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Contributors:

David Piesse, Chair of Ambassadors, **IIS** & Global Insurance Lead, **Guardtime**

Leanne Kemp, Founder & CEO, **Everledger**

Christof Gellan, former CFO, **Direct Line SpA**

Joshua Davis, Founder, **Dynamis**

Peter Hacker, Group CIO, **CGSC** & Co-Founder, Distinction Global, a specialist unit of the **CyberCrime Research Institute**

Richard Caetano, Co-founder & CEO, **Stratumn**

7-9 Fashion Street, London, E1 6PX

http://events.insurancenexus.com/insuranceiotusa/

Author

Morag Cuddeford Jones

Editors

James Vincent
General Manager, Insurance Nexus
james.vincent@insurancenexus.com

Marsha Irving
Head of Innovation, Insurance Nexus
marsha.irving@insurancenexus.com

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A few years ago the world of blockchain and cryptocurrencies was the preserve of James Bondian intrigue and shady practices. Part of the lingua franca of the dark web, it seemed a world away from the stolid practices of legitimate finance and its insurance cousins.

Fast forward to 2016 and century-old stalwarts of the insurance industry are actively engaging in conversations around blockchain and what opportunities it might hold for a sector already undergoing a period of rapid change.

In and of itself, blockchain is an uncomplicated concept. Defined as a form of distributed ledger, its advantages come in the fact of its universal accessibility, presumed incorruptibility (more of that later) and ability to be both an incredibly open yet also secure way of storing and transferring data.

Its implications for the insurance industry however are potentially infinite insofar as how the use of blockchain across the ecosystem can have a large number of consequences but also a possibly even larger number of unintended consequences. While executives may be looking to this technology with some highly defined goals in mind, the fact is that its use could prove to be the catalyst for rapid evolution in an industry that has remained essentially the same for the last century.

"What we've identified is that the whole world is involved in some kind of process or other. Partnerships are created within those processes that fundamentally lack trust. If we bring the blockchain into the middle of the workflow using decentralized trust, we can work through those issues"

Why engage?

The first point to consider is: In an environment where the insurance industry is already in such a high degree of flux - heightened competition and commoditization, the influence of mobile and startup disruption - is engaging with blockchain technologies really something to put high on the CEO's agenda?

Experts interviewed for this paper agreed that it is certainly something no insurer can afford to ignore however many expressed a note of caution. If not actively investing in developing for blockchain, adopting a watchful stance is important. However, it is neither mission critical this very second nor the technology equivalent of the second coming.

Peter Hacker, Group CIO, CGSC & Co-Founder, Distinction Global, a specialist unit of the CyberCrime Research Institute explains. "The global insurance industry should have a clear look at blockchain because, while it might not yet be presenting the same obvious, immediate opportunities to insurance as to the banks, it should clearly be considered as an unparalleled alternative and unprecedented replacement to centralized data models. I am convinced it is more than justified in this space. The impacts of blockchain mechanisms have the potential to threaten current 'business modus operandi' and trigger further disintermediation. Equally, we need to ask what its application will be across the value chain. This is not clear cut."

To make a realistic assessment of blockchain's potential impact, it is useful to look at the areas within the insurance market as a whole where its impact could be felt, for instance across future smart contracts, mutualization of risk, customer risk perception, risk layering, data decentralization or distribution models.

Where blockchain matters

"What we've identified is that the whole world is involved in some kind of process or other. Partnerships are created within those processes that fundamentally lack trust. You have your database and I have mine. And we're not sharing. If we bring the blockchain into the middle of the workflow using decentralized trust, we can work through those issues," explains Richard Caetano, CEO and co-founder of Stratumn.

Smart contracts: the irony of the insurance market is that, in order to define risk and therefore an appetite for it, the drive is towards as much certainty as possible. Hence the multi-point questionnaires at point of quote for something even as relatively low cost and commoditized as car insurance (this is all relative. Payouts for car accidents can be many times more expensive than a water-damaged rug; however, in contrast to large pieces of highly specialized industrial machinery they are also small-fry).

"It's about opening up new fields that are easy to handle," says Christof Gellan, former CFO, Direct Line SpA.

And, yet, when it comes to claims management it often seems like there is an endless to and fro while all the parties agree the facts, agree what the initial insurance contract binds them to and then continue to debate until each is happy that they have the best possible outcome for their own ends.

Smart contracts managed on the blockchain can eliminate all of this. Unlike contracts written by humans, smart contracts are based on computer codes and contain a number of potential outcomes based on a simple 'if X happens, do y' instruction (this page by bitsonblocks[1] is an excellent smart contracts primer for the uninitiated).

For the time being at least, smart contracts would appear to work best in areas of insurance where there is already little room for debate. Flight delay or cancellation insurance is one ideal target. There can be no argument that a flight is late and that a customer is insured for this event.

Smart contracts can automate the claims process without the insured party even having to make a call or send an email. In many cases the claim can be processed before the insured customer even makes it to the departure lounge.

"The blockchain removes the need for many types of value extractors, the intermediaries whose commissions and interference take time and money. The blockchain is massively disrupting their business and they're going to have to find new ways of creating value." Caetano warns.

1 https://bitsonblocks.net/2016/02/01/a-gentle-introduction-to-smart-contracts/

For the customer, this is one of the few obvious B2C benefits of the blockchain in insurance. While they may not know this is why it happened, something that used to involve several days or weeks of tedious to-ing and fro-ing between airline, insurer, layover hotel, bank and so forth is now resolved in seconds.

For the insurer the costs and time saved from not having to go through a predetermined claims process where the outcome is still inevitable can be significant. There is also the brand halo effect from customers enjoying great customer service (exponentially greater in the early days as it is such a diametrically opposite experience to what we are usually used to from the insurance industry).

Smart contracts do not leave room for interpretation and, as many risks involve human activity and can be open to interpretation, they don't solve every problem. In insurance computers will never be able to do everything. There is still a need for human discussion to solve shades of grey. At a level where a rapid decision or being able to make many decisions without deploying huge teams outweighs any other considerations, smart contracts can deliver cost savings and improved customer experience.

"There is fundamental impact on the administrative effectiveness of claims and its handling status quo"

Claims and fraud: This is one area where blockchain is expected to come into its own, although again not without caveats. The advantage of a distributed and untamperable ledger is that it provides anyone who accesses it with a traceable and verifiable set of moments of truth. From the provenance of items to an independent record of individuals' transactions or behavior, the blockchain gives insurers greater peace of mind that any risks they accept and claims they might pay out on have a more than reasonable level of veracity. The US Department of Justice estimates health care fraud alone costs the country up to $100bn a year2.

"The big advantage is that you can embed the cyber security part of blockchain into existing technology. For example, with pharmaceutical companies, in the clinical environment all records are in sharepoint. If we can then embed our blockchain into sharepoint we'll be able to help drug companies see if any data has been tampered with," David Piesse, Chair of Ambassadors, IIS & Global Insurance Lead, Guardtime reveals.

As an ongoing record the blockchain also has the potential to red flag multiple claims and other suspicious activity. Where fraudsters try to alter subtle details of claims to manage a second pass (or reinsure an uninsurable vehicle for example) it is anticipated that the coordinated details brought together from the various involved parties across the decentralized ledgers will red flag this activity.

"There is a lot of opportunity but you need to have a ledger of the assets that are insured and their history. If insurance companies were able to share this information then if one has paid out on a claim, the others know this," Gellan explains, adding "Customers don't generally see the advantage directly, there is no great increase in the speed of processing but it contributes to overall improvement."

2 https://www.justice.gov/criminal-fraud/health-care-fraud-unit

On the positive side however, while fraud costs insurers millions every year the perpetrators are very much in the minority. As a tool to encourage customer loyalty and brand consideration, the smooth conclusion of claims is vital.

The blockchain allows all parties involved in a claim to manage the process almost simultaneously. As Hacker puts it, "There is fundamental impact on the administrative effectiveness of claims and its handling status quo". Smart contract elements as mentioned above will allow for the automation of some if not all of the processes so legitimate customers should see their claims settled far more efficiently and satisfactorily than in the past.

However, it's important to mitigate the enthusiasm for blockchain's potential here. It certainly has the potential to reduce cost and time spent on each customer as well as delivering more certainty which allows insurers and brokers to operate a great deal more efficiently - if they bring their processes reasonably into line with blockchain's potential. The customer will simply see a unique true, sustainable added value model beyond a simple commodity.

As the perception of the industry is often far from enthusiastically positive, this will come as a pleasant emerging surprise. But don't expect hundreds of fawning grateful customers signing up in their droves as a result. If insurers use blockchain they have the opportunity to bring their customers' experience in line with the expectations they have of the rest of their trusted lifestyle brands, vis Uber and Amazon.

"We need to be able to create a digital custody chain of command. Legacy data has already been compromised"

Back end operations: One of the most significant opportunities for insurers who use the blockchain with immediate benefits is across their fundamental, back-end operations. From data silos to integrating new data streams and the all important data integrity, the blockchain has real potential to solve the complete information and tech tangle that most insurance companies have got into since the Big Data tsunami hit over the last decade.

Hacker explains: "The more you digitize and bring in artificial intelligence (AI) as well as interconnect globally; the more you bring in disruptors, the bigger your challenges and opportunities become. The biggest emerging challenge to the insurance industry today isn't from the blockchain, it's what the physical risk implications of AI or disruptors will be because we're now talking about the non-physical.

"The key challenge is that new technology such as artificial intelligence (AI) is often advancing much faster than regulatory authorities, governments, the insurance and the risk management industry can often proactively respond to or resolve uncertainty about liability or other threats to their businesses. If you lose your data, customer accesses, your IP, your brand and reputation can be brought down.

"Hence, you have to think and respond proactively and consider risk and award interconnectivity. What does your wider data, IP and revenue exposure streams mean to

your risk and asset exposure *then* consider the blockchain technologies in your value chain, customer and product distribution."

Apologists for blockchain technology point to the hash values attributed to entries as making the data shared on the ledger ultimately unhackable. This is honey in the ear of insurance executives who have suffered extensive cyber crime in the past. Fintech News reports that in late January 2015, US health insurance provider Anthem learned of a massive cyberattack to its IT system, which ended up compromising a staggering 80 million patient and employee records.[3] So far in its infancy, some commenters are more wary of blockchain's seeming impermeability, suggesting that speaking in superlatives means it's only a matter of time before hubris gets the better of them.

"In the telematics environment people have a lot of devices sitting in their cars. It's collecting a lot of data and providing information for insurance companies to write policies on. But if we don't know where that data came from it could be incorrect when it was analyzed. If we have a warranty on that data, we can write internet of things (IoT) policies. But we also need to look at the software supply chain. We need to track it through its various releases. We need to be able to create a digital custody chain of command. Legacy data has already been compromised," Piesse warns.

However, as data and privacy standards are so varied across the globe and levels of enforcement wildly fluctuating, being able to adhere to something that most agree is today's gold standard gives a level of confidence to insurers.

"Cloud computing rather than a multi centered internal data approach will lead to lower operational cost, but new risk management challenges" Hacker insists. "Blockchain Technology can lead to more security, increased distribution value and customer satisfaction. In 2018 with the mandatory EU regulation around data protection harmonziation coming into force there will be unprecedented challenges, both for data controllers and processers across the value chain. There remains one key fact. You can't outsource accountability."

"We separate the proof of data from the actual data. The proofs can be stored publicly while we can separate as much private data we want, storing it wherever we want. When insurers are challenged - at point of claim for example - the information can be tracked down and provided. But even more importantly, from a privacy perspective, the actual data record itself still doesn't need to be shared as long as each party can convince or be convinced that the data point they are discussing really happened," Caetano explains. The point being, we can validate the data point by its proof, which resides on the blockchain with the appropriate time stamp.

From a practical standpoint, the decentralization of data should drive much more efficiency and ease of collaboration for insurers, as we've alluded to already.

It may seem counterintuitive to suggest that spreading information around is a good thing, especially as for many years since data became such a priority organisations have been encouraged to bring all their data into a single place for ease of use.

3 http://fintechnews.ch/blockchain_bitcoin/blockchain-data-secure-optimization-in-healthcare-part-1/3852/

This is indeed true but it then becomes incumbent on the data owner to store, cleanse, update, protect and distribute that data as well as figure out how to collaborate with the many parties involved in the day to day business without compromising any of these factors.

"Everyone has all the information at the same point in time. There is no need to create outputs so they become inputs somewhere else. It reduces cost and increases speed," Gellan insists.

Leanne Kemp, Founder & CEO, Everledger adds; "Consortium efforts between insurers will flourish when there's no commercial competitive advantage. Subrogation is an interesting piece and could be an early stage platform implementation. It's clear this technology applies to back end settlement process, where records and logic should reside in a consortium network. There's a large piece of this that's all administrative efficiency. A prime example is motor settlements: When two or three people have a car accident and Allianz fixes yours; Axa fixes mine but they get together in the back end and work out the offset and apportionment. It's an easy, large win in blockchain."

Collaboration is key to the success of insurers in the future as more parties, not fewer, become involved in the management of individuals' risks.

"The more an operating model is centralized, which is going to be reflected in its cost structure, the less efficient it is and the higher probability that blockchain will have a massive impact," Hacker predicts.

Distributed ledgers mean a constant availability of verified data that isn't dependent on human availability. There is also the suggestion that, being verified, the evidence brooks no argument although as we have already heard, there is no incontrovertible proof that the blockchain is infallible.

Future applications: The reason that many in insurance are expressing their enthusiasm for blockchain is the tacit acceptance that their industry is changing beyond all recognition. To date those changes have been subtle but we are already seeing an acceleration towards new insurance models and startups with a mission statement that is more about service and lifestyle than risk are already beginning to grab the headlines.

From a blockchain point of view, the availability of near real time information accessible securely from a wide range of parties is not only an exercise in building trust in the industry as a whole, but also in building new products.

We can expect to see a rise in peer to peer or social insurance for example. Dynamis is already using the Ethereum smart contract network to create an unemployment insurance product[4] (see infographic, next page)

4 http://blog.dynamisapp.com/p2p-insurance-solutions/

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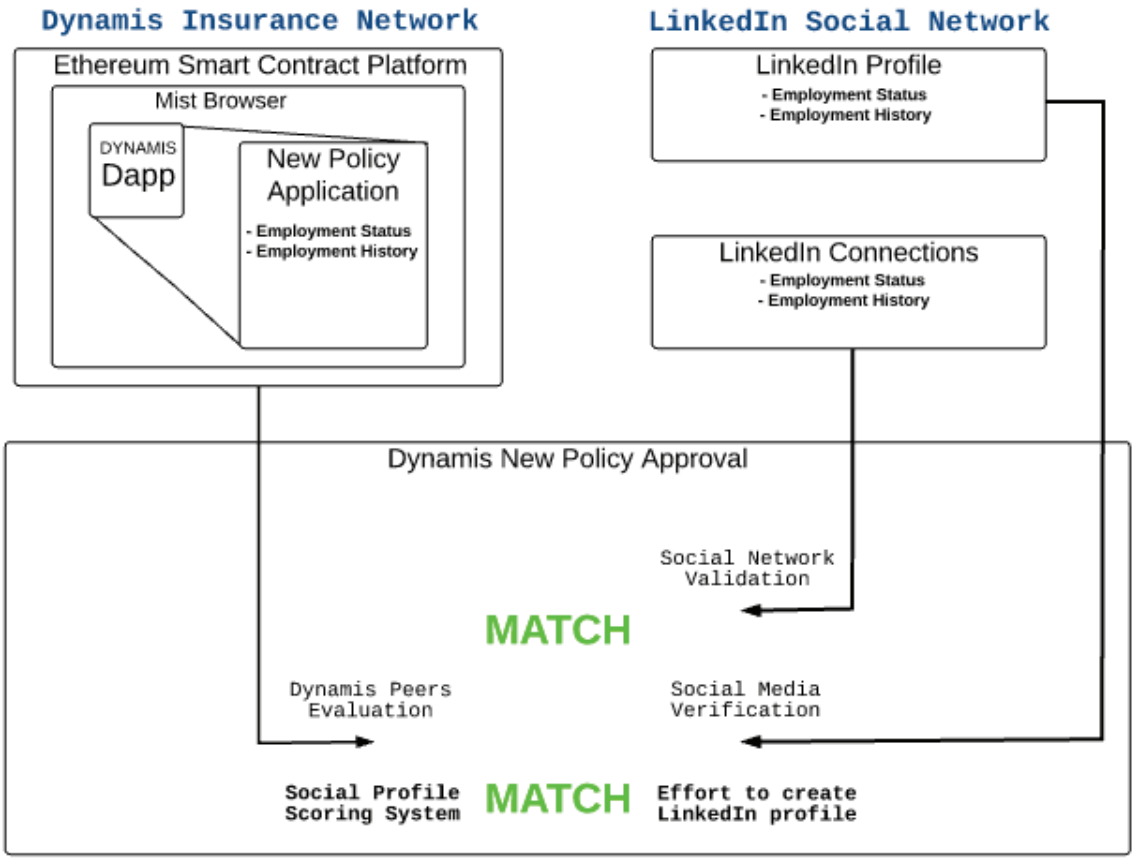

Insured customers choose how much to pay each month, based on their salary and as a result receive a scaled amount in the event of a claim. To act as a peer evaluator there is a minimum required participation in the scheme per week and tasks to complete. Participation can be extended to shareholder status where dividends are paid.

Claims are paid out on the basis of social capital. That is, connections on your social network (in this case LinkedIn) verify that you are actively seeking work in the role you purport to have held in the past, or equivalent. Information from your contacts on the social network and Dynamis' own network of peer evaluators then determines your ability to join the scheme and claim from it.

Individual insurance is another potential winner for companies seeking to differentiate or understand how the risk landscape is changing. An oversimplified example is to have auto insurance only kick in while the user is in or driving the car. Clearly, this is currently possible to a degree with telematics which assesses driving style and restricts some of the activities of probationary or high-care drivers but this is still based on general assumptions and insights taken at group level and applied to the same group as a whole.

It is again an opportunity from a dynamic-pricing perspective and has applications in areas where weather events are unpredictable until the last minute. Equally, with the focus on preventative service rather than post-event payment increasingly

popular, the ability to mobilise even at the last minute to protect assets is a valuable one.

Instead of paying out against large flood damage claims, blockchain data can identify and manage actionable events such as unusually high tides, ground saturation levels and a range of other factors which make an imminent flood near human habitation a near 100% certainty.

"Agriculture is often considered open to the whims of mother nature so in Australia where there are extreme weather events and a large agricultural belt, we anticipate there will be a marriage of blockchain, smart contracts plus parametric data alongside the deployment of drones. It's an interesting marriage of technologies," Kemp reveals.

"You can create prediction markets for all sorts of things," Joshua Davis, Founder, Dynamis claims, adding "but that's what insurance does anyway. You need human intelligence to make these problems solvable."

It also has the ability to integrate new data streams which insurers have already identified as valuable in prevention activities. Certainly experts have been exploring the possibilities presented by the quantifiable self movement and wearables such as fitness watches to deliver the necessary nudge to overweight or inactive customers whose health insurance claims would be high if they didn't take a proactive approach to health.

The Internet of Things (IoT) is proving useful across the board, although Davis would claim that sensor technology currently makes little economic sense for automation in commoditised markets such as auto or home.

"It's in industrial applications where it can make a difference today," he says. "When you have a $3m crane you can have all kinds of sensors that tell you if the operator was doing his job properly. This only works when the likely claim is high enough for it to be worth covering the whole thing in sensors."

"Insurance companies are investing because they want to have a competitive advantage and stay relevant. The trouble is that they are looking for distribution and growth but not updating the security"

What next in blockchain?

Entertainingly, the majority of mainstream insurers, when asked what the future holds for insurance and blockchain and when it might transpire, answer with a simple 'We don't know'. It really does seem to be the preserve of the startup community.

"There are three reoccurring problems that we are trying to solve with the blockchain," Caetano explains. "First, replacing a system with a single key holder to a centralized database with a decentralized network which allows anyone to control the keys to their own data. Secondly, getting rid of the issue of syncing systems. If

you have more than one data store, getting them in sync is a nightmare. Blockchain solves this through bottom up protocols. Finally, the third is user privacy. In a hyper-connected world consumers are having to share more and more information. Blockchains & cryptography allows us to share the proofs of data without asking to have more of the actual data."

That said, over six months the industry has gone from thinking of blockchain in terms of the dark web, mysterious bitcoin miners and shady deals on the Silk Road[5] to making serious enquiries as to what opportunities may lie ahead. John Hancock has begun exploring what it could mean for operational efficiencies, according to *CoinDesk*[6], although it is yet to explicitly put it behind any actual insurance products.

"A great deal of the investment to now has been proof of concept and startups," Piesse states, adding: "Insurance companies are investing because they want to have a competitive advantage and stay relevant. The trouble is that they are looking for distribution and growth but not updating the security. It's creating systemic risk by not focusing on the back end."

Kemp adds: "We're starting to see a number of the incumbents in Australia, US and Asia go beyond the exploration of the technology. Allianz has successfully trialled blockchain for catastrophe bonds."

"My peers and I agree that 2016 and early 2017 is the timeframe for proof of concepts. From then we expect the successful pilots to start becoming marketable product by 2018"

There is certainly a groundswell of opinion that insurers can't afford *not* to interest themselves in blockchain. The peer-to-peer opportunity certainly has elements of potential disintermediation although experts agree that the amount of regulation and monitoring such schemes would require perhaps doesn't disintermediate the insurer, rather it adjusts its role.

Building trust in the peer-to-peer network is one key foundation, and perhaps one of blockchain's unintended consequences will be to embed greater honesty overall. Davis states: "In a peer environment, you have to commit fraud against your friends."

"Insurance always used to be about the mutual sharing of risk and peer-to-peer brings this back. And it could almost eliminate the insurance company. It is a threat. But it's not possible where third parties are involved or in automotive for example. The potential costs could be ruinous," Gellan warns.

"In the long term this is obviously going to return insurance back to mutuality. Micro insurance and multi products are emerging. And the importance of viewing data as an asset, and one that needs to be assessed against risk in its own right, is also very important," Piesse insists.

5 The transactional site on the dark web notorious for selling anything a middle ranking gangster could desire from hard drugs to weaponry.

6 http://www.coindesk.com/insurance-company-john-hancock-begins-multiple-blockchain-proof-concepts/

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In at least hypothetical terms, blockchain can deliver a number of business efficiencies that answer many insurer's questions around coping with commoditized arms of risk. It also provides reassurance to the many organizations wrestling with the growing problem of data integrity and stewardship as the numbers of data streams and third parties handling them continues to grow almost exponentially.

"I can see blockchain's value in Coinsurance and Reinsurance. It's also going to be hugely valuable in reducing error. It's about reducing labor intensive operations and margins for error," Gellan predicts.

Kemp adds: "I can see integration between banks and insurers. Banks are looking to the blockchain for supply chain finance and provenance and therefore I feel Credit Insurance will be one of the first impacted insurance segments where interconnected intelligence will come into play. There isn't going to be one point winner though in the providing of blockchain services. It's a protocol, and is providing a rewiring of transactional truth."

In terms of timelines, there is general agreement that we can expect to see the results of blockchain integration begin to impact mainstream, general insurance in the next five to 10 years.

"I can see things becoming more concrete in three to eight years," Gellan predicts, adding that the speed of startups creating products isn't necessarily to be believed. Slow and steady will win the race, he concludes.

Caetano adds: "My peers and I agree that 2016 and early 2017 is the timeframe for proof of concepts. Demonstrating the core principles to show to the market. Then, we move into the pilot phase connecting to real systems and real users which should culminate at the end of 2017. From then we expect the successful pilots to start becoming marketable product by 2018."

"Tech is maturing at an incremental and exponential rate and we'll be seeing proofs of concept or pilots implemented through 2017," Kemp predicts. "It's very likely in a small sliver of the industry such as a niche market we might see complete commercial uptake. When you think of the size of motor vehicle or health that will take a lot more time given scale and complexity. That could begin to hit in 2018-20. There's a five year horizon where it makes a decent amount of sense."

Piesse also warns that too much focus on the shinier front end implications of the blockchain could be ignoring more important but arguably more pedestrian jobs in the background: "I think a lot of people are trying to redesign their systems from back to front in the name of blockchain and that's going to take five to 10 years. There are a lot of issues and no-one is looking at risk management from the back end."

However, there is also a sense that this figure might well be confounded in the near future. Event horizons for the web, mobile use, payments and virtual reality have continually moved forward with dizzying speed as adoption takes off and accelerates trends. While prediction may be a fool's errand, readiness would be the sage approach.

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Session 1: Plenary. **IoT Boom or Bust: Opportunities and Challenges in IoT Adoption**		
Session 2: Plenary. **Turn IoT On: Integrate IoT in Your Operations**		
Track 3A: Strategy IoT for Product: Revenue Plans	Track 3B: Connected Home Household Devices	Track 3C: Connected Customer Health & Life
Track 4A: Strategy IoT for Claims: Loss Prevention	Track 4B: Connected Home Connectivity	Track 4C: Connected Customer Lifestyle

DAY 2: WEDNESDAY, NOVEMBER 16

Session 5: Plenary. **Cyber Risk & Security: Put IoT Safety First**		
Session 6: Plenary. **Customer Services & UX: Make IoT Speak to the Modern Customer**		
Track 7A: Strategy Real-Time Data Management	Track 7B: Connected Business Corporate	Track 7C: Connected Car Telematics
Track 8A: Strategy AI & Automated Services	Track 8B: Connected Business Enterprise	Track 8C: Connected Car Autonomous Vehicles

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Contact Us: Marsha Irving, Head of Innovation, Insurance Nexus
Phone: +44 (0) 207 422 4353 Email: marsha.irving@insurancenexus.com

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