"The insurance industry is evolving — and evolving fast. Despite some cultural resistance and regulatory issues, technology adoption is at an all-time high, largely because startups are defining new processes and whole new business models with technologies developing at an incredible pace."

— Steve Andriole,
Guest Editor

Insurtech:
Reinventing the Insurance Industry

Cutter Business Technology JOURNAL

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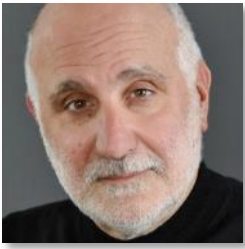
Opening Statement

by Steve Andriole, Guest Editor

This issue of *Cutter Business Technology Journal* (*CBTJ*) takes a wide look at insurtech. It looks at trends and opportunities and offers a suite of solutions — from several perspectives — about how to leverage emerging technologies in insurance models and processes. Let's begin with some general comments from Investopedia about the insurance industry and the role of insurtech:

> Insurtech refers to the use of technology innovations designed to squeeze out savings and efficiency from the current insurance industry model.… The belief driving insurtech companies is that the insurance industry is ripe for innovation and disruption.

The insurance industry, however, unlike the finance and retail industries, has not always been excited about emerging technologies. But why would the insurance industry resist technology that could potentially save time and money — and increase revenue? Why is there resistance to the innovations that insurtech startups and other companies provide? Investopedia provides some insight to these questions:

> Insurance is a highly regulated industry with many layers of jurisdictional legal baggage to deal with. As such, the major companies have survived this long by being incredibly cautious, which has made them shy away from working with any startups — let alone startups in their own, very stable industry. This is a bigger problem than it sounds, as many of the insurtech startups still require the help of traditional insurers to handle underwriting and manage catastrophic risk.

This backdrop is essential to understanding the insurance industry's technology adoption culture and the potential for insurtech to transform key processes and create new best practices. This *CBTJ* issue identifies some promising methods, tools, techniques, models, and platforms. The essential message is that even the most conservative industries can improve their business models and processes. The issue also demonstrates the range of that change with multiple perspectives on the transformation of insurance with insurtech. It's clear that major changes are well underway and even the insurance industry will transform itself dramatically over the next few years. Indeed, Accenture reports that the industry is ready: "87% of insurers agree that technology is no longer advancing in a linear fashion, but rather at an exponential rate"; "86% of insurers believe they must innovate at an increasingly rapid pace simply to retain a competitive edge"; and "96% of insurers think that digital ecosystems are having an impact on the insurance industry."[1] There's no ambiguity about what's happening in the insurance industry.

Insurtech Opportunities

Clearly the insurance industry is evolving — and evolving fast. Despite some cultural resistance and regulatory issues, technology adoption is at an all-time high, largely because startups are defining new processes and whole new business models with technologies developing at an incredible pace. Some technologies transforming traditional insurance industry processes include artificial intelligence (AI), machine learning (ML), blockchain, and advanced big data analytics. Insurtech is all about digital transformation.

Insurers execute the following 10 highly repeatable, easily modeled, interrelated processes: product development, pricing, underwriting, customer service, premium payments, payment collections, claims processing, policy administration, infrastructure services, and investment management.

The insurance industry itself is a "legacy" industry comprised of old processes, well-understood (though changing) regulations, and "vintage" technology solutions. At least that was the view in the late 20th century. But as the 21st century progressed, data became increasingly important. When analytics emerged as a powerful predictive tool, the industry married its data with analytical tools and techniques. Today, the above 10 processes are squarely in the sights of a suite of emerging and even disruptive digital technologies. Indeed, each of the processes can be improved by the following technologies:

1. **Product development:** telematics, wearables, social media, crowdsourcing, advanced predictive analytics, intelligent business process modeling and simulation

2. **Pricing:** blockchain, AI/ML, advanced descriptive and predictive analytics

3. **Underwriting:** blockchain, advanced analytics, AI/ML, intelligent process modeling and simulation

4. **Customer service:** telematics, wearables, social media, advanced analytics, intelligent chatbots, location-based services, conversational interfaces, AI/ML

5. **Premium payments:** blockchain, cryptocurrency, digital currency, AI/ML

6. **Payment collections:** blockchain, cryptocurrency, digital currency, AI/ML

7. **Claims processing:** telematics, wearables, blockchain, social media, IoT, advanced analytics, intelligent chatbots, location-based services, virtual reality/augmented reality, AI/ML

8. **Policy administration:** telematics, blockchain, advanced analytics, AI/ML

9. **Infrastructure services:** cloud containers, advanced analytics, AI/ML

10. **Investment management:** blockchain, advanced analytics, AI/ML

The overall winners? Blockchain, advanced analytics, and AI/ML. Insurance companies should pilot these technologies, among others, to determine their potential to improve multiple target processes.

Imperatives

What should the insurance industry do to optimize the potential of technologies like advanced analytics, AI, or blockchain and wearables, among other disruptive technologies? The first step is to understand the target processes of the digital transformation effort. This requires expertise in business process management and business process modeling to the extent that old and new processes can be simulated against a set of measurable metrics. Many insurers have created innovation labs, which are formal, funded commitments to change — often necessary in insurance organizational cultures. Notable labs include The Innovation Lab from America's Health Insurance Plans and MetLife's LumenLab. Innovation labs enable prototyping. Successful prototypes become pilots. Pilots lead to deployment. The objective is process and product change that's beneficial to customers *and* providers: one-sided improvements are short-lived. This is the simplified best practice for technology adoption.

The insurance industry is changing. Insurtech is the change agent. Transformation is the goal. Individual companies can participate in any number of pilots.

In This Issue

In the first article of this issue, Deepika Shah and Rajesh Vishwanathan present an engagement framework that enables insurers to optimize their relationship with the insurtech startups most likely to impact their business models and processes. The authors' ultimate purpose is to define a relationship model for small and medium-sized insurance companies "that neither have the financial resources nor the management expertise of their larger competitors." Of interest here is their due diligence process to determine the "fit" between insurers and the insurtech startups. The authors offer a checklist of criteria that speak to the cultural, leadership, and technological compatibility of the engagement team. They then shift to the features of the engagement itself, describing an engagement model to help insurers navigate the sometimes complicated relationship with insurtech startups. By the end of the article — especially if you're a small or medium-sized insurer — you should have a good understanding of how to find, select, and engage insurtech startups. Note the authors

Upcoming Topics

Big Data Trends: Predictive Analytics, Machine Learning, and the Cloud
Bhuvan Unhelkar

Change Leadership in a Digital Era
Sheila Cox

Technology Trends and Predictions 2018
Cutter Consortium

also recommend a phased approach to digital transformation — something all of us should take to heart.

Next, Andrea Silvello examines how connectivity impacts insurance processes and products. More specifically, he describes a framework for whole new personalized product categories otherwise bundled as microinsurance. As the author argues, the traditional insurance industry has been dominated for decades by a one-size-fits-all product suite. But now, thanks largely to the availability of algorithms capable of situational underwriting in real time, clients can choose insurance instruments that best suit their needs. Silvello also argues that insurers must become bona fide partners with their clients, especially in areas like healthcare. Even broader, he argues that a "new paradigm in connected insurance — health, car, and home — will face several challenges posed by rates of adoption, cost barriers, resistance to change, and privacy aspects, but the potential benefits are numerous for insurance companies and customers alike." The author takes a bold step describing a customized, personalized, real-time insurance future.

In our third article, Andreas Zolnowski and Markus Warg go a little deeper into the technology platforms necessary to deliver enhanced customer experiences. Their work enables the objectives described by Silvello and others calling for personalized, customized, client/service-centric insurance policies, procedures, processes, and products. The authors focus on the evolution of technology platforms from the monolithic ones used by large, traditional insurers. They acknowledge that incumbent insurers build their business on long-term customer relationships and require "the implementation of a comprehensive technological service platform that integrates legacy and modern infrastructure." These two requirements must be satisfied as large, incumbent insurers invest in digital transformation with what startup (and other) insurtechs bring to the table. Client service–centered platforms will be developed by all insurers, not just the larger ones, though smaller insurers will be able to migrate faster because they are relatively unconstrained by legacy applications. But the essential message is clear: data will drive the relationships between insurers and clients.

Our final article by Carl Adams, Simon Day, Richard Teeuw, and Naomi Morris gets specific. It's always helpful to provide a use case that demonstrates the marriage between insurtech and "ground zero." The authors focus on poorer communities where the importance of insurance cannot be overstated: insurance instruments and processes before and after

disasters. As the authors assert: "In the global disaster arena, innovation often goes hand in hand with humanitarian drive. Indeed, the 'insurance' for some poorer nations is the global humanitarian engine that kicks in once a disaster befalls those communities." Adams et al. challenge us all to think about innovation in insurance before, during, and after disasters. They suggest parametric insurance, pre- and post-disaster activity monitoring, social media, risk monitoring, and even crowd-based communications processes. An interesting aspect of their argument is that while "insurance" can innovate with more flexible products and services, there are a variety of supporting methods, tools, and techniques that can help mitigate natural disasters of all kinds, especially disasters that occur in poorer communities. The authors therefore define insurance very broadly. Their argument is holistic: it defines insurance and technology in an integrated and interdisciplinary way. Is this a new approach to digital transformation? Should insurance be surrounded by supporting technologies that redefine the role of insurance? Ask yourself these questions when you read their article.

Conclusion

True to form, the insurance industry is piloting before deploying many of the emerging technologies already transforming multiple industries. But the insurance industry is also acting out of character: it's adopting emerging technology at an incredible pace. "Insurtech" is what we label it, but at the core of insurtech is just — finally and enthusiastically — digital transformation.

Endnote

[1]"The Rise of Insurtech." Accenture, 2017 (http://insuranceblog.accenture.com/wp-content/uploads/2017/04/Accenture-Insurance-Insurtech-Report-2017.pdf).

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Riding the Insurtech Wave

by Deepika Shah and Rajesh Vishwanathan

Small and medium-sized insurance companies need to engage with insurtechs to fully take advantage of the insurtech wave and leverage it successfully. In this article, we highlight avenues for sourcing, curating, and building long-term relationships with the insurtech firms that are most suitable for the incumbent organization's strategic requirements.

Most insurance industry commentators are unanimous in their view that the insurance industry is ripe for disruption by insurtechs, probably in a more dramatic manner than the recent technology disruption of the financial industry. So far, the insurance industry has been characterized by very little innovation in terms of technology and very little focus on customer experience (CX). These are the specific areas that form the sweet spot for many startups. Hence, there has been a surge in the number of startups focusing on the insurance sector.

These startups primarily focus on and target particular value pools in the insurance sector rather than seek to provide an end-to-end solution. One reason behind this approach could be that insurance (especially life insurance, health insurance, etc.) is more trust-driven, which allows the incumbents to score better over the insurtechs. However, the scale of operations developed over time by the incumbents cannot be matched by the insurtechs in the short term. Hence, the insurtechs are seeking to address specific challenges, such as improving CX, the innovative use of technologies, and so on.

The Insurtech Impact

Insurtechs are characterized by agile delivery models and rapid innovation that delivers smarter solutions, leveraging best-of-breed and cutting-edge technologies. They have very few legacy processes and systems to manage and thus are generally in a better position to deliver solutions at very low cost and at a faster rate compared to the incumbents. This enables insurtechs to offer a greater value proposition at a lower cost.

In turn, this affects all the incumbents. In particular, the impact on small and medium-sized insurance companies will be higher compared to their larger counterparts that have greater resources at their command. Thus, it is critical for small and medium-sized insurance companies to address the challenges posed by insurtechs sooner rather than later.

The Insurtech and Incumbent Relationship

The relationship between the incumbents and the insurtechs is changing rapidly.[1-2] Insurtechs have demonstrated that they are in a position to challenge the incumbents by leveraging smarter technology and agile ways of working. At the same time, the incumbents are realizing the benefits of the practices introduced by the insurtechs.

In the financial sector, banks and emerging fintechs are partnering, where the incumbents retain ownership of their end customers while the fintechs improve user experience and customer-centricity. This trend is slowly finding its way into the insurance sector, too. Insurtechs now seem to be focusing on providing services to insurers and helping the incumbents unlock value.

An increasing number of insurance companies are making a strategic decision and investment in either working with insurtech organizations or bringing those capabilities in-house to increase responsiveness. Moreover, based on conversations with various clients and insurtechs, we believe that the relationship is evolving to a partnership model, where the incumbents are leveraging the capabilities of the insurtechs to fill critical capability gaps.

Later in this article, we frame two scenarios in which to build a relationship model — for those companies that neither have the financial resources nor the management expertise of their larger competitors.

Challenges with Startups

Working with startups is quite challenging, especially for companies in sectors such as insurance where the pace of change is very slow. This problem is further compounded in the case of smaller organizations because the focus on innovation is generally constrained by various organizational factors, including budgets, management capacity, and technical expertise. The typical challenges that organizations face when dealing with insurtechs include:

- Accessing the right pool of insurtechs relevant to the incumbent's needs is a challenge. We have observed a variation in maturity of solutions that startups offer toward addressing a particular business use case requirement. For example, Israel offers impressive startup solutions in the space of machine learning–based optical character recognition (OCR) and photogrammetry, while deep learning classification and predictive solutions are more prominent in Singapore.

- Recognizing that the technology maturity of the incumbent (both in terms of architecture and personnel) is important, since the realization of benefits from the new technologies depends on the ability of the current landscape to integrate with the new technologies.

- Understanding that regulatory compliance with respect to data security, privacy, storage, and so on, creates challenges in service delivery. For example, the insurtech might offer the solution only on the cloud, which might not conform to the laws of the country in which the incumbent is located.

- Identifying the right set of use cases is one of the most important challenges, as this will determine the success of the engagement and might quite often determine the future of the initiative.

- Considering the maturity of the product is also key because it might take much longer to deliver the desired results with a product that is still under development or not yet commercialized.

Some typical challenges for the insurtechs include the following:

- Startups find the process of engaging with incumbents time-consuming and often frustrating. Thus, it takes a great deal of effort to identify the right set of stakeholders to whom to pitch the capabilities.

- Incumbent organizations typically lack the necessary processes and software-support capabilities.

- Lengthy and bureaucratic decision-making processes also discourage startups, which are more accustomed to quick and agile decision making.

> *The disruption caused by insurtechs is both a challenge and an opportunity for small and medium-sized insurance companies.*

Unique Challenges for Small Companies

The disruption caused by insurtechs is both a challenge and an opportunity for small and medium-sized insurance companies. On the one hand, disruption will lead to increased pressure on margins; on the other, it will provide insurance companies with an opportunity to create differentiators by leveraging new technologies.

In addition to the general challenges listed above, small insurance companies face some unique ones as well, including:

- The availability of funds and management support for strategies, such as partnership/investment or acquisition, is limited in this segment.

- Typically, small insurance companies have resource constraints in terms of availability of top management for an extended period of time or the capability to create and manage dedicated functions to support ongoing innovations.

- The experience of such companies in working with startups is also limited, thereby increasing the challenges to adapt to the ways of the insurtech.

- With constrained resources, there is little time for experimentation and, hence, a low tolerance for failure. This is also reflected in the types of technologies employed as well as the stage of the technology and the status of the startups with which the companies prefer to engage.

- Limited technical expertise to manage interactions with the startups and also to manage the solutions post-deployment leaves the incumbents exposed to risk of failure of the product or of the startup itself.

> *Insurtechs are not going away, so it is essential for incumbents to strategize and leverage the insurtechs to address those areas considered important by customers and where the insurtechs add significant value.*

The Way Out

Insurtechs are not going away, so it is essential for incumbents to strategize and leverage the insurtechs to address those areas considered important by customers and where the insurtechs add significant value (e.g., advanced analytics, enhanced CX). At the same time, it is critical that small and medium-sized insurance companies ensure that any investments made will deliver expected results and de-risk themselves to the desired extent. To achieve these goals, the incumbents need to develop a clear strategy to guide the following aspects of engagement with insurtechs:

- A holistic approach

- An insurtech evaluation framework

- An engagement model between the insurtech and the incumbent

The next sections describe each aspect in greater detail.

Holistic Approach

A holistic approach for insurtech engagement can be broadly divided into three phases: (1) curation or sourcing, (2) proof of concept or validation, and (3) implementation and support (see Figure 1). Based on the maturity of the use cases and the overall solution proposed, the incumbent may skip a step or, alternately, fast-track some steps.

Curation or Sourcing

This first phase involves the identification of startups that match the set of use cases that the incumbent insurance company would like to develop. This is a crucial phase because it determines the quality of insurtechs in the funnel and the quality of solutions that the incumbent would eventually acquire. The key steps involved in this phase are:

- **Identifying the focus areas and defining the use case.** Given the wide variety of options available in the insurtech arena, starting with a set of capabilities that the incumbent intends to focus on and build upon is definitely the suggested starting point. Focus areas should be based on existing capability gaps or ones that take advantage of upcoming trends or market disruptions at play. A business-first approach, starting with a business question, can work alongside a technology-lead approach, starting with a technology in mind, to arrive at the most suitable and relevant list of areas upon which to focus. Examples could be analytics from drones or satellite imagery for an insurance company offering crop insurance products, technology-assisted underwriting in the case of life insurance, or a connected home solution for those providers dealing in homeowner's insurance.

- **Scanning for relevant insurtechs.** Insurtechs can be scanned through multiple channels (e.g., aggregator sites, insurtech accelerators, venture capitalists, and academic institutions). Having a local presence in the countries where a specific insurtech is located helps provide a great advantage in building a network and getting through to the right insurtech company.

- **Evaluating and engaging the insurtech.** The evaluation and engagement of the insurtech needs to be done in a scientific manner to ensure that the companies and solutions selected meet the needs of the

Figure 1 — Holistic approach for insurtech engagement.

incumbent and are also reliable and robust from both a technical and a business perspective. A detailed evaluation framework is described later in this article.

Proof of Concept or Validation

Here's where the rubber meets the road, in the truest sense. From a viability perspective, this phase is crucial for immature technologies/applications or where the incumbent insurance company would like to test things further before investing. It presents the opportunity to try out the solution in a near-production environment. Three key steps are:

1. **Plan and prepare.** The key outcomes of this step include a charter (purpose, goals, and objectives) for the pilot, the plan to carry out the pilot, and a clear definition of the success criteria. The success criteria definition is important to help evaluate the pilot outcomes and define what "success" will look like. Preparation also involves the identification and onboarding of key stakeholders as well as the provisioning of any software, infrastructure, and data needed for the exercise. Another key element is in ensuring adherence to regulations and organizational policies (e.g., data privacy) while executing the pilot.

2. **Execute.** This step is the actual execution of the pilot. Issues that come up during this step will need to be identified and resolved as soon as possible because they will have a bearing on overall results. It is important that the key stakeholders from the incumbent are aware of the progress of the pilot and can resolve any delivery issues as needed. The outcomes of the execution phase could include quantitative feedback (e.g., number of records processed accurately and accuracy of the model) and qualitative feedback (e.g., usability of the solution and coverage of the solution).

3. **Evaluate.** This final step involves comparison of the outcomes with the expectations (and also with other solutions if possible) and with the current state within the incumbent to understand the impact and benefits that the new solution brings.

Implementation and Support

The implementation phase involves actual deployment and configuration and could be treated as a live project. In some cases (involving advanced analytics and AI-based solutions), the deployment phase will

be followed by a training phase, where algorithms are configured and trained for the specific use case. In working with the insurtech, this might require specialized skills from a particular domain as well as a technical perspective. Quite often, ROI is not available immediately. The solution (especially in the case of deep learning/AI-based solutions) may require a gestation period (sometimes as long as two to three years) before results are evident.

Insurtech Evaluation Framework

The hunt for a suitable insurtech, which not only brings the desired business value to the table but is also the least painful to align with from an IT perspective, needs to be approached in a systematic manner. The framework needs to incorporate a holistic evaluation methodology that not only looks at the suitability of the product, but also the viability of the startup and the likelihood of a long-term engagement with the insurtech. The various factors that must comprise the evaluation framework include:

- **Insurtech fit**

  o Leadership of the insurtech and advisors

  o Financial viability

  o Funding status

  o Active client base and industry experience

- **Solution fit**

  o Regulatory compliance

  o Ease of use

  o Diversity of platforms supported and any constraints

  o Architecture compatibility, such as ease of integration, maturity of interfaces, etc.

  o Nonfunctional aspects, such as security, performance scalability, etc.

- **Operational maturity**

  o Implementation time and rollout time

  o Customizability of the software for organization-specific needs

- o Availability of support personnel

- o Training and documentation

- o Upgrade, maintenance, and product roadmap

- **Commercial proposition**

- o Licensing models and sales model

- o Geography-specific pricing models

- o Solution delivery model (SaaS/on-premises installation)

These factors must be evaluated in detail for each insurtech in order to identify the best fit as far as overall value proposition is concerned. The importance of each factor will vary, not just from one incumbent insurance company to another, but also for each use case. For example, for fairly mature requirements and low-touch solutions (e.g., products that work on open source technology such as OCR) scanning, the selection of the right insurtech partner and the offered solution might not be as critical as it would be for solutions that work on proprietary technologies and algorithms, where the risk of dependency for developing and maintaining the proprietary solution offered by the insurtech would be very high and, hence, critical.

> *It is important to empower the team to make financial and technical decisions and, at the same time, the team must be capable of mapping the business need to the offerings of the insurtech.*

Engagement Model

Depending on the business scenario being strengthened by the insurtech, there are two possible methods to build engagement between the incumbent and the insurtech: (1) a direct engagement model or (2) an engagement through a service provider.

Direct Engagement Model

For focus areas where the business requirement is clearly established and refined and the technology has reached a fair degree of maturity, the incumbent can look to directly engage with the insurtech startups. This model is good for technologies that have crossed the "exploration" cusp and are in the "wider adoption" stage. Larger incumbents are more likely to be in a better position in terms of required resources to govern and guide such a direct engagement model than are the small and medium-sized insurance companies. We have found that it is best to approach this model as a project, and the project team should comprise a representative from various areas, including:

- Line of business being served

- Application most impacted

- Infrastructure and security team members

It is important to empower this team to make financial and technical decisions and, at the same time, the team must be capable of mapping the business need to the offerings of the insurtech to ensure a good product fit within the overall landscape of the incumbent.

There also needs to be a plan to train technology and business teams within the incumbent organization to handle long-term operations or a plan to ensure that the insurtech will be able to support the proposition throughout its lifecycle. Adopting a machine learning–based OCR solution for validating a filled-in proposal form against provided identity proofs is a good example of a use case that a direct engagement model can handle.

Be aware that this engagement model consumes a lot of management resources by way of dedicated personnel and requires a great deal of time and effort to ensure that the right insurtechs are identified and solution propositions are effectively leveraged. Moreover, this model presumes awareness of, and easy access to, the insurtech pool, which might not always be the case. Finally, with direct engagement, the risk is primarily borne by the incumbent.

Engagement Through Service Provider

Engagement through service providers is better in cases where the incumbent has limited bandwidth to source and evaluate insurtechs and also in cases where risk management is a key concern of the incumbent's stakeholders. The presence of a service provider helps manage the entire value chain of startup engagement holistically while mitigating much of the support and sourcing risks that the incumbent might otherwise have been exposed to.

Service providers add a lot of value by not only bringing the required skills to translate the business requirements and carve out the solution scope, but also to help source, evaluate, and then, if needed, manage the validation and implementation phases of the solution. However, for these benefits to accrue, it is critical to identify and select the right service provider for the exercise. Some key attributes that incumbents must seek are:

- Value proposition in terms of the startup network and connections with accelerators, insurtechs, and venture capitalists in the geographies of interest to reach out to the right startups

- The capability to deliver from an end-to-end perspective (i.e., strategy formulation, use case definition, solution implementation, and support)

- A proven track record in identifying and curating startups and translating solutions into tangible and credible innovations

- A presence in the startup's home country to ease some of the otherwise painful legal prerequisites

This model of engagement is less agile than direct engagement; the service provider and the incumbent will need to make an effort to ensure that lessened agility does not become a hurdle as far as decision making goes. Furthermore, since there is no dedicated team for innovation in this case, top management support is critical to ensure that the engagement projects get due priority.

Conclusion

Small and medium-sized insurance incumbents should view the disruption caused by insurtechs as an opportunity and should seek to build collaborative partnerships with them. While "transformation" is a journey most insurance incumbents want to undertake, we have observed that a focused and gradual transformation works better for such companies. The incumbents need to follow a systematic approach to identify, curate, and apply the right insurtech at the right stage of their transformation journey to make the required difference and impact. The engagement through service provider model described in this article helps increase revenue and reduce cost by addressing typical constraints around budget, management bandwidth, and technology expertise that these companies face.

(Disclaimer: the views expressed in this article are personal views of the authors and do not reflect the view of Tata Consultancy Services Ltd.)

Endnotes

[1]Gallin, Luke. "InsurTech to Significantly Disrupt Insurance Distribution & Impact Rates." Reinsurance News, 26 July 2017 (https://www.reinsurancene.ws/insurtech-significantly-disrupt-insurance-distribution-impact-rates).

[2]Lynn, Jordan. "Insurtech a 'Double-Edged Sword' Set to Impact Insurance." Insurance Business, 5 August 2017 (http://www.insurancebusinessmag.com/au/news/breaking-news/insurtech-a-doubleedged-sword-set-to-impact-insurance-75180.aspx).

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Connected Insurance:
Delivering Value with a Customer-Centric Approach

by Andrea Silvello

Connected insurance, enabled by big data, the Internet of Things (IoT), and artificial intelligence (AI), is disrupting a major industry that is traditionally resistant to change. Insurance technology — or insurtech — is a vast field and incorporates the interconnected landscape of connected insurance with its three pillars: health, car, and home. Microinsurance comes as a transversal opportunity that can help close the protection gap on the one hand and allow carriers to propose customer-centric products and services aligned with client expectations and behavior on the other hand. But connected insurance is mainly about people: how to reach and engage with them in an efficient way and, at the same time, connect their risks with the insurance cover they take.

In keeping with the people strategy comes the understanding that the individual customer needs to be put at the center of every company that wants to succeed. The customer-centric approach starts from the realization that there is no "average" customer. Customers have different behaviors and preferences, and this presents rich opportunities to move past the outdated one-size-fits-all approach, even in the insurance industry.

Insurers that understand the client has to become the central point will need to put in place mechanisms and the technology to target the right customers, through the right channels, with the right messages, at the right time. This is a strategy that will drive long-term value to the business by acquiring high-value customers and keeping them coming back. Insurtech is the key to this and to other types of optimization.

The tendency is for insurance companies to become more of a 360-degree "counselor" that assists the insured in making the best decisions based on connected insurance solutions. Therefore, it's important to understand how the three enablers — big data, IoT, and AI — work together and what their roles are in the development of connected insurance.

Back to Basics

Big data refers to massive quantities of data, both structured and unstructured, that need to pass through certain processes to become useful for a given purpose. First the data needs to be collected from various sources depending on the business or industry concerned, then the data must be filtered for abnormalities and irrelevant data. Data normalization is required for integration with the rest of the existing big data the company owns in its repositories.[1] Interpreting such vast quantities of data can become a burden and, according to a poll by data mining and crowdsourcing firm CrowdFlower, data scientists spend around 80% of their time cleaning and preparing data.[2]

There is a strong connection between big data and the IoT, and this lies in the very nature of connected devices and smart objects. IoT delivers the information from which big data analytics can draw the data it uses to create the insights required of it. Big data existed even before smart objects but on a smaller scale. IoT analytics solutions must adapt to the needs of rapid data ingestion and processing, and incorporate accurate and fast extraction.[3] Anything from watches and thermostats, to cars, airplanes, and train tracks can now be connected to the Internet and gather and process data, mainly to indicate customer usage patterns and product performance. Information from IoT devices resides in big data and is measured against that data.[4]

AI is the brain behind it all, responsible for reading and interpreting the processed data. AI is an evolved form of data analytics that is also able to adapt based on new sets of data and to learn by experimenting. In a way, machines imitate human intelligence by enabling systems to perceive, decide, act, learn, and adapt to maximize their chances of success toward specific goals.

These three enablers, which are closely tied together, have already started to change the face of connected insurance — starting from health and car to home and along commercial lines — but the major changes are still to come, as the insurance sector is changing its

approach toward technology and the many ways that technology can be of use to it.

Connected Health

Connected insurance has come to play a crucial role in the health sector worldwide, but the current (traditional) role of the insurer varies immensely, depending on country-specific health and welfare policies. Health insurance could contribute to improve current conditions or even solve dilemmas, such as how to keep an ever-growing global population healthy and protected. To do that, insurers need to transition from simple "payers" to "players," and become a reference point with an active role in all the health-related needs of their customers. This outcome has become more probable since connected insurance and wearables have started to reshape the industry. Gathering vital data from patients and sharing that data with caregivers using technology is a game changer.

"Mobile is the future," said Google CEO Eric Schmidt in 2011.[5] Schmidt is now chairman of Alphabet (the parent company of Google), and he understands there is no return from the smartphone "invasion." We all live surrounded by dozens of different devices, and the smartphone screen has become the main reference for all our activities.

Customers today do not *go* online, they *live* online. They experience an endless sequence of moments in a nonlinear balance between the online and offline worlds. So why not use this habit of living online to keep people healthy and interested in practicing physical exercise or having healthy eating habits: preventing instead of treating?

In light of the above, connected insurance (from wearables usage to mobile health [mHealth] applications) presents great potential for both the insurer and the insured. Such potential should be harnessed in a profitable way by targeting less risky clients and presenting them with an improved, better-priced value proposition. For this to happen, insurance companies will have to seek partners from both the technological innovation sphere and the medical field, keeping in mind that insurance's role in the health system is changing from payer to player.

The "Payer" to "Player" Transformation

How can innovation in health insurance transform the insurance company from a simple payer to a proactive player in the customer health journey? Insurance covers can be differentiated by client segments, and the insurer can propose different levels of assistance based on specific tools and services (call center for emergencies; pharmaceutical products ordering and home delivery; eHealth with unique devices for specific target patients; professional medical advice via call, messaging, or video; etc.). Insurance providers can propose a discounted price for doctor visits through a preferred network of primary healthcare givers, perform online booking and payments, store medical history, and manage digital health agendas.

> *Customers today do not* go *online, they* live *online. They experience an endless sequence of moments in a nonlinear balance between the online and offline worlds.*

With the objective of promoting the adoption of healthier behavior, gamification and engagement based on wearables and tailor-made goals, alongside digital personal trainers and wellness agreements with gyms and shops, become key in setting a long-term healthy relationship with clients. In this model, insurers manage to stay profitable while *taking care of* and *not just paying* for clients' healthcare expenses.

According to worldwide insurtech thought leader Matteo Carbone, there are five main value creation levers to take into consideration:[6]

1. **Risk selection** enhances the underwriting phase with temporary monitoring based on dedicated devices. As far as the risk selection layer is concerned, connected devices can be indirectly or directly used to select risks at the underwriting stage, resulting in the acquisition of low-risk customers and a connected reduction in fraudulent intents.

2. **Loyalty and behavior modification programs** lead the client toward risk-free behavior. Behavioral programs are approaches that exploit information gathered about client behavior to direct clients toward less risky solutions. A reward system that stimulates safer client behavior is a key element in this evolved insurance landscape, and programs based on innovative gamification approaches are a must for keeping clients engaged. If the clients are

engaged, there is a higher probability for them not to switch between insurance companies.

3. **Value-added services** develop client-tailored ancillary services that allow the insurer to play as an omnichannel medical concierge. Value-added services consist of proposing to clients policy-related services that have a double aim: (1) to guide clients toward desired behavior and (2) to offer perceived value through services to clients. Some ancillary services are proposed to the insured clients to exploit relevant data detected. These services could be directly supplied by the insurance company or by means of specialized partners.

4. **Loss control** takes a broad approach to mitigate claims. Connected insurance allows the use of data collected from customers, through the means of wearables, smartphones, and other connected devices, to limit the profit and loss (P&L) ratio. This enables the development of claims management processes that permit the insurance company to act more proactively and make the whole process faster and more efficient.

5. **Risk-based pricing** develops insurance policies with pricing linked to client behaviors. Monitoring the "quantity" and "level" of risk exposure during coverage periods has become possible. Risk can be calculated based on information gathered through monitoring with a direct impact on pricing applied to the individual customer. Thanks to the integration between intelligence, connectivity, and better usability, wearable devices can offer interesting opportunities in health and activity monitoring, tracking, personal notifications, and virtual assistance.

The winning insurance value proposition will be the one able to propose to its customers insurance components together with e/mHealth modular services made available in a single, easy-to-use, and complete user experience accessible via a mobile app, including wellness, medical network access, and medical services.[7]

The Model of Vitality by Discovery Limited

To better grasp the actual benefits for clients (those who decide to get insured) and not just for insurers that adopt such an innovative approach, we should take a closer look at the South African player Discovery Limited. Discovery may be considered the benchmark when it comes to engaging and improving life quality for members and, generically speaking, national welfare. The company engages in long- and short-term insurance, asset management, savings, investment, and employee benefits through its various brands. Its Vitality shared-value insurance model system not only increases customer loyalty but improves customers' lifestyles and overall states of health. It includes a gamification strategy, which runs with the support of an extended network of partners and with the help of wearables and smart objects, alongside the well-known smartphone.

Vitality gives customers mini-challenges — related to shopping for food, physical and sporting activities, medical checkups, and so on — that, if accomplished, are rewarded with cash back, discounts, or other types of incentives. As a consequence, individuals end up having a more active life (engaged Vitality members exercise 25% more than non-Vitality members) and, according to a study released by the company, they live longer than non-Vitality members.[8] To be more precise, according to Discovery, the average life expectancy of an insured South African is 67 years, while the average life expectancy of an insured Vitality member is 81 years.[9]

The implications of these results for ensuring healthy lives and promoting well-being are significant. The Discovery Vitality model should be further investigated for a fuller understanding of whether and how it could work for other populations and to see to what degree innovation — driven by insurers and technology companies — can be used to benefit people in general.

Connected Car

Insurance motor telematics is currently at different evolutionary stages around the world, with Italy leading the race and Discovery representing one of the first companies to show that insurance telematics can directly impact P&L if managed correctly.

Figure 1 shows the various phases in which different countries find themselves and tries to predict the pace of adoption through 2020.[10] Italy is still leading over the US, the UK, and South Africa. This is because of the circumstances created by Italy's strong automotive industry and because the industry was a pioneer in working with telematics starting way back in 2002.
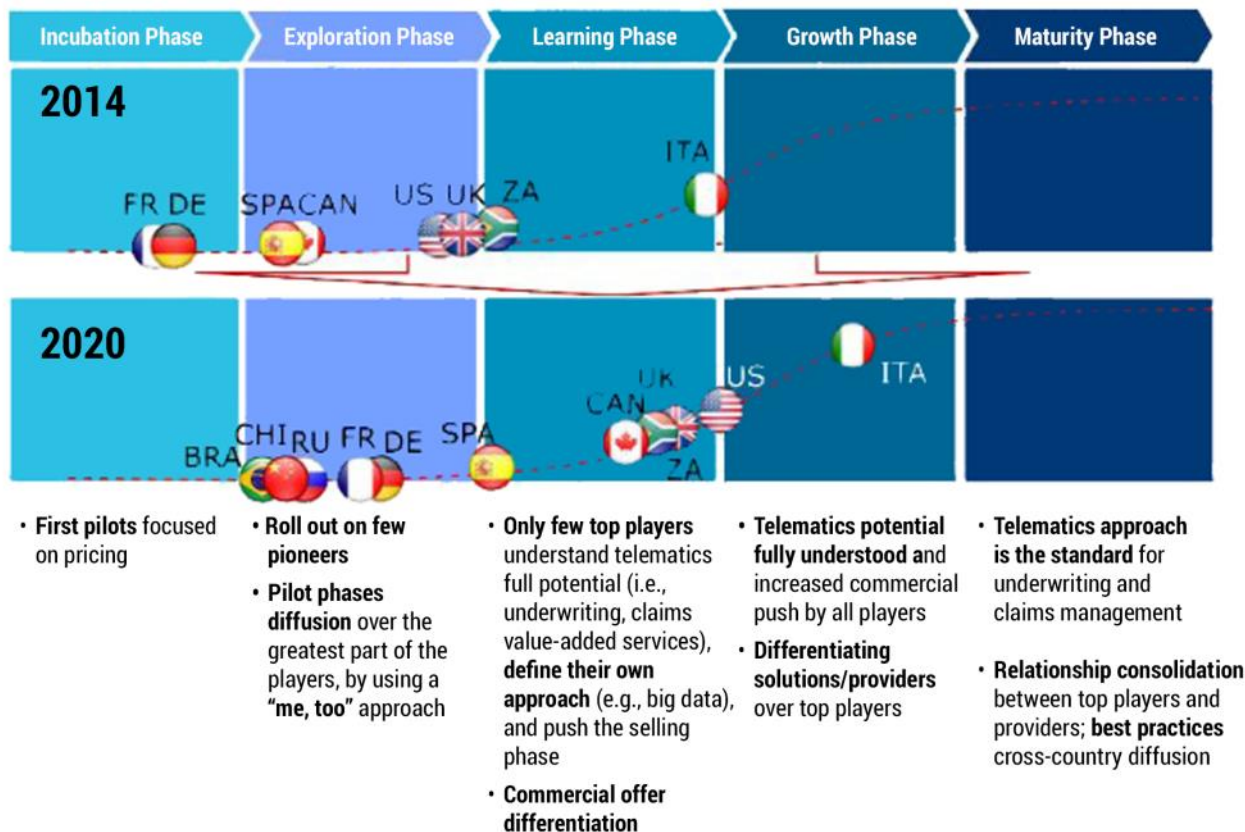
| Incubation Phase | Exploration Phase | Learning Phase | Growth Phase | Maturity Phase |

2014

FR DE · SPA CAN · US UK ZA · ITA

2020

BRA CHI RU FR DE · SPA · UK CAN US ZA · ITA

- **First pilots** focused on pricing

- **Roll out on few pioneers**
- **Pilot phases diffusion** over the greatest part of the players, by using a "me, too" approach

- **Only few top players** understand telematics full potential (i.e., underwriting, claims value-added services), **define their own approach** (e.g., big data), and push the selling phase
- **Commercial offer differentiation**

- **Telematics potential fully understood** and increased commercial push by all players
- **Differentiating solutions/providers** over top players

- **Telematics approach is the standard** for underwriting and claims management
- **Relationship consolidation** between top players and providers; **best practices** cross-country diffusion

Figure 1 — Connected car insurance adoption phases. (Source: Carbone.)

Even though the initial stage was costly, the Italian market managed to absorb the costs due to high insurance rates at the time. In a couple of years, insurers from Brazil, China, and Russia will be coming up strong behind insurance players from France and Germany, as they will have learned from the experience of previous players and will be accelerating toward the Exploration phase.

Another key to the Italian motor telematics model, which is currently entering the Growth phase, is that the market is now able to offer low-cost, self-installing solutions for vehicles. Italy still leads the race in the 2020 forecast precisely because it had a head start facilitated by the above-mentioned circumstances and because it takes more than a couple of years for newcomers to appear on the motor telematics map and to go up the scale.

Although there is not yet any strong statistical evidence about changed or improved driving behavior in customers with telematics-based insurance policies, the data analyzed by Swiss Re in one of its studies indicates that this will be the case in the near future.[11]

Connected Home

The last element of the connected insurance puzzle is the home insurance market. Nearly half of insurers believe that connected devices will help drive growth in the next three years. On the other hand, consumers are, for now, a bit skeptical about the technology, given the high costs still associated with home telematics and devices. Companies will have to overcome this obstacle, as has been done in motor telematics, by coming up with lower-cost solutions for the connected home. Consequently, adoption rates will start to go up slowly.

Some players are already taking steps forward. Take, for example, Octo Telematics, one of the leading players in motor telematics, which is developing projects with three insurers: Aviva, Groupama Assicurazioni, and Poste Vita. Startups are also beginning to come up with solutions at accessible prices. Even colossus Google is active in the field through its company Nest, but the partnership with insurer American Family is, for now, a mere comarketing initiative meant to test the Nest smoke detector solution on a bigger scale in the US state of Minnesota.

From the insurer's point of view, connected homes and access to data gathered from smart sensors and devices will provide valuable insights that can lead to higher customer satisfaction, lower costs and risks, and improved efficiency and prevention. It will also allow companies to have real-time data regarding the conditions of a property prior to and after a risk alert. The advantages are numerous. The customer can also benefit, with more control over perilous events ranging from gas leaks to fire hazards or even theft. And insurance companies can offer property insurance premium discounts, based on the customer's actions when a hazard alert occurs and on the measures the customer takes after the event to minimize the possibilities of recurrence.

Microinsurance

With particular focus on the smartphone — the main proxy of today's customer — insurtech has introduced the concept of microinsurance: insurance policies of limited duration and contained costs available directly on the client's smartphone with no paperwork. As an entrepreneur, I believe that this is bound to change the way in which clients interact and perceive insurance policies.

Currently, microinsurance already covers around 135 million people, which represents about 5% of the entire market potential, with an average 10% annual growth rate.[12] The risks covered by such solutions are the typical ones of the traditional insurance market: life, health, accidental death and disability, and property insurance.

Developing countries have economies that are generally based on farming and agriculture, so they can't manage to cover all the needs of a growing population exclusively with the goods they produce. While most underdeveloped countries are in Africa and Asia, some economies in South and Central America are also referred to as developing countries. This means that approximately 70% of the world's 7 billion people live in poverty.[13] In such a context there is significant demand for certain insurance products — ranging from health and life, agricultural, and property insurance, to catastrophe cover. The potential market for insurance in these countries is estimated to be between 1.5 billion and 3 billion policies.[14]

Although microinsurance is commonly associated with poor, developing countries, it presents a different type of business potential than do microfinance and microcredit (generally considered to have originated with the Grameen Bank founded in Bangladesh in 1983[15]). Microinsurance is not just specific risk insurance coverage at reduced cost for people in developing countries. It is an innovative way of selling insurance that is aligned with customer expectations while covering a specific need, at the right moment, at the right price, in a customer-centric approach. This type of insurance could help close the protection gap, both in developed countries and underdeveloped ones.

The role of microfinance, in contrast, is to create "a world in which as many poor and near-poor households as possible have permanent access to an appropriate range of high-quality financial services, including not just credit but also savings, insurance, and fund transfers."[16] Microcredit means providing credit services to those with low income. It is an extension of very small loans to impoverished borrowers who typically lack collateral, steady employment, and a verifiable credit history.

If people with low income are offered the right products, means, and knowledge, they will become effective consumers of financial services. The MicroInsurance Centre estimates that in the next 10 years or so, the microinsurance market could grow to 1 billion policyholders, representing a third of the potential projected 3 billion market.[17]

An important point is that insurance demand should not be taken for granted. Insurance often has a negative connotation in the developing world, which stops it from reaching more people. The market needs an innovative approach based on customer education and incentives.

Insurance benefits must be clear in the minds of potential customers and, for that to be achieved, there needs to be a building of trust. This can be done through new and engaging approaches like TV and radio program plotlines, or even through literacy campaigns. To create demand, other types of incentives can also be used, including tax exemptions, subsidies, or compulsory cover. For microinsurance to function in a developing country and economy, the products and the processes to be put in place must be simple and the premiums need to be kept low. For this to be possible, insurers need a changed mindset alongside a more efficient administrative strategy and distribution channel.

Insurers will have to find the right business model and partners when approaching such markets, and should

consider less common mechanisms for controlling moral hazards, adverse selection, and fraud. For example, proxy underwriting, group policies, and waiting periods mitigate adverse selection. At first, investing in microinsurance might seem a bit reckless, but the returns do exist and are gradual over time: starting with reputational gains in the short term, knowledge in the medium term, and growth in the long term.

Already more than half of the world's population uses a mobile phone, and 34% of the total population are active mobile social users with a 50% penetration regarding Internet usage worldwide. Fewer and fewer people use fixed telephone lines as mobile phones are the dominant means of communication, even in the Third World.[18] According to a Pew Research Center survey, in the last two years there has been a significant increase in the number of people from developing nations that declare they use Internet and own a smartphone.[19]

Moreover, in nearly every country, Millennials (those aged between 18 and 34) are much more likely to be Internet and smartphone users than those over 35.[20] This phenomenon is characteristic of both advanced and emerging economies. Despite these trends, fewer than 5% of people with low income have access to insurance or to covers that they need. These qualities make underdeveloped countries an ideal market for the insurance industry, and insurtech initiatives in particular, to explore because they present some great potential opportunities.

Consider a common statement regarding the industry that has proven true over decades: "Insurance purchase is not exciting; insurance is sold not bought!" The insurer must address the current context, which has dramatically changed with the arrival of mobile and then smartphone technology. Companies should get customers' attention by using the same channels that they use and talk to them in their "language."

Insurance should adapt to the customers' habits and their environment. I believe the best way to do that is by selling microinsurance that has a short duration with a push approach. Then you'll be able to provide the right insurance coverage, when the clients need it, directly on their smartphones. The trick is to avoid annoying customers with offers that do not interest them directly, at the wrong moment. To avoid that situation, insurers should use a system that can provide insight into customers' lifestyle and preferences.

Finally, a good microinsurance solution must create a seamless digital customer experience by reading and interpreting customer behavior and emotions. The aim is to create a win-win situation for customers and insurers alike. The key to selling insurance to Millennials is to reach them with the right message, at the right time, on a device where they swipe, tap, and pinch 2,617 times a day: their smartphone.[21] And Millennials are just the tip of the iceberg: the "connected generation," which encompasses many more people than just Millennials, is the single most important customer segment. Empowered by technology, members of this generation search out authentic services that they utilize across platforms and screens, whenever and wherever they can.

Conclusion

The insurance industry is slowly evolving from a one-size-fits-all approach toward a personalized approach that looks at individuals and their habits, needs, and environments. As the World Health Organization predicts a worldwide deficit of nearly 13 million doctors by 2035,[22] it's essential that connected health and connected health insurance evolve to allow care providers to be much more versatile and flexible in reaching their patients. Insurance carriers that look at their customers as partners to whom they offer value-added services and support could reduce costs and at the same time positively influence the health state of those customers. Customers would have improved access to medical care and advice at lower cost. Primary healthcare givers could reduce the number of unnecessary medical visits and could also limit hospitalization days per person with telemedicine and connected devices.

Clearly the new paradigm in connected insurance — health, car, and home — will face several challenges posed by rates of adoption, cost barriers, resistance to change, and privacy aspects, but the potential benefits are numerous for insurance companies and customers alike. The rate of adoption of motor insurance telematics, already implemented in many countries, confirms that customers may be open to such telematics-based insurance offerings.

These three pillars of connected insurance — health, car, and home — will have to stand within an ecosystem of partners, service providers, and interconnected devices that insurance companies will have to foster in order to deliver the ultimate user experience to customers. Microinsurance, as a transversal concept that can be

applied to all three pillars, provides an innovative way of selling insurance aligned with customer expectations while covering specific needs: at the right moment, at the right price, in the right place, and in a customer-centric approach.

In summary, a background system based on big data analytics that can identify patterns and provide optimized solutions based on real-time input, with a seamless, user-friendly interface up front will transform the way companies sell and communicate with policy holders.

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Let's Get Digital: Digitizing the Insurance Business with Service Platforms

by Andreas Zolnowski and Markus Warg

Exploiting the opportunities of digital technologies is a key challenge for most companies and a driver for digital transformation. While insurtech startups establish innovative customer-centered solutions based on disruptive technologies without having to build on any other software or systems, incumbent insurers must deal with existing, stable, but non-agile legacy systems and cultural barriers. In contrast to startups, however, incumbent insurers have built their businesses on long-term customer relationships, enabling them to rely on huge amounts of historical data about their customers and specific capabilities in the insurance business (e.g., knowledge of legal requirements, supervision, risk management, process capabilities, and professional competence).

To respond to the opportunities of the market and to exploit the existing data treasure, incumbent companies must combine traditional and modern capabilities and technologies to foster service innovation. Especially important in this endeavor is the implementation of a comprehensive technological service platform that integrates legacy and modern infrastructure. In this article, we reflect on the experiences gained in the digital transformation of a traditional insurance company in Germany.

Insurtechs and Incumbents: Capabilities Compared

Dramatic changes in technology and customer behavior have led to manifold challenges as well as opportunities in the insurance industry. Taking advantage of these changes, insurtech startups are entering the market and are competing for market share with incumbents.

Although long-term relationships and trust characterize the insurance industry, the changes initiated by insurtech seem to be pushing the market forward. As in other industries, startups mostly enter the market without traditional viewpoints. Instead, they question the existing structures and try to establish new, innovative solutions. This openness is one of insurtech's most important advantages and does not exist only with regard to existing structures. Increasingly, insurtech startups are showing an openness toward customers and consistently aligning their business with their customers and their needs. With this service mindset, startup companies question existing processes and focus on examining how customers behave.

With the ubiquity of technology and connectivity, customer behaviors have changed significantly. Customers tend to expect real-time services that encompass context-specific interaction. In concrete terms, this means that customers expect an individual approach that addresses each customer and his or her specific situation.

To meet this expectation, startups apply modern technologies that allow real-time processing of customer behavior and data. This technology is purpose-designed and rightfully aligned to the actual requirements of the solution. Startups run lightweight IT that is affordable, scalable, and flexible. This lightweight design makes it possible to proceed iteratively, and thus better meet customer requirements step by step, as they evolve.

Although startups outperform incumbent insurance companies in their flexibility and innovation, incumbents have significant advantages over startups. As mentioned earlier, incumbents have been in the market for decades and have created a broad customer base. They are frequently in contact with the customer and enjoy a great deal of trust that they have built up over time. Moreover, they have a lot of experience with legislation and regulation, have necessary licenses, and retain sufficient capital resources. Most important, however, are incumbents' existing contracts and trust. Since insurance contracts sometimes have very long terms, it is not possible to switch carriers quickly. For example, obstacles in the German insurance industry, such as age-dependent premiums when taking out insurance policies, make it costly to change health or life

insurance carriers. Moreover, insurance companies build on the trust of their customers and, as a result, customers feel strongly dependent on them. In addition to their broad customer base, incumbents have strong internal capabilities as well. Over the years, incumbents have built up process and professional competence that ensures efficient, effective, and legally compliant operations.

Due to long-term relationships and existing contracts, incumbents have significant data on their customers. Insurers can apply this data to design customer-specific solutions. However, many incumbents have difficulties using that data in a real-time environment. To cope with the disruption of digital transformation, an incumbent should combine its advantages with those of insurtechs, including openness regarding customer needs, new technical innovations, and a service mindset.

As we observed in our German case company, incumbents have three main challenges:

1. An incumbent must deal with legacy infrastructure.

2. An incumbent should adopt a service mindset that allows it to develop customer-oriented solutions.

3. An incumbent should derive benefits from its existing data and knowledge of the customer.

In the following sections, we examine these aspects in more detail.

Integrating Legacy and Modern Infrastructure in an SDA-Based Platform

Incumbents face a complex legacy IT that has built up over decades and consists of an enormous amount of different applications, databases, and systems. All components of this legacy IT are integrated into the company's business processes, and thus all ongoing operations are dependent on it. Considering the challenges of modern customer solutions, legacy IT is not able to meet the requirements for agile and flexible design. Instead, legacy IT is regularly characterized by monolithic applications that are specialized for defined purposes and installed on dedicated servers or mainframes. Also, all development projects for new business functions are planned thoroughly and carried out in long-term projects with a defined output.

To overcome the challenges of legacy IT, "companies have to establish agile, flexible, and collaborative processes and structures, and to execute this transformation without affecting ongoing operations."[1] To do this, incumbents must build on insurtech's complementary capabilities. One possible way to integrate the complementary capabilities of incumbents and insurtechs is the realization of a two-speed IT. For the realization of a two-speed IT, our case study company implemented a Service Dominant Architecture (SDA).[2] The SDA operationalizes concepts from service science in an architectural blueprint for the implementation of a service platform (see Figure 1).[3] Within its two-speed IT,
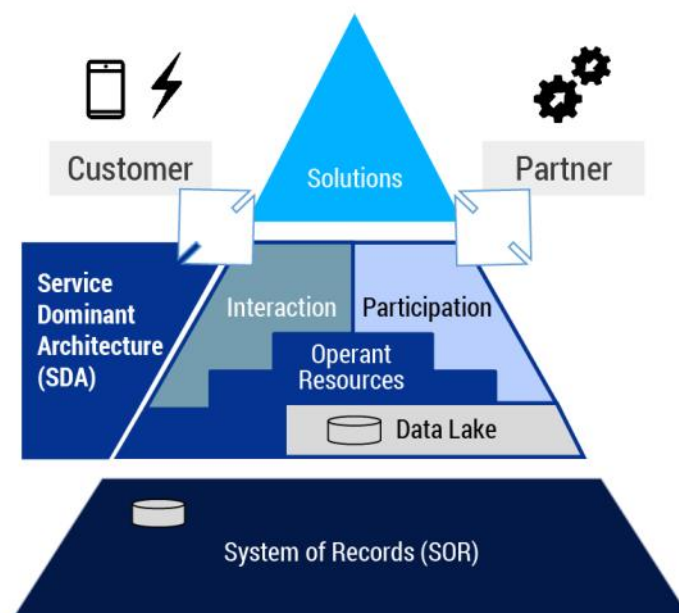

Figure 1 — The Service Dominant Architecture. (Adapted from Warg, Weiß, Zolnowski, and Engel.)

our case company implemented a service platform on top of the legacy infrastructure, adding important complementary capabilities to its legacy IT.

The SDA, as the architectural blueprint of the service platform, enables the integration and orchestration of capabilities and other resources (e.g., processes, data, applications, and functions) into agile, flexible, and collaborative services in real time. To generate customer-centric solutions, the SDA implements necessary technical systems to capture (i.e., integrate all relevant capabilities and resources and enable the participation of different partners with relevant capabilities and resources in value creation), exchange (i.e., facilitate the interaction between customer and provider to co-create value), and orchestrate relevant capabilities and resources. In this way, the service platform facilitates the implementation and development of new, customer-centric solutions.

Based on the theoretical foundations of service research, SDA comprises three technical service systems as well as a data lake. The first of these systems is the system of interaction, which allows interaction with the customer and thus enables cocreation, as with the interactive relationship between a provider and a customer during value-creation processes. Within these processes, a customer can interact with the service provider via a variety of different interfaces. Examining the interaction, the service provider can then identify the customer's needs and requirements and, based on this knowledge, implement customer-specific solutions.

Since different capabilities and resources are needed to realize solutions, the second technical service system is the system of participation. This system allows the integration of any partner into a fixed or loosely coupled system in which capabilities and resources for the development of new value propositions are orchestrated. The third technical system, the system of operant resources, provides existing capabilities and resources from legacy IT of the company. Here, resources from legacy IT (also known as the "system of record") are transformed into dynamically applicable information resources.

A supplementary data lake enables the application of all information in real time. It introduces new IT artifacts, related data structures, and management techniques, as well as related data management capabilities such as big data approaches and techniques (e.g., Hadoop, machine learning, artificial intelligence, and algorithms).

A service platform like the SDA enables a company to do the following:

1. Accelerate the capabilities in customer-centric areas.

2. Achieve useful collaboration and cocreation.

3. Deepen data-based customer understanding.

4. Create networks of partners and other external service providers.

In this way, the insurer integrates the necessary capabilities and resources to realize flexible and customer-centric solutions.

> *The SDA, as the architectural blueprint of the service platform, enables the integration and orchestration of capabilities and other resources into agile, flexible, and collaborative services in real time.*

However, as we observed in our case study, implementing a service platform on top of legacy IT is not sufficient. Legacy IT consists of manifold applications and databases essential to the company's survival that serve existing processes and customers, so these applications must continue to operate. At the same time, existing applications, data, and infrastructure that were designed for traditional IT environments limit the incumbent's ability to maneuver.

Mastering this challenge requires a radical shift in legacy IT toward a target of more modularity and flexibility. In our case study, this target was achieved in two major steps. The first step involved developing new services for existing applications and databases, encapsulating existing application processes and data, and facilitating the modularization of the legacy components. (Modularization is an essential element for a more flexible use of existing applications and data.)

The second step involved reengineering the insurer's existing applications. This reengineering is necessary for several reasons. First, existing applications are built-in monolithic structures that are optimized for operations on mainframes. Second, these applications are based on traditional programming languages like

COBOL, for which there are fewer and fewer people with corresponding programming skills. Third, there are a variety of different specialized applications, the number of which need to be reduced. In our case study example, the company has more than 10 applications for preparing insurance offers because of the historical development of the company's business. To reduce this application landscape size over time, the company is striving for one integrated application for all offers.

In general, the goal of all activities is the integration of traditional capabilities on the service platform, thus combining advantages of the incumbent insurers (e.g., experience with regulation and a base of existing clients) with advantages from insurtechs, including customer centricity, flexibility, and simpler structures.

The Need for a Service Mindset

Thus far, our case company has focused on its insurance products and product details (e.g., coverage, premiums, and terms). In addition to the implementation of a comprehensive service platform and considering the current market evolution, a change in the corporate culture and mindset was necessary. Triggered by changes in customers' behavior and inspired by the SDA, top management in the company developed a unified understanding of service as a target for the entire company. This understanding has been spread throughout the organization and is used as a common perspective for organizational development.

As an examination of customer behavior shows, the client's essential needs do not change. Insurance industry customers mainly seek protection, asset growth, and risk management. Simultaneously, offerings need to be convenient and, hence, understandable and fair. Even if the needs of the customers do not change, their behaviors do. Customers are already accustomed to new technical possibilities and innovative value propositions, resulting in modified behavior characterized by the use of various communication channels between customer and company. Clients also are broadly involved in value-creation processes and thus are used to personalized or individualized offerings, and they are used to communicating and sharing with modern technology.[4]

In general, changes in customer behavior lead to new requirements that IT and its organization must fulfill. IT must enable fast and dynamic interactions between the company and the customer, support real-time communication, and be consistent across all communication channels.

As illustrated in the case study, driven by these requirements, incumbents must implement a more flexible organization with flexible processes. The target of the organizational change is to change the traditional culture and to establish a modern and empowering culture. To achieve a modern culture at our case insurer, an agile project culture was successively introduced in new projects. This gave employees greater responsibility, more flexibility, and increased proximity to the customer.

This greater proximity to the customer, with a focus on customers' needs and requirements, was key to achieving customer-centric solutions. Customer-centric design approaches (e.g., Design Thinking) and agile project structures enabled our case company to achieve a comprehensive integration of the customer and thus enabled complementary capabilities that previously have been associated only with insurtechs.

Increased Exploitation and Use of Data

To better understand the customer and to be able to design customer-centric solutions, incumbents need more proximity to the customer. However, it is difficult to integrate the customer into business processes. One way to better understand the customer is through data about that customer. In our case company, the service platform facilitates the capabilities for storing and processing customer data, which was a basic requirement for a better understanding of the customer. Specifically, the service platform — and particularly the data lake — acts as a central space for any relevant data. This includes all data from legacy IT, data obtained directly from the customer, and data from other partners.

A key challenge in implementing the data lake is integrating existing data from legacy IT. As we observed in our case study, accessing data held in different systems and databases is very complex, especially in incumbents with historically grown IT structures. Hence, we recommend a step-by-step integration of available data. Due to the amount of data, the data lake is not supposed to map the data from the legacy databases completely. Instead, a relevant subset of frequently required data is identified and implemented.

Data the customer provides is important and equally necessary to better understand the customer's current

situation. At first, the case study company implemented rather easy prototypes that tracked the interaction of the customer with the website. In more sophisticated prototypes, the case study company intends to incorporate mobile phones or fitness trackers to gather customer data.

Data from other partners is useful as well, complementing the insurer's existing data and enabling a more comprehensive view of the customer. For example, by adding statistical data about the place of residence, the insurer can derive additional information about the customer.

The consistent collection and use of data results in the implementation of an event-driven architecture. An event-driven architecture is characterized by reacting to defined events and carrying out appropriate actions. This enables the insurer to offer the customer a tailor-made service.

In general, knowledge about the customer is becoming increasingly important. This knowledge enables customer-specific solutions that correspond to the actual customer's problems and delivers added value to the customer. This customer focus is particularly necessary for competition with insurtechs, which are characterized by high customer orientation.

Changing Business Models of Incumbent Insurers

Changing customer expectations and the competitive pressure insurtechs are exerting are propelling changes in existing insurance companies' business models. One example from our case study illustrates how an insurer can adapt and extend an existing value proposition and business model. In this example, a prototypically implemented use case reveals how additional information about the customer can improve the customer approach (see Figure 2).[5]

In this case, individualized information appears on the insurance website as a starting point for additional offers. Our case study company implemented this feature on its website as a result of the capabilities and resources it collected on the service platform.

The prerequisite in this case is that the visitor is an existing customer and has previously visited the website's login area. During the login process, a cookie was written on the visitor's computer that helps to identify the customer for future visits.

The first step of the use case starts before the customer accesses the website, with the identification and collection of all necessary data. In our case study, this data was defined during the implementation of the solution, so it can be loaded to the data lake if required. Preloading data enables individualized responses even when the data source is no longer available. In this instance, local crime statistics were identified as necessary data and loaded to the data lake. Additional data specific to the customer was identified in legacy IT as well and transferred to the data lake. By copying all necessary data to the data lake, it is now possible to identify the customer and offer additional information in real time.

In the next step, the customer enters the website's household insurance area. The customer connects to the service platform and the cookie identifying the customer is submitted to the platform. In this step, the system recognizes the customer's identity and, based on

Figure 2 — Individualized information on a website: a use case. (Source: Zolnowski and Warg.)

this knowledge, the service platform loads all necessary data about the customer, including information on the customer's current insurance contracts. At the same time, the service platform loads the crime statistics from the cache and, if required, any additional data from the insurance company's partners. The platform can now provide the customer with individualized information; in this case, the crime statistics for the customer's address.

As a last step, the customer may want to contact the insurance company. The customer can contact the service platform and is forwarded either to the direct service center or to an external partner.

In this example, the service platform is a central element for innovative solutions by the incumbent organization. The integration of all necessary resources and capabilities in a comprehensive platform facilitates a customer-centric approach with situationally relevant information. The insurance company can create and offer a customer-specific customer benefit, and thus a value proposition that was not possible before, signaling a comprehensive change in the business model. As a solution provider, the insurance company can offer a value proposition that goes beyond household insurance. It can position itself as an expert in home security and offer additional services, such as a new alarm system.

By implementing a service platform, our case study company combined complementary capabilities and resources from its existing business with insurtech capabilities — an essential part of the digitization of the insurance company.

Summary

Incumbents seeking to digitize their businesses need to combine traditional and modern capabilities and technologies. Implementing a service platform is one possible approach to address this issue. This platform facilitates the development and integration of all necessary capabilities and acts as the nucleus for innovative solutions.

Capabilities and technologies are not everything, however. Creating customer-centric solutions also requires an open service mindset, which helps to develop a comprehensive understanding of the customers' needs and behaviors. To achieve this understanding, incumbent organizations need to analyze and collect data

on their customers. By achieving a comprehensive understanding of customers and adopting a service mindset, companies can react to customers' changing behaviors and thus develop customer-centered solutions.

Endnotes

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Innovation in Insurance Support for Disaster Preparedness

by Carl Adams, Simon Day, Richard Teeuw, and Naomi Morris

Disaster Insurance for the Poor? It's Complicated

The insurance arena is undergoing an evolution through technological developments, demand changes for coverage, and risk perception. A dire need for change is evident when we look at large disasters that have the potential to cause harm to diverse communities over sizeable geographical areas.[1-3] Take, for example, the Boxing Day earthquake of 26 December 2004, with an epicenter off the west coast of Sumatra, Indonesia. It was one of the most powerful earthquakes ever recorded, followed by a massive tsunami that rapidly spread across the Pacific and Indian oceans. The impact was significant in Indonesia, Malaysia, Thailand, India, and Sri Lanka, killing thousands of people in coastal communities. The earthquake also devastated several low-lying island states in the Pacific. Its impact was felt as far as East Africa — 4,500 kilometers away — where the quake hit coastal villages and communities in Somalia, resulting in over 170 deaths and more than 50,000 displaced people.

There are many more examples of disaster events that impact communities over large geographical areas (e.g., volcanic eruptions, windstorms and storm surges, technological accidents, infectious diseases). Often, communities are affected for many months, sometimes years, as a result of damage to infrastructure and economic capability. These communities are typically further impacted through disruption to supply chains and economic activity. In this article, we discuss insurance innovation potential within the global disaster risk domain, particularly focusing on poorer communities and the role of technology.

When Hurricane Maria passed through Puerto Rico and other Caribbean Islands in September 2017, it had a direct impact on many local supply and production chains. Two weeks after the hurricane, only about 5% of Puerto Rico had electricity, and local delivery of food and other essentials was severely disrupted. The impact on supply chains extended much further afield because Puerto Rico is a key part of the supply chains for top pharmaceutical and life sciences companies that make use of a highly skilled workforce, adherence to the US and EU regulatory environment for pharmaceuticals, and an attractive corporate taxation environment.

Natural hazards risk engineer James Daniell developed the CATDAT database as part of his PhD studies, which has collated natural disaster events around the Earth since 1900 and details over 35,000 natural disasters.[4] From his work, we are able to estimate the impact of disaster events: about US $7 trillion in economic damage and 8 million deaths since the start of the 20th century.[5] Often, it is the poorer communities that are most affected by disaster events, since they have fewer resources with which to prepare for hazardous events and deal with disasters.[6]

Nations around the globe have been keen to explore how to understand the risks and impacts of disasters, as well as how to plan for adequate responses.[7, 8] The United Nations (UN) has been at the forefront of much of this activity. In 1994, the UN produced the "Yokohama Strategy and Plan of Action for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness, and Mitigation."[9] This was built on the UN's "Hyogo Framework for Action 2005-2015,"[10] providing guidance to help nations with disaster prevention, focusing on improved community resilience.

The UN recently approved the "Sendai Framework for Disaster Risk Reduction 2015-2030."[11] This framework calls for a shift in focus toward more planning and preparedness — effectively more disaster risk management and risk reduction — as opposed to disaster response. This stance is very relevant from an insurance perspective, arguing that communities that are informed, aware of, and prepared for hazard events are more likely to cope and rapidly recover. The Sendai Framework complements the UN's Sustainable Development Goals (SDGs).[12] This complementary relationship becomes evident when we consider that

the poorer communities in the world can be trapped within a cycle of disaster. Once a disaster occurs in poor communities, it becomes increasingly difficult to recoup and recover. Poorer communities will likely effectively be knocked back and held back in their development potential.[13] The World Bank raises similar concerns: "Developing countries feel the impacts of disasters most severely, and the costs of disaster response and rebuilding drain already limited resources."[14] The World Bank also suggests that such costs at the national level can be mitigated through financial planning, and it provides guidance and support via its Disaster Risk Financing and Insurance (DRFI) Program.[15]

> *In the global disaster arena, innovation often goes hand in hand with humanitarian drive.*

The main drive to address large disasters has been toward an insurance perspective; after all, "insurance" has been the most prominent support to prepare for hazardous events and ensuing losses covering all aspects of life for individuals, corporations, local governments, and community entities. However, a direct translation of insurance thinking and practice in areas of high risk, from the richer nations to the poorer nations, is unlikely to work. For instance, the poorer communities are often unfamiliar with the insurance mindset to disasters. They have very little disposable income, and there are many other things to purchase, such as food, education, and life's necessities. In addition, the typical insurance claim process in richer nations often takes several months to complete, which is far too long for anyone in need after a disaster, especially for people in poorer nations who may have been barely managing before the disaster. There are also challenges for the insurance industry because poorer regions are often "data poor"[16, 17] — lacking reliable risk data for an insurance provider to make any informed provision decisions. Providing insurance in poorer regions involves dealing with unknown levels of risk and different types of customer needs.

Opportunities for Innovation

Clearly there's a growing need in the insurance realm and we face many challenges in addressing that need with traditional insurance provision. This context is ideal for innovation to emerge (which is what has

been happening), and there is even greater potential for innovation on the horizon.

In the global disaster arena, innovation often goes hand in hand with humanitarian drive. Indeed, "insurance" for some poorer nations is the global humanitarian engine that kicks in once a disaster befalls those communities. Countries and agencies continually explore how humanitarian initiatives can address the needs of disaster-affected, poorer communities. For example, the Humanitarian Networks and Partnership Week (HNPW), hosted by the Swiss government and cochaired by the UK's Department for International Development (DFID) and the UN Office for the Coordination of Humanitarian Affairs (OCHA), provides a location for humanitarian networks and partnerships to hold their annual meetings. It is an interactive, open-door, problem-solving event that provides space for experts and experienced humanitarian responders to discuss common challenges and explore possible innovative solutions.

A key theme at HNPW events has been the Connecting Business initiative (CBi),[18] which strengthens and supports private sector networks with programs targeted at building individual and community resilience. The initiative was launched at the *World Humanitarian Summit* in May 2016 and takes forward the summit outcomes as well as the "2030 Agenda for Sustainable Development,"[19] including the Sendai Framework for Disaster Risk Reduction, the SDGs, and the Paris Agreement. The Geneva Cash Working Group (CWG), cochaired by OCHA and the Cash Learning Partnership (CaLP), collaborates and addresses key technical and strategic issues related to cash-based assistance. This group brings together cash practitioners/experts, donors, host governments, the private sector, and the broader humanitarian community — including the Global Clusters (about 20 regional CWGs) and other global networks — to address technical and strategic challenges by sharing information and building evidence and expertise.

One of the main innovations emerging from the insurance industry to address large-scale disasters is "parametric insurance," which provides a win-win for both the insurance companies and for those insured, typically small developing states with limited contingency reserve capacity of their own.[20] Parametric insurance, or "parametric risk transfer," does not indemnify the full loss for the protection buyer but provides a predefined amount of protection that will be paid out on the basis of predefined event-occurrence terms.

In schemes such as CCRIF SPC (formerly the Caribbean Catastrophe Risk Insurance Facility),[21] which acts as a joint reserve mechanism backed by international reinsurance markets, the 16 small island states under CCRIF aim to cover their estimated liquidity needs for three to six months after a major catastrophe, with payouts triggered by exceedances of hazard-event intensities (e.g., hurricane wind speeds or seismic ground accelerations) in their territories. Limiting the total amount that can be paid out by the insurance company to a predefined level reduces the risk for the insurer. Predefined limits are crucial to the insurance industry because the traditional approach to insurance is that it would be liable to pay out to cover the full cost of losses if a disaster hit, and as we have noted, losses can vary across communities.

Parametric insurance, as seen with CCRIF SPC, uses predefined triggers to initiate payouts such as hurricane wind speed, hurricane minimum central pressure, rainfall totals, or height of flood waters. This helps the insurance companies identify the levels of risk and the levels of exposure — the basis of any sustainable and fair insurance provision. Although the payout will not cover unexpected consequences of actual hazard events not considered in the definition of the triggering hazard-event intensities, the insured states do benefit from parametric insurance by having a very explicit and comparatively quick claims process — a key issue when a community has been hit by a disaster and is in immediate need of short-term liquidity to enable resilience. For example, following the passage of the Category 5 Hurricane Maria over Dominica on 19 September 2017, CCRIF SPC confirmed a $19.3 million payout to the government of Dominica in response to the exceedance of windspeed parameters and is assessing whether an additional payout will be made in response to exceedance of rainfall parameters associated with the hurricane.[22]

Similar state-level parametric insurance schemes are being implemented in other groups of Small Island Developing States (SIDS), such as the Pacific Catastrophe Risk Assessment & Financing Initiative (PCRAFI)[23] for Pacific Islands, and in other developing countries, such as the 32 African states covered by parametric risk insurance, which focuses on the impacts of drought and other extreme weather phenomena upon farming through the African Risk Capacity (ARC).[24] Of course, the big challenge with parametric insurance is identifying appropriate triggering mechanisms and corresponding predefined amounts of protection (and fees) that address the needs of both the insurers and those being insured. Such challenges are particularly acute in the case of

schemes addressing climate change consequences, although these are a priority for SIDS and their partners. Thus, in addition to more normal catastrophe risk coverage associated with extreme event occurrences, CCRIF SPC, the World Bank, the US Department of State (DOS), the UN Food and Agriculture Organization (FAO), and The Nature Conservancy are jointly developing a scheme known as COAST[25] to promote resilience to climate change and the effects of rising sea levels, such as coastal erosion and inundation of sea level infrastructure.

Many examples of parametric insurance are at nation-state levels, but it is a relatively new phenomenon in the insurance industry, and we are seeing examples emerge at the large corporation level. Other problems may exist when the parametric insurance approach is applied below the state level in poorer regions of the world, down to the community level. Such communities have limited resources, and also the regions are often data poor — both in terms of community-level past loss and vulnerability data and local variation in hazard-event intensity data. Additionally, there is variety in local cultures, local needs, and local risks, so the type of insurance protection needed may vary considerably from community to community.

> *Many examples of parametric insurance are at nation-state levels, but it is a relatively new phenomenon in the insurance industry, and we are seeing examples emerge at the large corporation level.*

Other Routes to Innovation

A disaster goes through a cycle of impact, starting with pre-disaster preparation. The immediate aftermath of the disaster usually results in an urgent humanitarian response (needed even quicker than any parametric insurance can cover). Often, there is a long period of rebuilding the infrastructure and economic capabilities of the affected community. There are innovation opportunities at each of these stages.

Pre- and post-disaster activity can be informed with better information for both local communities and for associated organizations, such as the insurance industries and support agencies. Sensor networks are starting to play an important role here. These technological support bases provide both a mechanism to develop

and store a knowledge database and a mechanism to share, accumulate, and disseminate information about local and global disaster events as they unfold.[26] For instance, advanced and adaptive monitoring networks have been used for flood monitoring.[27]

Global Disaster Monitoring

Several examples of global disaster monitoring have emerged over recent years. For instance, the website Global Disaster Watch[28] contains current information on a variety of disasters around the globe, including earthquakes, storms, floods, droughts, diseases, and any major disaster event. It also contains guidance on being prepared for disasters, as well as reports on current research covering disasters and their impact. In addition, the website Earth Report[29] contains similar sets of information. Both Global Disaster Watch and Earth Report operate blogs with contributions from the wider global society. Moreover, *The Guardian* collates information on natural disasters[30] informed with current examples from the news networks. Early warning systems are emerging as well and often actively provide access for, and engagement from, wider global communities (e.g., NASA has put its sea level–monitoring data and toolsets online for interested parties to use[31]).

> *Although poor communities are often data poor from a risk and vulnerability assessment perspective, there are many technologies and wider support mechanisms that could help provide useful data.*

There are other examples of systems and activities from the Americas, Europe, Asia (particularly Japan), and Africa. Ushahidi[32] (Swahili for "witness" or "testimony") is a simple but powerful platform based on mobile apps that enables people to collect and share eyewitness reports of events, be they political upheavals (e.g., Kenya's disputed 2007 elections) or disasters (e.g., the 2010 Haiti earthquake). Ushahidi has been used around the world for several citizen-engagement projects. These systems bring out some interesting aspects of global disaster monitoring, preparedness, and risk management, namely, that successful systems often involve and engage the wider citizen population.

Ushahidi is just one of many organizations transferring technological skills and obtaining information on or input into a particular task or project by enlisting the services of a large number of people, either paid or unpaid, typically via the Internet, and directing this output of data and energy toward creating a better, more efficient level of preparedness and response. This approach works when integrated with the larger community and governments of affected populations. The Digital Humanitarian Network (DHN),[33] for example, leverages digital volunteers in support of 21st-century humanitarian response. More specifically, the aim of this "network of networks" is to form a consortium of volunteer and technical communities and to provide an interface between formal, professional humanitarian organizations and informal, yet skilled and agile volunteer and technical networks. Millions of individuals and groups around the world with transferable skills donate spare time to complete real-time media monitoring of mainstream and social media, rapid geolocation of event data and infrastructure data, creation of live crisis maps for decision support, data development and data cleaning, geographic information system and big data analysis, satellite imagery tagging and tracing, and time-sensitive Web-based research.

Use of Mobile Technology, Social Media, and the Crowd

Although poor communities are often data poor from a risk and vulnerability assessment perspective, there are many technologies and wider support mechanisms that could help provide useful data.[34, 35] For instance, social media, often through mobile technologies, has been used to support people in all stages of a disaster event.[36, 37] Plus, the wide adoption of mobile technologies around the globe provides a base to consider innovations in coverage, engage communities of support, and provide data for trigger mechanisms.

A further innovation in risk preparedness — and in dealing with a post-disaster situation — is using the crowd to help map out areas facing potential hazards. A good example is Missing Maps,[38] an open, collaborative project in which people can help map areas where humanitarian organizations are trying to meet the needs of vulnerable people. It also provides much-needed information in data-poor areas.

An example of such use of the crowd within a mapping context is seen in the disaster response for the small

Caribbean island of Dominica, after the devastation of Hurricane Maria in September 2017. Within a few days of the hurricane passing, activation of the "International Charter on Space and Major Disasters"[39] enabled the free provision of satellite imagery with submeter pixels. Volunteer groups, led by the Humanitarian OpenStreetMap Team,[40] organized "mapathon" crowdsourcing events, which used "before and after" satellite imagery from Hurricane Maria to map the damage on a house-by-house basis across Dominica. Within a few days, the extent of the hurricane damage had been comprehensively mapped,[41] guiding rescue activities and assisting insurance industry loss adjustors. Mapathons are most effective when they are facilitated within the community that has undergone the disaster, since a bottom-up approach uses key local knowledge, resulting in fewer mistakes (as was the case after the earthquake in Nepal in April 2015, where it was clear that using people with local knowledge increased the accuracy of the mapping activity).

Strong Social Mechanisms

Often, the locations facing high levels of risk from disaster have strong social communities, as well as embedded historical knowledge of previous disaster events. Therefore, there exists a wealth of capability embedded in the community on what and when supports are needed to address disaster events. This knowledge is invaluable when identifying possible triggers (in the case of parametric support) or the types of support that would be useful in the event of a disaster. The items that need support and protection are likely to be very context-specific.[42]

Microfinance and Corporate Social Responsibility

The mobilization of the global crowd after an event can be both significant and very swift. A variety of microfinance options have emerged, some using well-developed community structures. Similarly, the amount of effort that corporations, large and small, donate to corporate social responsibility (CSR) is very significant. Many corporations support good causes and charitable activity. CSR is particularly relevant with multinationals and global companies that rely upon global customer bases and supply chains. There seems much potential to tie into these current societal trends when examining possible innovations.

Conclusion

Poor communities around the globe clearly need extra support to cope with disaster events and to escape the cycle of disaster and economic knock-back once an event strikes. With the full impact of global warming on the horizon — and a probable rise in extreme weather — there is an increased likelihood of disasters. Furthermore, there is much opportunity to build upon the multidisciplinary bodies of knowledge, capabilities, and support mechanisms to develop innovative support solutions. For instance, knowledge about risks and disaster events is developing around the globe through many disciplines, such as socio-environmental sciences, remote sensing (e.g., using infrared or radar sensors on satellites or drones), and technology sciences, particularly environmental data sensing and monitoring using mobile device apps. There are multiple agencies now focusing on disaster events, such as the UN, governments, and non-government organizations (NGOs).[43] There are also various infrastructure and support mechanisms emerging, such as those provided by the insurance industry as well as initiatives from local communities.

The discussions in this article bring out key themes to complement the potential for innovation. One theme focuses on changes in technology to support both the local communities and the insurance/support providers. This theme covers the trends within the global-monitoring capability at both the large level (e.g., the range of satellite monitoring) and at the very local level (e.g., providing complementary local sensing via ground-based sensors and crowdsensing). Further themes would include the need to involve local knowledge and communities to evolve innovative solutions and the potential of combining or blending the various approaches to solutions, such as local community thinking with parametric insurance coverage, to produce long-term, sustainable, risk-support solutions.

The potential insurance innovation landscape presented here shows the key areas for the insurance industry, new entrants, and alternative models of insurance support within this globally important area. Innovations can address the data-poor problem through the collection of data to inform insurance providers on the likelihood and severity of disaster risk for suitable parametric coverage. This could include global structures (e.g., monitoring the use of satellite technologies

or local community monitoring). Furthermore, innovations can come from the engagement of communities to develop their own initiatives. Innovations can come from humanitarian projects and initiatives to complement local or insurance coverage as well.

Similarly, there is great potential for innovation in using technologies to mobilize the crowd to support poorer communities throughout the various stages of a disaster (from pre- to post-disaster). Perhaps the most interesting areas for innovation arise when we start blending innovation capabilities such as commercial insurance innovation (e.g., forms of parametric cover) with social innovation supports or crowdsensing and monitoring support.

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[42]Similar themes have been discussed in the book *Corporate and Social Transformation of Money and Banking: Breaking the Serfdom*. This book, coedited by Carl Adams, looks at social transformations and innovation in the banking sector, which recognizes the potential of blending commercial organizations' capability with local community capabilities — often using technology.

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