provider capacity.

Technology in Healthcare

An estimated 20-24 million patients cross borders each year to receive medical treatments. These trips accounted for approximately USD 45-70 billion in medical tourism industry spending in 2018 (Patients Beyond Borders, 2019). The year before, Allied Market Research (2018) estimated the valuation of medical tourism to be around USD 53 billion. Their expected compound annual growth rate (CAGR) is estimated at 12.9% through 2019- 2025, reaching a valuation of USD 143 billion by 2025. (Allied Market Research, 2018). These statistics support the influence of medical tourism as a positive, healthy and sustainable portion of a country's GDP throughout various sectors, such as hospitality, transport, pharmaceuticals and cultural tourism. The industry is firmly growing, and consequently, more countries are investing in and implementing this niche market to their benefit and thus expanding their services (De Micco, 2017).

As the medical tourism industry produces at least USD 45 billion a year (2018), which accounts for approximately 2-3% of global tourism, emerging markets are embracing this phenomenon and developing their medical institutions in hope for lucrative returns. In India, for instance, medical tourism raked in USD 3.9 billion in 2016, which accounted for 0.2% of their annual

GDP. India is one of the strongest health tourism forces and their revenues contributed 5% to global medical tourism's market share. Additionally, in that year, India created 167,000 employment opportunities within this field. By 2021, medical tourism is expected to exceed USD 8 billion (Krishnan, 2017).

Globalization has supported the growth of medical tourism significantly and subsidizing neighboring industries (Lee & Fernando, 2015). For example, the development of the 'sharing economy' has boosted customer options whether it be more convenient transport (with the likes of Uber & Lyft) or more economic and alternative accommodation (Airbnb & Booking). The lucrativeness of this industry has resulted in a vast increase in competition and constant innovation- most of which thrives from the technology industry (Tathagatta & Santanu 2018).

The development of new technology and intelligence in healthcare, travel and hospitality has shaped these industries into becoming more consumer orientated. Government tourism and medical ministries are continually tackling this field with new approaches in order to increase customer satisfaction (Ying, Jia & Du, 2018). For instance, patients can freely browse their diagnosis and compare treatment plans all in a click of a button, such as on various GOV websites, informational pages, social media and networking sites or private websites such as medical agencies. Price and availability have never been so transparent before the internet age. There are various technology systems used to strengthen health travel. 'The success of online travel agencies (OTA's), such as Expedia, Booking.com, TripAdvisor, and Ctrip has paved the way for the parallel healthcare vertical, online medical agencies (OMA's).' (Woodman, 2016, pp144).

OMA's act as an intermediary between a patient and a provider by offering transparency and security prior to bookings (Lee & Fernando, 2015). These companies have played a crucial role in the organization of a procedure from a patient's point of view in particular. OMA's generally assist with arranging accommodation, meals, tour guides, payments and any other special requests a client asks for. They also benefit the providers as they lure in customers with strong marketing techniques and brand recognition. OMA's almost act as a client's virtual friend- whatever and whenever they may need, the OMA will be on duty (Kerns, Krist & Woolf, 2013). Furthermore, electronic health records (EHR) have emerged as a critical advancement for providers offering doctor transparency to their patient's medical records regardless of their location. In addition to that, more convenient online payment systems have been introduced and are accepted through new destination management organizations (DMO's) (Wamba & Keogh, 2019).

Blockchain Technology

Blockchain technology surfaced during the aftermath of the global financial crisis in 2008. The technology emerged after a pseudonymous person, or perhaps group of people, going by the name of Satoshi Nakamoto created a new method of payment, by a cryptocurrency called Bitcoin (Tapscott & Tapscott, 2017). Cryptocurrencies are digital types of currency which differ from ordinary fiat currencies as they are not regulated or distributed by governments. In order to be approved and legalized, Bitcoin had to be accompanied by a functioning electronic system so that it facilitates its transactions in the most transparent and controlled way (Tackmann, 2017). This is where Blockchain was created.

In recent years, Blockchain technology has thrived and has been characterized by many experts to be as fundamental and parallel to that of the internet. Blockchain ‘is an electronic database of transactions, whereby new deals are added to the chain and then stamped and protected with a mathematical equation’ (Murphy, 2018). Blockchain, in essence, is a distributed ledger of information between parties, and before being entered, must be verified by the majority of members in the system. Once published, the data can never be wiped out. The data is protected by state-of-the-art cryptography, to connect timestamped series of occurrences together so that meddling of any information is easily noticed. To simplify and summarize from Tapscott & Tapscott (2017), blockchain can be classified with six essential elements:

Immutability- Transactions are secured, stored and validated using complex cryptography almost impossible to breach. Every record entered, must match the prior record (in code) to be approved.

Distributed Ledgers- A database with no central authority. These are independent computers which are recording, distributing and developing data, meaning information is tracked and easily moved across accounts.

Increased Capacity- The blockchain network is constantly expanding due to increase of investment and interest shown and therefore, there are more and more of these independent computers. As a result, a lot more information can be stored via blockchain rather than standard centralized resources with a limited number of computers storing data.

Decentralized- There is no governing force overlooking or tampering with any of the resources. This network is maintained by independent computers meaning the user has total control over their asset.

Historic- All data entered on one blockchain is linked together by code, meaning the user has easy access and transparency to their asset from the day it was entered.

Fast- Blockchain technology is built in a way to be able to handle and process transactions very quickly. Standard payments, for example, may take days (prone to corruption), whereas a payment made on blockchain will be executed in a matter of minutes- if not seconds.

The internet was once recognized as an emerging technology to facilitate peer to peer messaging. Soon, the internet rapidly became the backbone of our digital economy, but as time went on, its flaws became apparent. 'Hacks, trolls, security breaches, and the inability to protect data privacy have limited many transactions and impeded collaboration opportunities to date, whereas blockchain offers the ability to ensure the integrity and privacy of data and protect value exchanged among an unlimited number of users via a global peer-to-peer network.' (Akmeemana, 2017).

The financial services industry was amongst the first to captivate the benefits of blockchain due to the endless opportunities available in financial transactions and alternative currencies. However, as blockchain develops, countless industries are becoming more ripe and ready for disruption. Programmers are developing remarkable ways this new technology can record and exchange almost anything of value to us. Innovations extend from birth and death certificates, marriage licenses, wills, secure intellectual property, diplomas and course certificates, financial documents, medical histories, insurance claims, job analysis, contracts and performance management, crowdfunding and absolutely anything else that can be coded, no matter how complex. (Tapscott & Tapscott, 2017).

The Setbacks of Medical Tourism

Both providers and consumers are exposed to unwanted risk as a consequence of the challenges faced within the medical tourism industry. The different risks and repercussions vary on the set practice and procedure taking place. However, the most common concerns patients face before travelling abroad range from the doctor- patient language barriers, provider credentials, hidden costs, follow ups and legal issues (Bostan, Roman & Lazar, 2016).

Not speaking the language of the country where the provider is located may provide difficulties during diagnosis, treatment and follow- up. English is perceived as a dominant global language in which personnel from both healthcare and hospitality industries are trained to communicate in (Joseph & Munghate, 2012). Whilst having a global language benchmark may have its benefits, if a doctor is not completely fluent in the patient's language, the chance of consultation error could significantly increase. The burning issue that arises with language barriers is the lack of transparency and the reassurance patients have when choosing their medical provider. One can never be totally certain of smooth communication until being face to face (Akmal & Hyder, 2019).

Healthcare providers around the world have disparate standards of accreditation. Patients, however, generally have little access to these certificates and usually know little more about the diplomas they see hanging off the walls of their Doctor's clinics (Han & Hyun, 2015). Whilst these credentials can be checked online, the issue of language barriers arises when a diploma is written in foreign language and approved under unfamiliar standards. Assuming someone travels abroad to Thailand to receive therapy, how would one know for sure that the education and experience their therapist received is as legitimate as they claim? This is crucial as a certain

portion of service pricing reflects the level of training one receives to become qualified to be in such position; ultimately being used to cover the costs of that training. Consequently, fraudulent healthcare is a major concept holding patients back from travelling. Various cases have been reported where patients helplessly return home scammed of their money. In 2016, an American citizen, Feldman, relocated to the Philippines, setting up a website advertising kidney and liver transplants. Feldman attracted various American clients in hopes of defrauding them for their money. He notably lured in a Canadian patient expecting a liver transplant, having bank wired $76,000. After arriving to Manila, Feldman was unsuccessful in arranging the procedure and the client later died at his clinic; Feldman was later found guilty of falsifying credentials and jailed for life (Hodges, Turner & Kimball, 2018). Shifty providers and dodgy medication go hand in hand. In Southeast Asia, for example, there is an epidemic of counterfeit Malaria and Hepatitis B& C tablets swarming the area. A study shows that 38- 52% of these tablets are produced with no effective ingredient (Newton & McGready, 2006).

Cost uncertainty is driven by the lack of transparency within procedure plans. Hidden costs can emerge from different angles (Behrmann, & Smith, 2010). Unexpected health complications, for instance, can considerably boost initial pricing plans as all procedures carry some form of risk of further complication (punctured artery, for example). Additional testing may then be done, such as CT and MRI scans resulting in the patient having to stay in hospital for longer- consequently having to pay more for their stay (Crooks, et al. 2013). Many providers lack in clarity as to whether their procedure plans are all inclusive and cover such hidden costs. For example, a surgery may require a biopsy to be taken for testing- is this covered in the initial plan? Or would implants be needed for a joint replacement? Hidden costs can also be non- financial. For example, follow ups can be limited once a patient returns to their home country. Access to

doctors via phone calls and personal emails may be restricted which may dent a patient's belief in the security of travelling abroad for healthcare (Woo & Schwartz, 2014).

Various issues may arise from procedures, such as health complications or added financial fees. Depending on the situation, the patient may feel cheated on and may believe their rights have been exploited. In such a scenario, it is not uncommon for a patient to take the matter further, such as taking their medical provider to court. However, foreign healthcare facilities may challenge patients in doing so as 'not to sue' statements may be written discreetly. (Burkett & Levi, 2007). Furthermore, the burden of handling foreign laws and added legal fees is something patients would strive to avoid. In conclusion, there are various potential threats which may occur in the aftermath of a procedure and if not stipulated properly, a client will not feel entirely safe before booking and may result in them not travelling (Woo & Schwartz, 2014).

How Blockchain Can Help

Blockchain technology has a range of attributes, such as its large capacity, immutability and strong security, which undoubtedly has the potential to revolutionize the way businesses run their operations and has the tools to disrupt industries (Zsarnoczky, 2018). This paper summarizes the four key elements of how Blockchain can influence medical tourism by driving its volume and efficiency. The four key elements are its interoperability, security, disintermediation, trust and transparency (Tapscott & Tapscott, 2017).

Interoperability

Interoperability refers to the ability of multiple systems or machines, like computers, to share and exchange data. Standard healthcare systems have various flaws in sustaining operation

efficiency. Inability to successfully store and exchange medical data in a secure way, can lead to vital drawbacks with significant consequences. This is caused by a patient's Electronic Health Record (EHR) being dispersed through different databases and isolated from usage. (Galen et al., 2018.) Failing to merge EHR's permanently coheres a patient with their foreign medical provider. For instance, should a patient wish to abort their treatment or change their provider, they may be unable to forward all existing medical data (such as diagnosis, treatment plans and procedures) to their newly chosen provider (Blijleven, Koelemeijer & Jasper, 2017). With that being said, the aspect of interoperability should not be neglected to ensure smooth medical treatment. Furthermore, there have been many reported cases of a patient's privacy being invaded even after a procedure. For example, in India, a patient visited Shah clinic for a breast augmentation. Months after the procedure, her provider posted 'before and after' surgery photos on the clinic's website, even though she had told him she did not approve of this. The patient ended up taking the doctor to court and sued him for invasion of privacy (Manaf, Alavi, & Dahari, 2013).

Security

With Blockchain technology, implementing a patient- centric network could enhance the way medical data is stored and distributed. A patient's complete medical history can be tracked and kept on a health system with total privacy. This data is cryptographically protected and treated as 100% sensitive information, meaning only whoever the patient grants access to, can view their medical records (Ying, Jia & Du, 2018) Russian company, Robomed Network, 'is a global digital platform that allows patients to manage and control their healthcare data through a mobile EHR' (IMTJ News, 2018). "Our blockchain is designed to continually expand record-keeping capacity for tracking and accumulating a comprehensive database of medical knowledge and

clinical pathways used in a broad range of medical cases," said Robomed Network's co-founder Philipp Mironovich. Robomed issues Blockchain tokens which consumers purchase with regular currencies and are then used to pay for all services during their medical tourism experience. The benefits of this avoid all exchange rates, transaction delays, hackers and enhance supplier credibility with transparency to actual fees (Zsarnoczky, 2018).

Providing follow- up appointments is usually essential to most patients having received medical treatment (Connell, 2006). Utilizing a patient- centric network would provide customers with the assurance that they can communicate with their doctor via Blockchain technology by exchanging medical records. Crucially, information stored on a Blockchain cannot be tweaked or replaced, which allows patients or doctors to confidently forward those records further and can be used for secure prescriptions (Pilkington, 2015). Du, a telecommunications company from the United Arab Emirates, has since 2014 implemented a Blockchain management platform consisting of electronic health records to fuel the cooperation between hospitals and private clinics. The trend was picked up by various other companies and used to capitalize on the medical tourism sector within the Persian Gulf Countries. In Dubai, for instance, from 2015 to 2016 medical tourism grew by 10% generating over $380 million from 326,738 medical tourists in 2016 (International Medical Travel Journal, 2017).

Bringing this cutting- edge model into play, users will be alleviated of stressful financial transactions. Payments on Blockchain are done via issued tokens which are purchased upon registration. The Blockchain technology serves as a linkage point between a patient and their provider through implementation of smart contracts (Tapscott & Tapscott, 2017). Smart contracts are defined as computer protocols that digitally facilitate and verify the negotiation and execution of a contract. (Investopedia, Smart Contracts, 2017.) Robomed, for instance, issues

Blockchain tokens which consumers purchase with regular currencies, and are used to pay for all services during their medical tourism experience. The benefits of this avoid all exchange rates, transaction delays, hackers and enhance supplier credibility with transparency to actual fees. Again, complex algorithms handle this part of the technology, making the transaction between the patient and provider almost impossible to hack (IMTJ News, 2018).

Trust and Transparency

"Trust is defined as a willingness to rely on an exchange partner in whom one has confidence." (Moorman, Deshpande & Zaltman, 1993). In the world of medical tourism, however, trust would indicate that a medical provider is credible, capable and skillful enough to look after their foreign clients. Rapid improvement of technology allows patients to explore their overseas options and research any concerns they may have regarding their provider/ destination. Customers contemplating on travelling abroad for medical treatment will generally start by browsing health reputations of different destinations and what the range / quality of medical procedures are being offered along with the facilities of the clinics. Whilst there may be a lot of information on display, the content available is often questionable. Websites, both government sites and private businesses tend to post leading content in an attempt to influence your decision on where to travel. In some cases, businesses can market themselves as capable providers for patients in need of potential life- threatening procedures; when in reality, their clinics are not even accredited (Crooks, 2009). If these listed certificates were forged or modified, Blockchain's unique cryptography could distinguish these faults and make them visible to all users. Blockchain's codes would produce a 'hash' key on all tampered data and ultimately, enhance the credibility of all other data (Pilkington, 2015).

Disintermediation

Patients may also choose to book and travel through an intermediary, traditionally known as travel agencies. Medical tourism agencies act as a bridge between the patient and their provider, taking care of patient accommodation, travel, visas, dining and other necessities as well (Linn & Koo, 2016). These intermediaries have over the past few decades established themselves as vital players in the medical tourism industry. However, being so influential, can cause opportunistic behavior. For instance, an agency may be recognized for having strong ties with dental clinics, however, they may not be so closely connected with cosmetic surgeries. Patients may be oblivious to this factor and only recognize their strong brand reputation, without truly knowing what it is for. As a result, the customer may not receive the best possible medical treatment they had hoped for. Or perhaps the patient even opted for a dental procedure, but still failed to receive the best quality treatment as the agency may not be affiliated with a clinic best suited to most suitably treat that particular patient. Most medical tourism agencies can only assign patients to clinics they are under contract with (Healy, 2009).

Booking through an intermediary also raises the burning issue of increased pricing due to significant mark- up costs. To increase profits, agencies may book patients with a provider that offers incentives or referral discounts. Again, customers are in danger of not obtaining the best possible treatment (Behrmann & Smith, 2010). To make matters even more frustrating, these agencies may not be held legally responsible for any wrong- doing as they are not the ones who perform procedures themselves (Burkett & Levi, 2007).

Taking the above into consideration, Blockchain technology has the tools to verify these business credentials with their issuers and authorities. Therefore, relieving patients of their doubts when

viewing certificates, credentials, descriptions and even online reviews. Through such a platform, customers would be guaranteed access to staff qualifications (such as their resumes) in order to assist them with making a better calculated decision. (BTC Studios, 2018). As draconian as this sounds for providers, they can use this to their advantage to sustain and build a stronger brand image. Ultimately, Blockchain technology offers transparency to both health and non- health related data. Patients who can directly communicate with their provider prior to travelling will be unlikely to seek further assistance, eventually disabling the influence of intermediaries.

This paper explores how the implementation of Blockchain technology in medical tourism could benefit patient- tourists as well as medical providers. As per research methodology, a survey was carried out in order to determine whether the characteristics of Blockchain could positively influence people's opinions regarding travelling abroad for medical procedures. In conclusion to this research, the thoughts people have towards potential improvements of medical tourism will be analyzed to confirm whether Blockchain technology would make these people more likely to travel abroad for medical treatment.

Methodology

Chosen Approach

The results drawn from this research were statistically concentrated. The objective was to efficiently measure the probability of success, which in this case relates to implementing Blockchain technology in medical tourism. With that being said, a deductive approach was deemed to be most suitable for this paper. The deductive approach concludes the thesis, based on an already existing theory, and then designs a research method to assess this. The deductive

approach is carried out using questionnaires, allowing the researcher to measure different peoples' thoughts and understanding (Saunders et al. 2012).

The primary goal behind this research is to examine whether Blockchain technology could make people more comfortable to participate in medical tourism. To test this, a 'Likert Survey' was used in order to measure to what extent participants would agree with proposed Blockchain solutions. Based on these results, an analytical observation would be formed to judge how more likely the person would be to travel abroad to receive medical treatment.

There were ten questions in the survey which were split in two sections. The first section examined whether respondents had already participated in medical tourism and also measured the likelihood of them ever doing so. The second section included eight statements which contained potential solutions to medical tourism. These solutions were drawn in response to the literature sourced problems summarized in this paper. Participants could agree or disagree with each of these statements on a scale of 1-5, representing responses of 'strongly disagree' and 'strongly agree' respectively.

The distribution of the survey was mainly done via 'snowball' sampling. Respondents were asked to share the survey amongst people they believed most suitable to participate. Due to the research being carried out during the Coronavirus pandemic, the selection of participants had to be carefully considered to avoid public disturbance, skepticism and prejudice responses. The survey collected a total 107 responses from 31/03 to 06/04.

The targeted audience used for research came from dispersed ages, nationalities and careers. All participants were adults. The first couple of questions in the questionnaire measured the participant's current thoughts on medical tourism and tested to see whether they may have

considered it or not. Once results were collected, the answers of people who had not considered medical tourism to those who had were to be compared and analyzed.

The biggest issue that arose with this research was that, initially, the survey was meant for people actually considering medical tourism and for those who had already participated. This would have narrowed down the target audience to people primarily in their 40s- 60s or people under an above average income bracket. Unfortunately, due to research being carried out during the COVID-19 pandemic, the distribution approach had to be re- considered, and ultimately, the type of participants had to be re- calculated too. Given the environment, and the research topic, people might have initially felt the survey was a prelude to a scam (being tricked into paying for medical treatment) or an invasion of their privacy (manipulating their vulnerability to the Coronavirus).

Results

The research was conducted with an intent to examine how likely survey participants would be to take part in medical tourism after the implementation of Blockchain technology. Via snowball sampling, 107 results were obtained from 31/03 to 06/04. Every question in each survey was answered, meaning that all 107 responses were valid. The first two questions pertained to the respondents' experience with medical tourism and the likelihood of them ever considering it again. The remaining eight statements were set to gauge the participant's opinion on potential medical tourism solutions.

Firstly, the survey participants were split into two groups based on their experience with medical tourism. Group One recorded the results of respondents who had never travelled abroad to receive medical treatment and Group Two recorded the results of those who had, at least once.

Eighty- four per cent of people (90) who took part in the survey had never participated in medical tourism and 16% had (17) (see table 1). Results were evaluated based on the average participant reaction to each statement. Also, the standard deviation was analyzed to measure how far peoples' values differed from the mean. Finally, a 't-test' was carried out to check for any significant differences between the two groups, Group One and Group Two.

In essence, the results were predominantly positive as the overall average response for the complete sample to any one of the eight individual Blockchain solutions did not fall below 3.5. Of the whole 107-person sample, only 15 respondents (14%) felt that, on average (considering each respondent's average response to the eight proposed Blockchain solutions together), the package of eight Blockchain solutions would not make them more likely to consider medical tourism; the mean being less than 3.0. Conversely, fully 49 respondents (46%) agreed that, on average, the package of eight proposed solutions would make them strongly more likely to consider medical tourism; the mean being above 4.0.

As a matter of fact, the lowest average of answers appeared when asking participants whether they would ever consider travelling abroad for medical purposes. Out of the 107 responses, the data suggests that the majority of people feel neutral about participating in medical tourism or slightly in favor to it, with the average answer being 3.4 and standard deviation of 1.18. (table 2). However, when asked about industry solutions, their average answers spiked, and most had agreed in favor of the practice. Altogether, the average response to the eight proposed Blockchain solutions was 3.8.

The statement that received the strongest support from the entire sample, with the highest mean of 4.1 (SD = 1.05) was the ability to quickly, easily and reliably gather information pertaining to

medical providers and institutions. On the contrary, the two statements receiving equally the weakest support, with the lowest means of 3.7 (SD = 1.1 and 1.2) were the necessity of having a one- stop shopping option and the ability to store all personal medical records on one platform. Interestingly enough, the standard deviation for the storage of medical records, was the lowest (graph 1). This hints that the response had less variability- and ultimately larger agreement.

The range of data varies in each answer, meaning some of the questions were very strongly agreed with in contrast to some that were very strongly disagreed with – ultimately bringing the average down. Contrarily, some questions had more consistent answers where the majority of people gave the same answer. However, medical provider accessibility, personal medical record privacy and convenient data storage were the three statements that had the largest number of '5's' in their responses. This result suggests that these statements were amongst the most consistently approved solutions. Diversely, the question regarding currency exchange rates held the largest number of '1's' and a mode number of three, meaning that most people answering felt neutral about the solution (graph 3).

Delving even deeper into the results allowed the survey to display substantial patterns amongst the two groups. As previously mentioned, the survey participants were split into two groups based on their experience with medical tourism. Group One recorded the results of respondents who had never travelled abroad to receive medical treatment and Group Two recorded the results of those who had, at least once. Eighty- four percent of people (90) who took part in the survey had never participated in medical tourism and 16% had (17). When participants were asked the question of whether they would consider travelling abroad for medical treatment, respondents from Group Two were statistically significantly (p-value = 0.020) more open to participating in

medical tourism than Group One and this was the only significant difference recorded between the two groups.

The most prevalent response amongst the people who were already patient- tourists, was that quick access to their medical providers and follow up appointments were most important to them, and if solutions were to be introduced, they may be more likely to consider another procedure. The top response for the participants with no previous medical tourism experience was also the importance of provider accessibility. Interestingly, those who travelled identified three solutions scoring above four and those who had not travelled, found this solution as the only one to score above four. Also, the least supported solution was a favorable currency exchange rate. This solution was scored the lowest among both of the groups (graph 1).

Group Two, where the participants had already travelled abroad for medical procedures, had a fairly lower range of answers compared to the other group. In group two, the most occurring number was four or higher for every question, whereas the most occurring number for the other group's questions dropped to three twice. In general, a lot more fours and fives can be seen scattered across Group Two's answers than Group One's, suggesting a lot more support from those with experience. Also, Group Two had a much wider range of mean values, from 3.47 to 4.24, whereas group one had a range of mean values from only 3.75 to 4.04 (table 2).

Discussion

General Analysis

This study finds that Blockchain Technology can impact medical tourism, with research results showing all eight proposed Blockchain solutions had a mean above 3.5. The implementation of

Blockchain has the potential to make people more comfortable when travelling abroad for medical purposes. The effects of a new cutting- edge technology exposes the gaps in medical tourism, with people believing Blockchain's solutions will make them more likely to participate in such practice and ultimately, suggesting that the medical tourism industry is ripe for disruption.

The ability to quickly, easily and reliably gather information pertaining to medical providers and institutions was the most positively supported solution by the whole sample, suggesting that this is what makes people most likely want to travel abroad for medical treatment. A possible reason for this is the current lack of transparency offered via search engines. Perhaps we can quickly obtain information through killer speed internet and broadband, however, this does not necessarily make it easier to find the exact information we want due to online information overload. Further to that, the questions then raised are how exactly reliable are those pieces of information and can we trust the sources? If medical data, such as certificates and accreditations were tweaked or false, Blockchain could identify these errors using unique codes. These unique codes, or cryptographic keys, produce 'hash' signs when data is tampered with and are then apparent to all users. As a result, data can be stored securely and is at a lesser risk of theft (Pilkington, 2015). According to this research, if one could browse via a Blockchain they may be more likely to participate in medical tourism.

A key contribution to this study is that there are no significant differences between people who had already travelled abroad for medical treatment and those who had not. Those results reveal that a 'one- size fits all' approach for touting Blockchain's benefits could make sense. This means marketing Blockchain as a solution to some of medical tourism's problems will be relatively straight- forward in that different Blockchain messages will not have to be developed

for the two groups of people. According to these results, these two groups of people have similar expectations of medical tourism and therefore, companies that provide Blockchain solutions will easier penetrate the market. Providing Blockchain at retail will save provider costs in that marketing strategies may not need to be tailor- made for separate groups.

Implications

A real- world implication of this study is that Blockchain technology can penetrate some of the various entrenched problems in the medical tourism industry. Considering the consumer demand of wanting quick, easy and reliable access to medical providers, this opens the door for solving one of medical tourism's major setbacks- unwanted intermediaries. The statement with the least popularity among respondents was the ability to have a 'one- stop shopping' option where patients could book travel, accommodation and medical procedures with one firm. actually, this option refers to Blockchain's competition. One- stop shopping options are the key business models to medical tourism agencies. Although through Blockchain platforms, one- stop shopping could potentially be introduced, the study shows that the significance of other Blockchain attributes could overwhelm intermediaries as they do not have the technology to compete with these features. Therefore, the survey results have shown that Blockchain could allow people to plan and book their medical tourism trip with confidence and without the need for 'one- stop shopping' agencies.

Also, storing personal medical documents on one platform showed to be equally as neutral as the one- stop shopping statement. This suggests that patient- tourists have more of a concern about how to actually access information and the credibility of others rather than the ability to easily store theirs. Eliminating (or replacing) intermediaries, Blockchain benefits consumers by

substantially driving their costs down and subsequently influences the trajectory of the medical tourism industry. Reducing the number of intermediaries shapes the dominance of top medical providers that rely on those intermediaries to bring them customers. This will now be due to enhanced customer autonomy and self- reliance. Also, for providers to be able to compete, they must be able to present suitable certificates and accreditations.

Furthermore, the most consistently approved solutions from the research suggest that the trust and transparency attributes of Blockchain enable customer self- reliance and the ability to make better- informed decisions. When up against the incompetence of Electronic Health Records, Blockchain becomes a viable bridge supporting the flow of information between patients-tourists and their foreign medical providers. Irregularities in EHR which complicate patients' treatment plans can be sidestepped as Blockchain carries a permanent display of all procedure treatments, plans and interventions. The point is, if a patient- tourist was able to provide both their foreign and local medical providers the sufficient information needed regarding their medical history, they would be more likely to participate in medical tourism. Interestingly enough, people that had already travelled abroad for medical treatment claimed that guaranteed follow- up appointments was the most important proposed Blockchain solution for them. This hints that on previous experiences, they must have faced some sort of hardship keeping in touch with their foreign medical provider. Local providers may face troubles when attempting to access the patient's medical data, through Blockchain however, patients can grant local providers authorization of viewing their medical records. As a result, this can increase interaction between local and foreign providers and ultimately, maintain the continuum of care.

It seems as though another key concern people have prior to their medical tourism trip, would be to keep their medical documents secure and maximize privacy. Blockchain's privacy- by- design

model is another major perk for consumers. Guaranteeing discretion and providing secure customer identity bestows customer comfort and greases the wheels for market regulators.

The main findings of this paper suggest that when potential customers are presented with Blockchain solutions, they become more likely to consider travelling abroad for medical treatment. The main reasons for this are the elevation of trust and transparency towards foreign medical providers, convenient data storage, maximizing the security of personal identity and guaranteeing follow- up appointments. Lower costs, competent doctors and credible accreditations are three of the main drivers of medical tourism. The wider adoption of this emerging technology could drive down medical tourism costs by eliminating intermediaries and provide enhanced transparency to medical providers and institutions.

Limitations

Due to the Coronavirus pandemic, there were a number of factors influencing research intentions. Initially, the research would have mainly targeted existing patient- tourists to gain a first- hand perspective on what their main issues were during their medical tourism experience. The research would then analyze how much more comfortable participants would be if they were offered Blockchain solutions. Only 17 respondents were already patient- tourists. Given the environment, explicitly reaching out to people with existing medical history was averted to prevent any feeling of privacy invasion. Instead, using the ‘snowball’ technique, the survey was passed around to the general public and limited to just over 100 people. The small and uneven sample size restricted interpretation. This is because only 17% had already travelled enlarging the focus on non- travelers. However, a larger sample would have balanced the analysis.

Additionally, the use of the actual word Blockchain throughout the survey was avoided to prevent biased answers from those respondents with previous positive or negative exposure to Blockchain technology; for example, it is conceivable that some respondents have had exposure to Bitcoin and/or other cryptocurrencies that might influence how they feel about Blockchain. However, in the title itself, the word Blockchain was mentioned which may have potentially caused a few leading answers amongst some of the respondents. A clear- cut definition of Blockchain should have been used to limit any pre- assumptions going into the questions. Again, with a larger sample, it would have been possible to categorize participants by their familiarity with Blockchain and other disruptive technologies.

Justifications

Due to the rapidly growing popularity of medical tourism, extensive research has continuously been carried out. As this industry grows, experts have been comparing its success factors to its weaker points, checking to see which areas could be enhanced to fuel a stronger growth rate. With emerging economies embracing this phenomenon, medical institutions have aimed to come up with innovative ways by which medical tourism can higher impact its country's GDP. In the wake of rising Blockchain popularity, the gaps in medical tourism classify the industry as ripe for disruption. Despite its emergence, the technology comes with its challenges which have continually been studied and worked on. However, researchers have shown the ways in which Blockchain has impacted different industries and this particular research was designed to see how Blockchain could strengthen the movement of medical tourism.

Future Research

The time constraints and COVID-19 limitations associated with this study suggest that further research could be carried out on a much larger scale. In the future, more careful observations should be made on existing tourist- patients to analyze behavioral patterns and reactions to the inconsistencies in medical tourism. It would also be interesting to monitor respondents' demographics and perhaps age too. This way, researchers will be able to estimate the areas in which Blockchain could have the highest impact in and quickest growth rate. This data could be extremely valuable to investors and potential start- ups.

This study was focused from customers' perspective, analyzing their reactions to potential Blockchain solutions. In the near future, the attitude towards Blockchain from a medical provider's point of view should be tested. Finding out how dependent these medical institutions are on their online medical agencies and how strongly they feel they will be able to compete independently. Questions like these are crucial to find out whether health workers will even agree with the use of Blockchain platforms. Additionally, it would be interesting to see what the opinions of these OME's are. Perhaps some of the most dominant medical agencies feel as though Blockchain would not provide enough competition to bring them to closure. This data would be useful to study as it could provide researchers with a rough idea on how the industry could be shaped. Furthermore, the service providers behind Electronic Health Systems could give researchers an insight into the main technical issues within their platforms. With technology rapidly developing, this data can be used to see what these providers are doing in terms of product development and just how quickly they are advancing.

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Table 1

Medical Tourism Experience	Number	Consider Travelling (Average)
Travelled	17	4
Never Travelled	90	3.28

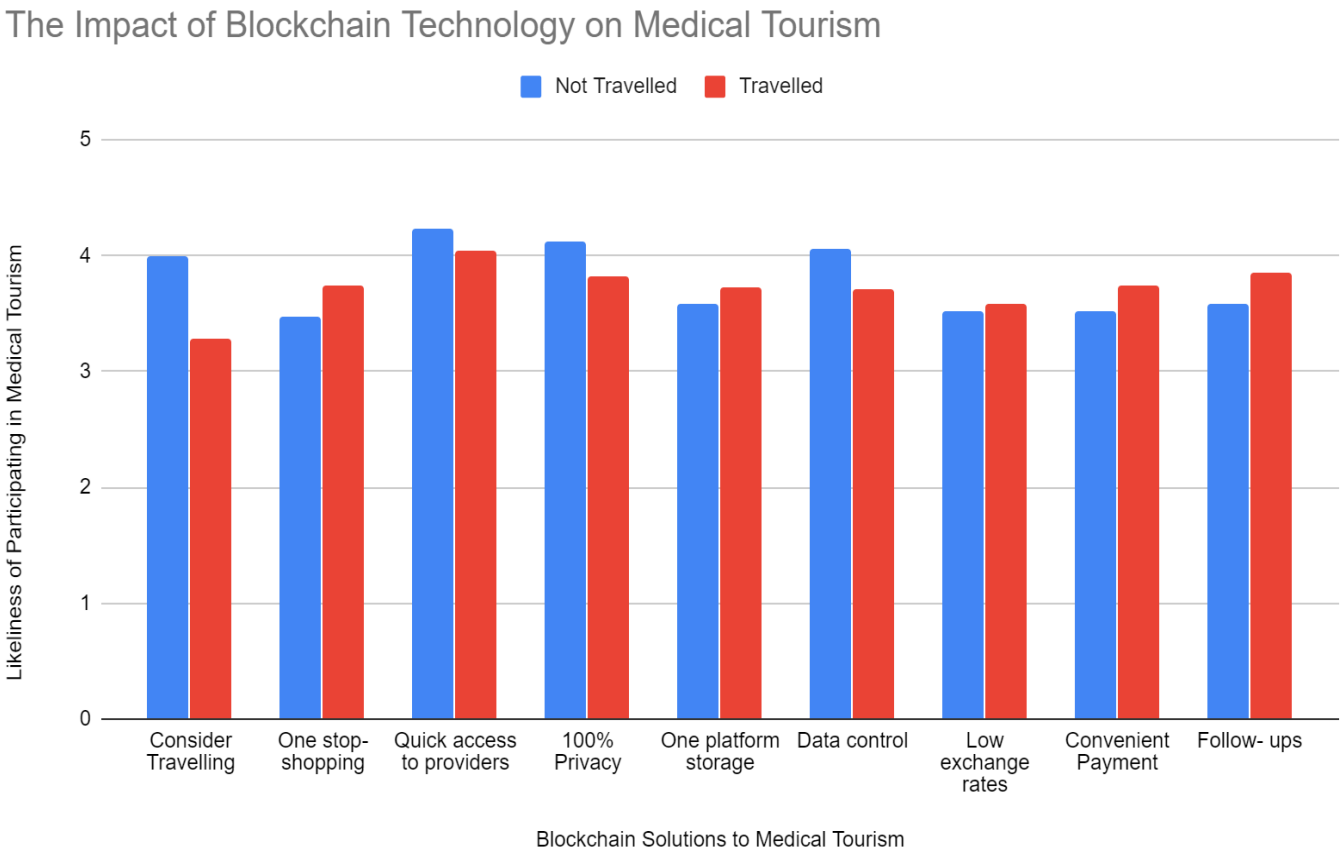
A table showing the number of research participants who had previously travelled abroad for medical tourism.

Table 2

Blockchain Solutions	Mean	Standard Deviation
One stop- shopping	3.700934579	1.100728346
Quick access to providers	4.074766355	1.015919832
100% Privacy	3.869158879	1.158106067
One platform storage	3.700934579	1.20701529
Data control	3.76635514	1.086620512
Low exchange rates	3.579439252	1.181918677
Convenient Payment	3.710280374	1.141079808
Follow- ups	3.813084112	1.029112469

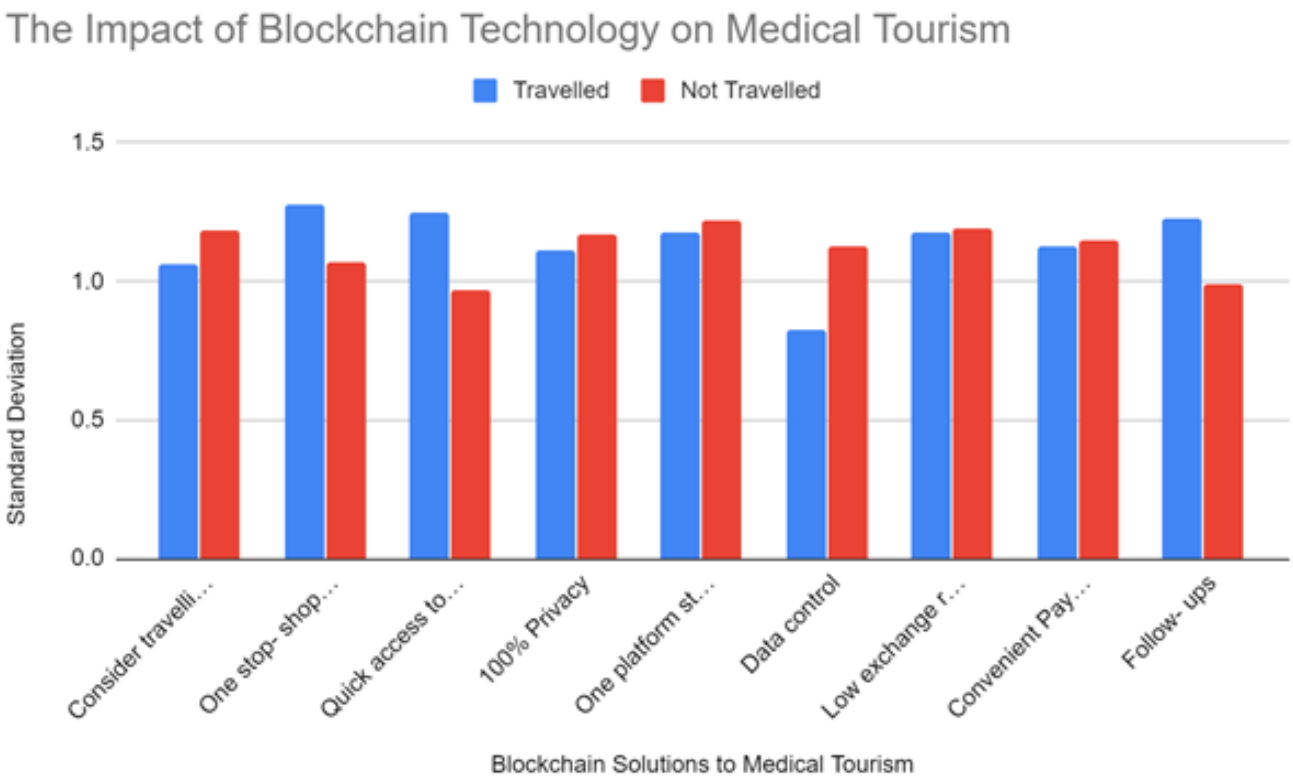
A table displaying the mean and standard deviation of each Blockchain solution based on the whole sample.

Graph 1



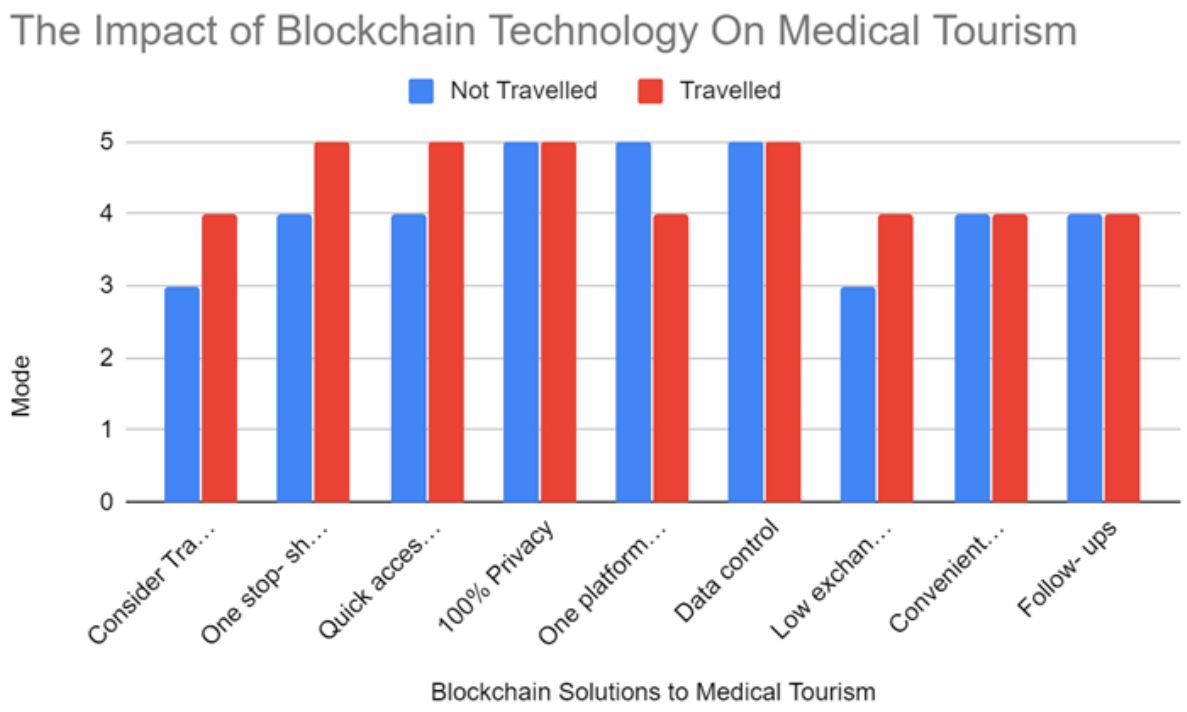
A bar chart displaying people's likeliness to participate in medical tourism after Blockchain solutions. The likeliness of participation is listed from 1 (strongly disagree)- 5 (strongly agree).

Graph 2



A bar chart displaying the standard deviation of responses.

Graph 3



A bar chart displaying the mode number of answers to Blockchain solutions.