

INSURANCE FUTURES

Radical innovation and sustainability

By Peter Kingsley of The Oracle Partnership

FEBRUARY 2020



Innovation to address climate and biosphere sustainability is both a source of solutions to urgent problems and a source of systemic technological, socio-political and financial risk. It is also an opportunity for the insurance industry.

Over the next decade and more, novel forms of complex risk will emerge as industries, trade, financial markets and political systems—each fragile—begin to mitigate and adapt. We can expect shockwaves where global systems are not risk-adjusted for possible downsides, or chaotic extremes that may emerge as, say, oil companies lose investor support and write off stranded assets. Or for sudden changes in government policies and unintended consequences.

Less recognised is that they are not adjusted for radical innovation—a new system of far-reaching, fundamental structural change. One reason is that innovation is a hidden world. This essay reveals some of the secrets of that world. It explores emerging innovation, drawing on evidence from patent landscapes, and outlines both scenarios and options for the industry.

Towards extremes

The convergence of possibly runaway climate change, cultural wars, political instability and radical innovation will present major challenges and opportunities. Insurance has a potentially vital, even central role in addressing sustainability by driving risk management innovation and leading development of what we refer to as ‘inventing the big hedge’.

Public and investor confidence rests on finding a set of innovative options that will work in any future scenario, even the worst case.

The scale and urgency of the global challenges are driving development towards extremes. There is a growing consensus that the world faces ecological disaster. This demands fundamental and urgent action to mitigate or adapt to the risks of ‘too little, too late’.

In a complex, interdependent, uncertain world; systemic, integrated inventions in everything from politics to technology and core infrastructure will determine long-term outcomes.

The principle that underpins our work is that long-term resilience depends on matching the complexity of the future environment with the complexity of response in human systems. Simple or incremental solutions will not work. Nor will a slow transition that keeps current systems and ways of life in place.

Given the scale and urgency of the challenges, radical innovation is not simply desirable, but essential.

Radical innovation

In the past, radical innovation was defined by the image of the individual inventor, the eccentric outsider, the maverick. We see it differently. Individual genius and ‘fundamental’ or ‘pioneering’ inventions, in the language of patent experts, remain vital. Yet they are just part of the picture. Radical innovation is best framed by scenarios and imaginative long-term foresight—vision-led and systemic. With an ecological disaster in prospect, it must be focused on the public good.

Yet prospects of system-wide innovation remain remote. It is inherently complex, with many moving parts, ideas and inventions integrated from disparate fields—from science and technology, to law and regulation, to commercialisation and policy interventions at city, regional, national and international levels.

Developing and mapping possible future scenarios that describe the evolution of complex systems over time presents challenges. Scenarios are too often seen as a key component of risk management, rather than a primary framework to develop strategy and a source of inventive ideas for new products and markets, social policy or political ideology.

Imaginative, rigorous long-term thinking is rare. The Bank of England's Prudential Regulation Authority guidance on 'managing the financial risks from climate change' suggests that the lack of scenario and inventive expertise at high levels, particularly in the insurance and banking sectors, is itself a risk factor.

Secret worlds, white space

The potential impact of innovation is understated in financial market forecasting and insurance modelling. If we define radical innovation as systemic, then it is a vital driver of sustainability, a source of risk and the target of insurers searching for new products and services.

Analysts are typically silent on the broad potential influence of disruptive ideas, in part because they are not yet articulated, or even imagined. Invention and innovation are secret worlds. Why secret? Inventors in small firms and corporates alike protect big ideas with their lives.

The challenge is compounded by the fact that breakthrough inventions are latent in 'white space'. This is best defined as areas at the intersection of business ideas, technologies and markets where patent coverage is weak or non-existent, yet commercially, socially or ecologically valuable.

Inventing in white space is about creating new paradigms and by definition market leadership, high margins and returns, public good, and sustainable differentiation. The world's leading inventors are white space experts. In contrast, innovation 'hot spots' are overcrowded, with many overlapping and competing claims, patent 'clusters' and 'thickets' that ultimately mean low returns.¹

All together now

The challenge for national leaders is to anticipate the shape of the future landscape and invent policy in advance. The question is how to adapt to the societal and environmental threats long before full impacts are known. Political leaders, faced with uncertainty and unpopular decisions in the short-term, default to prevarication.

This is a primary source of cultural tension. As fears grow in the public imagination, inventive policy will become the focal point, not simply inventive technology. In other words, a new innovation paradigm may emerge, focused on ecological security and social stability, setting the agenda over the next decade and beyond. Public action is critical, if short-termist politics is to change.

There are signs of convergence around a shared vision and sense of purpose. Investors may shift from short-term hedging, to long-term perspectives and provision of 'patient capital' for the sustainable economy. Regulators² are re-framing the system of rules, progressively enforcing a scenario-based framework on insurance, financial institutions and corporations, to demonstrate they have developed strategies to address the downside risks of climate change out to 2050.

We can expect novel hedging strategies to emerge that protect long-term investor, consumer and societal interests, as well as deliver security to insurers in both asset and liability terms.

Radical invention needs both ground-up action at scale and visionary leadership from the state—as well as investors and corporate leaders. The challenge is to re-invent the system of governance itself, in the wider interests of the public, bringing together public and private funding.

Progress towards the ‘inventive state’, which recognises the role of government in ‘moon shot’ projects will depend on the ability to take the long view and shape a vision that anticipates future needs. Some elements of this are illustrated by the EU’s Green Deal, which sets out a ‘mission oriented’ growth agenda focused on carbon neutrality, green innovation across all industry sectors, and a ‘just transition’ that combats inequality and does not leave workers behind.

The innovation landscape: Evidence

This then raises the question of the role of insurers. It is easy to forget that insurers underwrite risk, pooling ‘availability’ and shaping credit rating and asset management culture. Investors cannot support funding infrastructure or home insurance in high flood-risk areas without insurance. In other words, insurance underpins financial stability, life and health policies, mortgage security and pensions.

The challenge is to match insurance industry innovation with the emerging, increasingly volatile and uncertain operating environment, which will both create threats and drive demand for new risk products and services. Insurers have a leadership role to play in inventing novel approaches to mapping emerging, complex risk and delivering solutions to minimise the protection gap.

The context in which insurance operates is itself changing fast. Innovation takes many forms. The list of initiatives and inventions ranges far and wide. Much of it focuses on specific challenges, rather than systemic transformation, such as localised energy efficiency in domestic and industrial settings and ‘off grid’ solar power. There are early signs of technological breakthroughs, such as carbon capture from air. Novel forms of geo-engineering have new momentum. At the same time, ‘natural geo-engineering’, in the form of mass reforestation and restoring wetlands to protect coastal regions is mainstream. Vertical farming promises to transform local food production.



In the short-term, many of the solutions will be less about technology than local leadership by cities, sometimes despite national level complacency.

There are also policy interventions that may achieve similar ends by different means, such as bans on fossil vehicles in cities emerging in Europe. We can expect tax changes in air travel, particularly aimed at frequent flyers.

Over the next decade, radical, systemic innovation will emerge. Take two illustrations: predictive networks and mass automation in cities, and modelling that explores possible impacts of sea-level rise and flooding.

Mass automation: Intellectual property evidence

Our research of intellectual property landscapes draws together patent analysis and non-patent literature. It shows that insurance has so far focused on incremental innovation, often using blockchain and artificial intelligence (AI) to streamline existing processes, looking for cost reduction, automation and efficiency rather than fundamental or pioneering invention. The same is true of early stage systemic innovation. The evidence suggests that so far, little of the potential has been realised.

There is evidence of more ambitious strategies. Take the intersection between insurance and cities. Patent filings surged by ten times between 2014 and 2018. There are indications of ‘patent wars’ between insurers and new entrants, such as IBM, and between the US and China.

Some of this has been spurred by opportunities for individual and behaviour-based pricing in automotive insurance: a sign of things to come across the risk industry and in all insurance classes. Drones feature prominently, for everything from monitoring industrial sites to agriculture and water risk assessment. Some key patents focus on incident management: remotely controlled drones can use cameras and sensors to scan household fires and automate claims management.

A central strand in the narrative is that mitigation, prevention, mass-automation and control via Internet of Things (IoT) and complexity modelling is central to the development of sustainable urban environments. Sensor-based ‘big data’ fits within the broader narrative. Insurance-focused patents illustrate that aggregation and fusion of data about people, things, places and real-time system dynamics will shape the future agenda.

Some of the world’s leading insurers, including State Farm (the most prominent in terms of patent filings), Allstate and Swiss Re, together with industrial systems suppliers such as Johnson Controls, are vying for dominance. Individual and small-scale inventors are also significant. They are potential acquisition targets.

More important, Didi and China Re are filing patents at scale. China now matches the US on patent volume. Didi’s filings illustrate that mass-automation, control, adaptive cover and pricing can reach city-scale. IBM, the world leader in AI-based IP, is patenting at system-scale, using blockchain and AI to deliver insurance on demand, in partnership with municipal authorities.

‘Mass-automation’ and real-time insurance is a hot-spot of systemic innovation that has the potential to substantially cut traffic volumes, traffic density and accidents, as well as lower pollution, emissions and overall systemic risk.

More important, there are significant white space opportunities. Data security and privacy are ‘system conditions’ that will determine progress. They are also white spaces. Similarly, there is little overlap in the patent landscape between pollution control, well-being and health, and active monitoring and control systems. This is despite the fact that this has the potential to address some of the primary challenges of climate change.

Taken together, the hot spots and white space have predictive qualities. The endgame conjures up images of ‘total automation’, as well as ‘total surveillance’. The rate of development will be determined more by socio-cultural norms than by technology alone. Active surveillance may be the price that some countries choose to pay for a low-risk, environmentally sustainable future.

Even so, this paints a largely technology-centric picture. It reflects the culture and pre-occupations of important groups, not least investors, who have experienced decades of high returns from funding technology.

There are other, equally radical ways of delivering sustainability. Some depend on forward-looking models not of the man-made environment, but of the natural physical environment and how it will shape the transition to a post-fossil fuel world.

Sea-level rise: Retreat to higher ground

Assessments about whether coastal regions are vulnerable to frequent flooding, storm surges and rising sea levels, short and long-term, present challenges for individual mortgage holders, corporate leaders, communities and insurers alike. Simulations and predictive modelling will point to the winners and losers, and solutions—such as natural ecosystems, man-made defences or retreat to higher ground.

The recent Intergovernmental Panel on Climate Change report on ‘The Ocean and Cryosphere in a Changing Climate’ flood and coast risk puts this in perspective.³ Even if carbon emissions are cut to the best case projections, by 2050, floods previously expected to occur every hundred years will be annual events. Many of the world’s major cities, including Miami, Jakarta, Manilla, Bangkok and Los Angeles risk being overwhelmed.

The shocks, as we explore in our essay on *Inventing the Big Hedge*, will emerge long before. The trigger will be that mortgage holders, investors, credit agencies and insurers lose confidence in the narrative that coastal regions can be defended, creating a potentially sudden crash in asset values.

Detailed maps capturing long-term scenarios that predict vulnerability are the raw material of new complexity models—the input to simulation and predictive systems.

Complexity modelling

Complexity modelling, as these illustrations suggest, has many applications. As long-term perspectives and ‘stewardship’ gathers momentum with investors and insurance leaders, modelling of possible outcomes will have a vital role. Trust in science, modelling and simulations will be decisive.

This raises questions of where insurers and the risk industry may look for future value, beyond sustainable development and security.

The answer is complexity modelling itself.

To recap, the guiding principle is that the innovation agenda and human action should match the complexity, uncertainty and speed of the future operating environment. This means that active models that describe that environment, simulate future pathways, drive ecosystem design and automation are where the insurance and risk industry have a major role. Complexity modelling will both reduce risks and open up the potential of radical, systemic innovation.

Some of these systems are emerging. High quality, secure data is a pre-condition, necessary but not sufficient. In US property insurance, localised flood models rely on loss data and granular detail down to a few feet from newly available historical records going back 40 years.

This is just the start. In volatile weather and climate conditions, historical data is not a reliable guide to the future. The insurance industry is shifting from backward-looking historical analysis to real-time feeds, live risk assessment and predictive systems. Long-term scenarios of possible—distinct from probable—risks are now the focus of regulators, investors and credit agencies. With this, insuring systems for both the short- and long-term, rather than individual risk events, will be at a premium and define the future role of the industry.

Extreme scenarios, radical innovation

The scale and urgency of the challenges is driving development towards extremes. The tendency to look for individual inventions that transform, for example, carbon capture, is pervasive. Yet system-wide innovation, involving the integration of multiple ideas, will have more impact.

Novel forms of risk will emerge as industries restructure, driven by the convergence of the sustainability agenda and digital technology.

All fossil fuel and emissions related industries are already in turmoil. Water, energy, agriculture and transport sectors, as well as cities, are beginning to re-invent from first principles, in part under pressure from investors and credit agencies.

Two extremes may emerge. In one scenario, radical, high-risk and systemic innovation transforms the industrial, environmental, financial, economic and political landscape. Everything from e-vehicles, decentralised micro-solar and automated cities, to cutting pollution at source, to new alternatives to high-emission concrete, emerge. In some parts of the world, desalination, nano-filtration, efficiency and re-use deliver practical answers to water stress. Agriculture is localised. Mass-scale investment in green technology delivers high levels of energy efficiency and creates prospects of a post-oil and fossil fuel world. Reforestation, or ‘natural geoengineering’, together with carbon capture and novel photosynthesis, deliver at scale.



Whilst many transformations have the potential to mitigate or drive adaptation to long-term climate risk, short-term volatility dominates the risk landscape, as core systems and industrial sectors re-shape both underwriting and investment strategies.

In the other extreme, lack of leadership, investment caution and public resistance hold back development. In this scenario, fragmented innovation fails to deliver breakthroughs. Ideas do not cross-national boundaries, address strategically critical issues, or spread in the public interest. Fears of ‘too little, too late’ are realised. Lack of patient, long-term capital hinders progress.

The financial community hedge their bets by supporting the current industrial models and systems, slowing adaptation and increasing risk. Fears and uncertainty about stranded assets begin to crystallise, but the transition is slow and cautious. There is perpetual volatility as the mismatch between actual innovation and what is needed emerges.

In this scenario, radical innovations do not emerge, nor scale. The absence of leadership, at corporate, city and national levels means lukewarm support. The potential of vision-led innovation in the public interest, driven by partnerships between governments, financial institutions and inventors is only realised in the most politically cohesive countries and cities. Social and political innovation fails to deliver. At the same time, extreme weather produces volatility and instability, made worse by fears of runaway climate change.

Insurance: The options

In each scenario, insurers face the challenge of shifting from covering individuals and specific events, to insuring interlinked complex ‘systems of systems’. With the earth’s ecological systems entering a period of unprecedented volatility, complexity will increase, as will human responses, through ‘green’ innovation, policy interventions and digital systems. Many technologies will increase complexity risk.

The insurance industry has the opportunity to lead the development of long-term, sustainable resilience, playing a role, for example, in automating prediction and control systems. Complexity modelling is central. Sensor data and source integration is necessary, but again not sufficient.

Earlier, we argued that the strategic challenge for national leaders is to anticipate the shape of the future landscape and invest well in advance. In the past, exponential technological innovation has been seen to be a good thing in its own right. Now the question is how to adapt to the societal threats posed by that same innovation, long before the storms begin. As fears grow in the public imagination, inventive policy will become the focal point, not simply inventive technology. In other words, a new innovation paradigm will emerge, focused on security and social stability. This will set the agenda over the next decade and beyond.

Against this background, some insurers may withdraw, increasing the protection gap through higher pricing and restricted coverage. Others will specialise only in high margin, relatively simple risk classes. Competition to find profitable niche markets will increase.

On the other hand, specialists in complex risks will emerge. The industry has the opportunity to lead vision-led, radical, systemic innovation. Success will depend on dynamic, real time complexity modelling, novel forms of products and risk advisory services. Insurers can shape the innovation landscape and in turn the risk environment to meet the challenges of both physical and transition risks, limiting growth in the protection gap. This is in the interests of the public, cities and corporations and national governments. It is also in the insurers own interests, since it protects their own business models and positions them to act as both drivers and informal regulators of change.

1 <https://oraclepartnership.com/long-reads/geo-politics-innovation/>

2 Illustrated by the Bank of England’s Prudential Regulation Authority

3 <https://www.ipcc.ch/srocc/download-report/>

About the author

Peter Kingsley, Chairman and Co-Founder of The Oracle Partnership, chairs PJR, a specialist foresight and strategic advisory firm. He has provided foresight and thought leadership to major financial institutions, corporate boards and wealth managers for more than 20 years. Earlier in his career, he held senior strategic positions at Reuters and Dow Jones, amongst other things designing information and editorial services. He was a partner at Stanford Research Institute's futures think tank. His more recent work has included advising the leadership teams of international banks; the senior partner of a major hedge fund; the leadership team of one of Lloyd's largest insurance underwriters; one of the world's leading software companies; a regulator; one of the world's largest water engineering firms; and several utility firms. He originated, designed and led the Coutts 'Futurescope' foresight and thought leadership programme.

More information on Insurance Futures and The Oracle Partnership can be found at:

oraclepartnership.com/insurance-futures



Founded in 1947, we are an independent risk management, benefits and technology firm with offices in major cities around the globe. We serve the full spectrum of business, financial, government, union, education, and nonprofit organizations.

milliman.com