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ISSUE 09

GAMIFICATION OF INSURANCE AND LOSS ADJUSTING EDUCATION

THE REBRAND STORY

Ewan Cresswell shares his thoughts on the new Integra brand, which launched in January 2021

MALICIOUS DRONES:

HOW TO PROTECT CRITICAL INFRASTRUCTURE

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ISSUE 09: Jan 2021

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GUEST EDITOR

Fraser Galbraith

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Welcome to Issue 9 of 'Integrated', our magazine devoted to sharing our specialty lines claims insights and knowledge with you. I hope you all enjoy the new format, which has been purposely set out to encourage interaction and discussion. Please reach out to the article authors directly should you have any feedback or would like to discuss their topics in more detail.

2020! The unforgettable, virtual Groundhog Day that will be remembered forever as the year everyone's lives turned topsy-turvy. However, one surety borne out of the pandemic is the necessity for change within the insurance industry – a catalyst to spark incredible creativity and innovation – which just so happens to be the focus of this Integrated Issue 9.

Integra is no different. Integra has undergone an exciting rebrand (which you'll hear about on page 03), implemented a new claims management system, launched IRIS (Integra's Remote Inspection Solution) in response to lockdown conditions and has a 'guest editor' for this issue of Integrated.

IRIS has been successfully utilised on 25 losses around the world since it was launched in Q3. Our initial predictions as to the improvements/efficiencies of the claims handling process have been vindicated by the positive feedback received from our clients. We believe we have only scratched the surface of the capabilities and applications of IRIS and look forward to providing you with updates as the technology continues to evolve and its usage increases.

As a new, young-ish adjuster, it's been exciting to see Integra's strategic expansion continue. The number of adjusters within Integra has grown to 48, operational staff has increased to 17 and new strategic partnerships were achieved in five countries – providing Integra with greater capacity, expertise and a wider reach to fulfill our commitments to our clients.

While this edition of Integrated comes to you in a very different, but no less 'silly season', we all hope that you, your colleagues, and families continue to remain healthy and safe.

Best wishes
Fraser Galbraith (Guest Editor)

A FRESH IDENTITY FOR INTEGRA

Doug Horne

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The Integra brand and website have recently undergone a complete makeover. Integra Founder and Chairman Ewan Cresswell talks to Head of Marketing & Communications Doug Horne about why Integra has decided to rebrand the business he launched over 22 years ago.

Doug: Ewan, tell us a bit about the history of the Integra brand. And when was the first Integra logo created?

Ewan: I established Integra back in 1998. That was when we created our first company logo too, and that's stayed with us unchanged until very recently. So, the logo's done a solid job for over 22 years but now it's definitely time for a fresher, more contemporary look.

Doug: What motivated you to start the business then?

Ewan: I'd spent years working in larger organisations and to be honest I was fed up with large company politics! I was looking for the independence of running my own technically-focused boutique loss adjusting business.

Doug: What was Integra like back then?

Ewan: I started Integra with a single loss adjuster, me. I quickly picked up assignments in Peru, USA, Chile and Egypt. By the end of year one I was at capacity and my former colleague David Heath came to join me, doubling the size of the business! We've come a long way since then! Now we have almost 70 staff across five continents.

Doug: So, what was the original inspiration behind the Integra name?

Ewan: I wanted a company name that conveyed trust. Trust and integrity are so important in the loss adjusting world, thus 'Integra'. You need strong relationships based on trust to get claims settled equitably and quickly. Also, I wanted the name to signify the integration of technical skills with insurance knowledge. So 'Integra Technical Services' stands for two things really, 'integrity' and 'integration' of essential skills.

Doug: And what inspired the design of the first logo?

Ewan: I wanted the logo to symbolise this integration idea, so that's where the logo's interlaced matrix structure came from.

Doug: So why the recent rebrand to the new Integra identity?

Ewan: Well, the business continues to evolve in all kinds of positive ways. Of course, it's unrecognisable from the business I started way back, but still retains its core values and ideals. Now feels like the perfect time to refresh the brand, reflecting the changes in Integra.

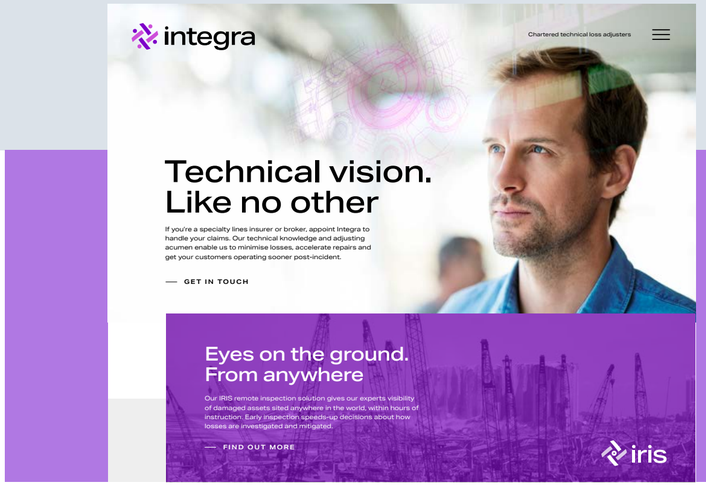
Doug: And what are those changes?

Ewan: This is a very exciting time for us. Our teams, sector expertise and geographical reach are all expanding in response to feedback from our clients. We're bringing on a new generation of exceptional adjusting talent to follow in the footsteps of more senior, experienced colleagues . And, more and more, we're using the latest technologies to support our technical loss adjusters, both in the field and in the office. The objective being to deliver an even better claims experience for insureds, brokers and insurers.

Doug: The new logo and styling…what are they saying to the outside world?

Ewan: On one level the symbolism is around people linking up to create dynamism. We want to emphasise that we're a dynamic and collaborative 21st century business. And that we're 100% in step with the changing needs of the insurance market. But also reassure everyone that culturally we're the same business as the one I started over two decades ago,

The new logo and website



with the same high standards and independent values. That's why you'll find quite a bit of continuity between the design of the old logo and the new.

Doug: Why do you think branding is so important to Integra?

Ewan: Because it communicates who we are to the world. To our customers, partners and the wider insurance community. Because it enshrines our values. And because, in my opinion, it looks really good!

Doug: And where is Integra headed as a business…what does the future look like?

Ewan: It looks very bright indeed. Obviously, we're living in very challenging times right now, but despite that Leo, Mark and myself are optimistic about our future. We have remarkable people, a future-proof focus on technology and a whole new breed of talent that's already taking the business in new directions. I feel just as excited about Integra now as I did 22 years ago!

GAMIFICATION OF INSURANCE AND LOSS ADJUSTING EDUCATION

Bridging the succession gap

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Time and again we find the insurance industry lacks experienced professionals with the skills and expertise to drive positive step-change. This worrying trend is set to continue for years to come, as succession gaps widen outside the major insurance hubs.

Established hubs enjoy a strong demand for highly skilled professionals and easy access to international insurance institutes rich in experience and knowledge. But outside these hot-spots, expertise is often harder to come by. Here, many small or medium-sized institutes work in affiliation with international institutes and have fewer education or training opportunities.

UPSKILLING THE NEXT GENERATION

How do we bridge this succession gap? High-quality education is essential to empower younger insurance professionals with the skills and knowledge to become our industry's future leaders. But current teaching techniques are often outdated, with over-reliance on traditional classroom learning, slide presentations and self-study books. Insurance academics point to the many challenges posed by these long-established methods:

- **Lack of training resources**
- **Material not engaging, limited practical examples and application scenarios**
- **Language barriers**
- **Cost**
- **Time away from work**
- **Companies do not prioritise the education of their employees**

Current teaching methods make it difficult for insurance professionals to advance their careers and acquire internationally accredited qualifications. This leads to some young professionals becoming demotivated or seeking alternative career paths.

Covid-19 accelerating digitisation

Restrictions imposed by the global Covid-19 pandemic have overturned education norms. Remote education has blossomed and digitisation of content become widespread. Insurers and brokers have been at the forefront of this change by quickly adopting digital platforms to spread their knowledge and deliver training. But, while remote learning has overcome many of the drawbacks associated with more traditional education, it also has limitations. The unidirectional nature of virtual classes can make students feel less engaged and discourage them from gaining a deeper understanding of the subject.

Gamification: the new learning game

Now, a new educational approach is seeing an enthusiastic uptake from young professionals. Gamification is the use of educational games to provide a blended experience that combines three powerful methodologies: flexible learning, experiential learning and simulations.

- **What is flexible learning?** This puts students right at the heart of the process, allowing them to take part at anytime from anywhere and at affordable cost. Students have easy access to resources while receiving continuous assessment and feedback on their progress

- **What is experiential learning?** Here, participants reflect and learn from an experience embedded within the process and go on to implement the lessons learned. Experiential learning plays a hugely important part in educating loss adjusters about claims handling, although sometimes the insurance market is resistant to this method

- **What are simulations?** These expose students to reality-based scenarios, all within a non-threatening, experimental environment. Simulations provide a safe, structured and accelerated experiential learning cycle. An example might be a claim handling scenario that grows more complex as the student progresses, while following a specific educational curriculum. Simulations give the student a platform for making decisions and reflecting on outcomes without the risk of upsetting stakeholders. Compared to more traditional methods, simulations often make learning more active, engaging and productive. Integra's IRIS solution offers this method of learning to 'up and coming' claims brokers and claims insurers

LEARNERS BECOME PLAYERS

Gamification enables simulations based on learning outcomes to become the building blocks of a video game. Here, the student interacts with the learning material as a player, with the game providing continuous feedback as its complexity and difficulty increase. Add in reflection sessions and seamless AI-powered feedback, and educational games can bring out the best in remote or classroom learning. Better still, they can be played anywhere, at anytime and from any device.

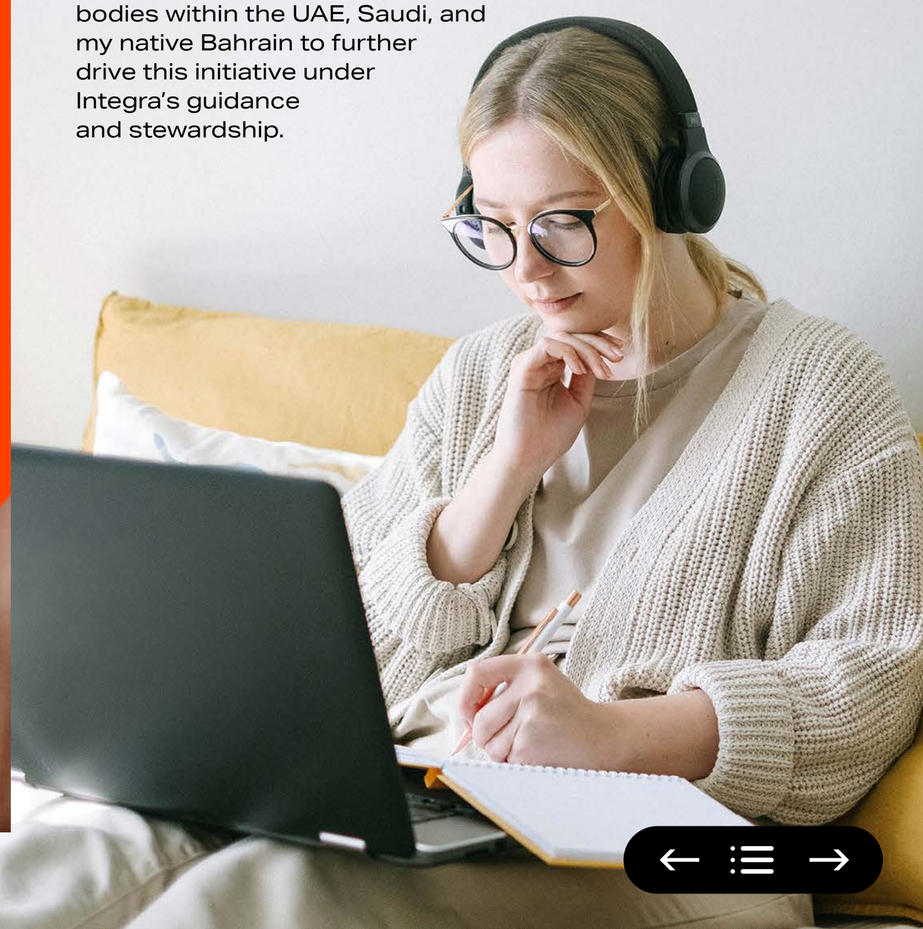
The rise of gamification

Global insurance education opportunity

Educational games have the potential to break down learning barriers within the insurance sector by allowing young professionals the chance to work on industry-specific case studies in a flexible and risk-free experimental environment. If published internationally in multiple languages, games could be a catalyst for transforming and standardising the insurance learning curriculum on a global scale.

An experience-led educational format, tailored to the needs of young professionals and created by industry leaders, could be the key to bridging the succession gap facing the insurance industry currently. Gamification of the insurance education system would rely on the insurance community providing experiential learning content. After all, simulations can only deliver an authentic user-experience if they include information about real claims.

I myself am passionate about bridging the knowledge gap through gamification. The desire to share knowledge and up-skill the market is symbiotic to Integra's growth plans. With new offices opening and local resource partnerships forming globally in 2021 and beyond, I intend to continue working with regional insurance accreditation bodies within the UAE, Saudi, and my native Bahrain to further drive this initiative under Integra's guidance and stewardship.



THE DUAL-USE CONUNDRUM: GAME OF DRONES

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Gerard Ward explores the dual-use risk presented by emergent technologies. Recent drone attacks illustrate this dual-use risk, and in particular the challenge confronting Critical Infrastructure (CI), the vital national assets that are cornerstones of the modern economy. A decade ago, traditional security measures such as electric fences, guards, video surveillance and access control systems formed part of the physical protections designed to keep intruders out of a CI facility. However, the rapid growth of emerging technologies like drones gives rise to a new class of threat. If used maliciously, drones can deliver clandestine airborne payloads that inflict severe damage.

Traditional security measures can no longer control and neutralise threats from malicious drones, also known as Unmanned Aerial Vehicles/Systems (UAVs/UASs). Currently, few facilities around the world are equipped to detect and deter drone-related threats, and therefore address the level of threat exposure. If CI is targeted by drones effectively, the resulting business interruption, monetary loss and broader economic impacts could be devastating.

Drones as destructive weapons

In September 2019, the Abqaiq oil facility and Khurais oil field in Saudi Arabia were hit by 18 drones and cruise missiles. This was despite the area being protected by air defence systems installed by the Saudi Arabian government with US assistance. These facilities accounted for approximately 5% of global oil production, and closure in the aftermath of the attack sent shock waves through financial markets. Fortunately, disruption was short-lived, but the incident illustrates the threat that drones pose, given their ease of deployment, small size and low cost compared to conventional weapons.

Drones causing disruption

While the 2019 strike demonstrates use of drones as kinetic weapons, they can also create nuisance resulting in loss. A drone traversing Gatwick's airspace in December 2018 caused the cancellation of over 1,000 flights and direct losses of over £50m. Travel insurers suffered losses as passengers sought recovery of rebooking fees and loss from forfeited flights due to the disruption.

Although the scenarios above describe malicious intent, in reality drones are used daily in a wide range of commercial settings. A recent Bloomberg article describes how Indonesian asset owners use drones in conjunction with AI-driven image analysis to map estates and count trees. But the malicious use of drones highlights the risks posed by emergent technologies when repurposed for malicious use.

Dual-use technologies

Most cyber-related incidents encountered by Integra result from threat actors deploying technologies originally developed for security testing, but harnessed for malicious purposes. These dual-use technologies pose a growing risk as cyber and emergent technologies become democratised through lower capital investment, greater accessibility and enhanced capability. Off-the-shelf (OTS) drones and custom-home-built (CHB) drones can be equally damaging to CI if threat assessment and countermeasures prove inadequate. However, such countermeasures (see table opposite) are complex and often costly to maintain.

The examples above are instances of drones being controlled directly by bad actors. But the remote data carrying instructions between operator and drone can be compromised too. A compromised drone can represent a threat just as perilous as the drones that attacked the Abqaiq oil facility. Any drone compromised while inspecting CI could be forced to crash intentionally and cause significant damage.

DRONE DETECTION AND DEFENCE SYSTEMS

Non-destructive	Destructive
Electromagnetic perimeter fences	Drone gun (laser)
Radar-based system	Birds
Electro-optical imaging system Visual detection	GPS jammers High Power Electromagnetic Pulse (HPEW)
RF-based detection	Counter-UAV patrol
Magnetic detection	Cyber exploitation

Threat actors can interrupt drone communications, fabricate or modify data and hijack critical networks. In 2011, Iran captured a US military drone by jamming its positioning control signals, then spoofing the GPS data so the UAV landed in north-eastern Iran.

While the use of encrypted communication between US UAVs and military command has prevented a repeat incident, bad actors are continually exploiting new vulnerabilities, often utilising dual-use technologies. Many civilian drones remain vulnerable to data-jamming, interception and manipulation because they rely on unencrypted communication links for transmitting instructional data.

More complexity, more vulnerability

The drone market is tipped to reach US$43 billion by 2025 (Statista, 2020), suggesting widespread deployment and dependency across many industries. While real business benefits exist, the operating landscape for these drones as an emergent technology is set to become more complex. Drones are effectively flying computers, so data is at risk and hacking or malfunction could cause physical damage or, in the worst case scenario, loss of life. The use of delivery drones by the likes of Uber Eats or FedEx creates data privacy issues and the need to comply with GDPR and the USA's IoT Cybersecurity Improvement Act of 2020.

Given the complexities of these emergent technologies and the threat drones represent as dual-use technologies, the root cause analysis of accidents has to be exact, as with any data-driven process. Having the right claims management solution that can rapidly and accurately pinpoint root cause relies on specialist skills working within an organisational structure to attribute cause to data or electronic components. Integra has assembled a team of experts who can collectively investigate people, procedures, operations and information systems to accurately determine cause and consider policy response. Identification of the prospects for recovery and betterment form key parts of this root cause analysis.

Gerard Ward is a cyber specialist who has managed claims with causes spanning malware, errors, criminal and state APTs. He holds specialist data forensic and information security qualifications, and has 15 years experience in project-managing the implementation of secure systems.

DIGITAL TWINNING IN SUPPORT OF ASSET INTEGRITY MANAGEMENT

Contribution by Ashtead Technology and Welaptega in the novel way of using precision inspection data in asset integrity management programmes

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Ashtead Technology

Continuous evaluation of integrity risks for high-value, safety-critical and environmentally sensitive assets is a complex challenge. Asset integrity is typically determined by referring to evidence compiled over the lifetime of an asset, including original design specifications, as-built and installation records, inspection and monitoring data, maintenance and repairs, and continued engineering analysis.

For many installations, these records exist as standalone documents and provide nothing more than a discrete snapshot of a moment in time. By assimilating records into a holistic view, it is possible to account for the asset's interconnected nature and build a realistic 'narrative' of its fitness-for-purpose.

Deeper understanding

The rise of digital twinning is turning this accepted practice onto its head. A 'digital twin' is a virtual copy of an asset, used to bring volumes of discrete information into a single, integrated and digitised asset model. As a living replica of a physical structure, the model is continually updated to reflect the present condition of its real-life counterpart and provide a historical record.

At its most basic, a digital twin enables data to be organised so that it's more easily accessible. More usefully, they can be used to support real-time fitness-for-purpose analysis, enhance predictive and preventative maintenance, simulate performance under adverse events, identify risk and optimise asset-integrity best practices.

In addition to physical assets, digital twins can be relied upon to represent processes, systems and services. A recent MarketsandMarkets report estimates the total digital twinning market to grow from US$3.1 billion in 2020 to US$48.2 billion in 2026[1].

For offshore energy infrastructure, digital twins may start from as-built CAD models but require regular or even real-time input of real-world data to ensure they remain representative of the asset. This requires access to accurate environmental data, asset response data and quantitative knowledge of the asset's physical condition. Providing best-available data to optimise digital twins is challenging, and when it comes to underwater infrastructure, the challenge is magnified further.

[1] Source: https://www.marketsandmarkets.com/Market-Reports/digital-twin-market-225269522.html

Optimised digital twinning

Best-in-class digital twinning specialists apply hydrodynamic analysis and finite element methods to digital twins for real-time condition monitoring. While best-available data is crucial, having more data is not necessarily beneficial. Hypothetically, a digital twin of an offshore structure could be built entirely using in-situ 3D scans and system response monitoring on every structural member. However, this would result in excessive detail in areas with low criticality, leading to slower computation speeds and increased costs to maintain and update the digital twin.

Instead of using 3D scans of all structural components, digital twins can use estimated geometries based on 2D measurement outputs, such as calliper gauging or plate thickness measurements. When measurements approach minimum strength criteria or accumulated fatigue damage becomes critical, higher resolution 3D data can be integrated.

Risk-based assessment

Correctly optimised digital twins employ a risk-based approach, using input data with resolutions equivalent to the criticality of individual components. This approach of applying variable levels of data resolution provides the greatest cost-benefit to drive the digital twin, which can itself be used to identify critical components and determine the level of data resolution required.

Digital twins provide much-needed record-keeping continuity between the design-to-construction and operation-to-decommissioning lifecycles of an asset, which often involve personnel handover and loss of knowledge as assets age and operators change.

Despite the advantages of the technology, predictive models based on even the most reliable data will still have blind spots for so-called ‘black swan’ events. Over-reliance on digital twins comes with the risk of marginalising existing integrity management practices, including visual inspection and conventional NDT, which often uncover unexpected results.

However, digital twinning provides significant advances in reliable, data-based decision-making, and lessens reliance on personal competency and continuity over the lifetime of an asset. Adoption of digital twinning results in lower operating costs, increased asset life and more reliable management of risk.

ABOUT ASHTEAD TECHNOLOGY

Ashtead Technology supports construction, inspection, maintenance, repair and decommissioning projects in the international offshore energy industry. Combining technical know-how with discipline and creativity, Ashtead Technology provides safe, cost-effective and competitive solutions to challenges across the energy sector. Founded in 1985, Ashtead Technology employs over 170 people worldwide at hubs in Aberdeen, Abu Dhabi, Broussard, Halifax, Houma, Houston, Inverurie, London and Singapore. Since 2016, the company has significantly grown its business by integrating TES Survey Equipment Services, Forum Subsea Rentals, Welaptega Marine and Underwater Cutting Solutions into its service offering.

MEET TYLER DE GIER

General Manager, Welaptega – an Ashtead Technology company

Tyler started his career with Welaptega working in offshore operations and business development, eventually becoming a lead engineer on mooring fitness-for-purpose assessments. Prior to rejoining Welaptega, Tyler held the position of Advisor – Offshore Installations and Safety Officer at the Canada-Nova Scotia offshore oil and gas regulator (CNSOPB), specialising in production asset integrity management, decommissioning and regulatory and standards development. Tyler is a Professional Engineer and holds a B.Eng in Mechanical Engineering from Dalhousie University.

LUMINESCENCE IMAGING

The past, present and future of damage assessment of photovoltaic arrays

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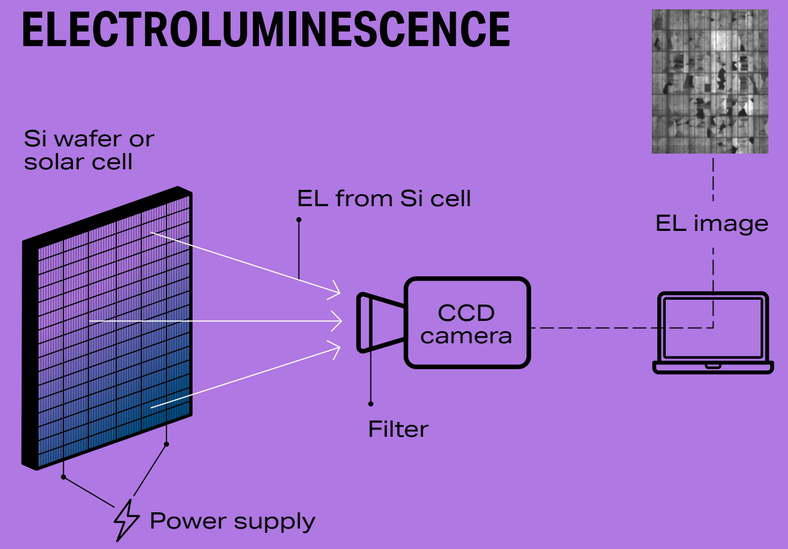
Assessing damage to photovoltaic array installations (PVs) can be a complex and challenging task. Installations are typically multi-modular, cover large areas and damage can be difficult to detect. Often damage will cause a reduction in efficiency or output rather than total failure. Cell-level cracks, microcracks, scratches and heat spots are difficult to identify by visual inspection with the naked eye.

The solution to damage assessment has come from the PV industry itself. PVs have a recommended design life of approximately 20 to 25 years. However, in practice, some fail in less than 10 years. Recent studies in the USA show that the average system underperforms by 6.3% compared to figures projected at financing stage. As a result, the PV industry has focused on developing technology to conduct fast and accurate testing to identify failing units. This technology is transferrable and can be used to test arrays quickly and accurately following an insured event.

Drones and infrared thermography

One of the more established methods of inspecting PVs with drones uses infrared thermography (IR). This well-developed and readily available technology is excellent for identifying major defects such as glass breakage, soiling (bird droppings or other), string disconnections and hotspots. However, IR is limited when it comes to micro-cracks and similar types of damage, which are commonly seen following significant wind, hailstorm or fire events.

To circumvent the limitations of IR, ongoing research has led to the development of luminescence imaging. There are two types of luminescence imaging: electroluminescence (EL) and photoluminescence (PL). Presently, only electroluminescence is being used, with photoluminescence undergoing further research and development.



InGaAs camera. A two-dimensional photodiode array that detects shortwave infrared (commonly referred to as SWIR)

Smarter electroluminescence technology

The “clever” technology used in EL is an InGaAs sensor, also referred to as an InGaAs camera. For the techies, this is essentially a two-dimensional photodiode array that detects shortwave infrared (commonly referred to as SWIR) incident light. This is collected in the form of a photo-generated charge, converted into voltage and turned into an image by off-chip electronics.

In practice, a drone is used to image the entire installation using the traditional IR technology. Once problem areas are identified from the IR images, the modules are inspected by an inspection team using EL. This involves exciting the modules with an outside source (generator) and using an InGaAs camera to produce images of the affected areas. Applying AI and machine learning, the images are reviewed and the damage identified.

From a timing perspective, the average EL team can work through approximately 1,200 modules per day. Typically, once the on-site work is completed, we expect analysis of the footage to be available within three to four weeks.

As mentioned, this technology is undergoing continuous development. Until recently, due to the interference of sunlight, EL imaging could only be undertaken in low light conditions (such as during early evenings). But, the latest InGaAs cameras compensate for sunlight “noise” and allow EL inspections to be performed in daylight. This speeds up the process and provides safer working conditions for inspection teams.

The next generation of InGaAs cameras is undergoing development and, as image acquisition rates increase, it is anticipated that they too could become drone-mounted. This will require a corresponding improvement in the camera stabilisation gimbals fitted to drones.

Fully automated PL inspections

Research in photoluminescence is ongoing. The principle behind PL is to excite the modules using natural sunlight during the day and a laser at night. If this is achieved, and faster InGaAs cameras and improved stabilisation gimbals become available, it is anticipated that fully automated drone inspections will be possible in the future.

In our opening paragraphs we commented that, in practice, PVs exhibit failures which are not necessarily associated with insured or insurable events. EL technologies could be used to survey insured facilities, possibly every three years, to establish pre-damage baselines and define the actual pre-loss condition of an installation.

This technology is available in both the USA and Europe, with certain specialists in this sector having inspected in excess of one GW of damaged assets in the field.

In conclusion, traditional damage assessment by means of physical inspections has proved to be labour-intensive, time-consuming and fails to account for a number of damaged panels. The current use of combined IR and EL inspections of damaged PVs can present significant benefits to both insurers and PV owners in terms of time and cost savings. Although the industry has already come a long way from the physical inspections of arrays, the anticipated introduction of automated PL inspections will prove to be exceptionally beneficial in terms of time, cost saving and accuracy.

We are keenly watching the developments in this space!

REFINERY RESTART AT THE FLICK OF A SWITCH?

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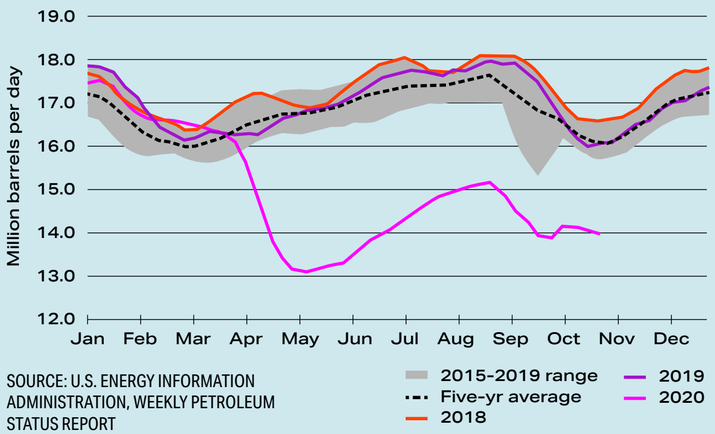
Covid-19 – The impact on refinery operations

Following the Covid-19 pandemic and the ensuing global decline in oil demand, a number of petrochemical facilities around the world took the decision to temporarily (or permanently) scale down throughput, or even shutdown entirely.

U.S. GROSS REFINERY INPUTS (ROLLING FOUR-WEEK AVERAGE)



SOURCE: U.S. ENERGY INFORMATION ADMINISTRATION, WEEKLY PETROLEUM STATUS REPORT

As the global economy moves to control the pandemic, activity is set to rebound. Demand for refinery products will recover and crude throughput will increase significantly. Indeed, some facilities have already resumed operations. For example, after India imposed national lockdown in April 2020 its top refiner, Indian Oil, cut capacity to 39% due to falling demand. As lockdown eased, throughput gradually grew and Indian Oil was reportedly operating at 100% capacity by November 2020.

Increases in transient operations such as plant start-ups and production ramp-ups result in heightened risk for downstream energy insurers, as highlighted by the Centre for Chemical Process Safety:

'Process safety incidents occur five times more often during start-up than during normal operations'.

How to get the plant back up and running, safely!

Procedure: Refineries are highly complex, featuring an integrated network of process units, pipelines, storage, control systems, steam, gas and power lines. Restarting a refinery is not a simple 'switch on', but requires a predefined technical procedure with careful instructions for restoring plant operations and production capacity in a safe, controlled manner.

Standard start-up procedure:

1. Ensure the reason for shutdown has been dealt with and all work permits signed off
2. Walk-down lines and valve positions to ensure they are correct
3. Open appropriate isolation valves to process units according to plan
4. Check tanks and vessels have correct inventory levels
5. Coordinate feed and intermediate product rates with affected downstream and upstream processing units
6. Begin circulating and heating feed through the units
7. When products/intermediate products meet specs, switch line-ups to finished tanks or downstream processing units
8. Gradually bring process units up to full production or planned rates, in the 'ramp-up' phase

COMMON START-UP RISKS

Machinery breakdown	• Restart (and shutdown) can involve operations outside 'steady state' parameters that stress parts and lead to breakdown • Compressors or pumps may be subjected to increased loads and lack of proper lubrication during start-up
Valve positioning	• Incorrect valve positioning (i.e. from a failure to 'walk the line') can lead to loss of hydrocarbon containment
Faulty instrumentation	• If instruments such as flow meters are kept idle for sustained periods they may give incorrect readings which impact other parts of the plant • False sensor feedback to the control system may cause the controller to adjust parameters incorrectly, potentially leading to large incidents
Human error	• Start-ups and shutdowns typically take more than one shift (12 hours) to complete • Any step missed could lead to failure of equipment and personnel injury
Preservation	• Failure to properly purge/preserve the process vessels, equipment and pipelines at the time of shutdown/restart can compromise integrity • Critical safety devices must not be bypassed whilst troubleshooting during unit start-ups and shutdowns
Heating/ cooling	• Improper ramp-up of heaters and coolers can cause significant physical damage

How can the implementation of digital refining improve safety?

As crude oil refining becomes less profitable and regulatory pressure grows, refineries are increasingly ‘digitising’ their plant and processes to improve profit margins and minimise costly downtime. Digital refining can also improve safety during the start-up process:

1. **Increased process automation**
   Increased use of automated instruments, such as remotely operated valves connected to the control system, helps to mitigate potential human errors.
2. **Virtual refinery training programmes**
   Accurate virtual refinery models can be used to train operational personnel to conduct start-ups and test them in certain plant upset scenarios and develop safe, effective troubleshooting methods.
3. **Portable monitoring systems**
   Specially designed portable monitoring devices can be used by onsite operational personnel to display procedures, checklists, specifications and real-time operating parameters.

CASE STUDY

INCIDENT:

An earthquake resulted in an ESD of a refinery in the Philippines. Several days later, an explosion occurred during the attempted restart of the naphtha hydrotreater’s feed furnace.

CAUSE:

The Sequence of Events log found that fuel gas isolation valves were in a closed position prior to restart. However, bypass valves may have been allowing gas to bleed into the furnace, causing gas build-up and explosion when it was fired. By-pass valves allegedly moved due to earthquake, allowing gas to pass into the furnace, but were not detected during pre-start line walk.

LESSON LEARNED:

Physical checks must be in place to verify the valve positions prior to restart (cannot rely solely on DCS data). Monitoring systems should have detected the build-up of fuel gas.

Insurance considerations for start-up claims

1. **Did an insured event occur?**

- Investigation needs to establish whether the incident was due to standard ‘troubleshooting’ issues that commonly occur during start-up (which are foreseen and easily rectified) or caused by a sudden, unpredicted event outside of normal operations

2. **Apart from reinstatement of damaged property, what other costs are covered under physical damage claims?**

- Additional costs can include flaring/slopping, utility requirements (steam, power, nitrogen, etc.), safeguard/park equipment and firefighting expenses. The insured’s ability to recover these costs is entirely dependent on the policy wording. Such costs may represent a large proportion of the loss and result in significant ‘uninsured losses’ if coverage is not afforded
- It is imperative that the insured fully understands what is and isn’t covered by the policy and that expectations are managed by establishing this early in the claim

3. **Second incident considerations?**

- This is important when plant shutdown is due to an insured event and further incidents occur during post-repair start-up
- Investigation is required to discover whether there is a direct causal link between initial and subsequent incidents. If so, this is potentially part of the initial covered loss. If not, this may need to be considered as a second event with a separate policy deductible
- Was it inevitable that the incident occurred at the next start-up?
- If there is BI cover in place, it is crucial to delineate the interruption caused by the second incident such that it can be calculated and shared with the claims stakeholders in the future as required

DIGGING INTO THE ROOT CAUSE:

Leveraging domain knowledge and digital capability

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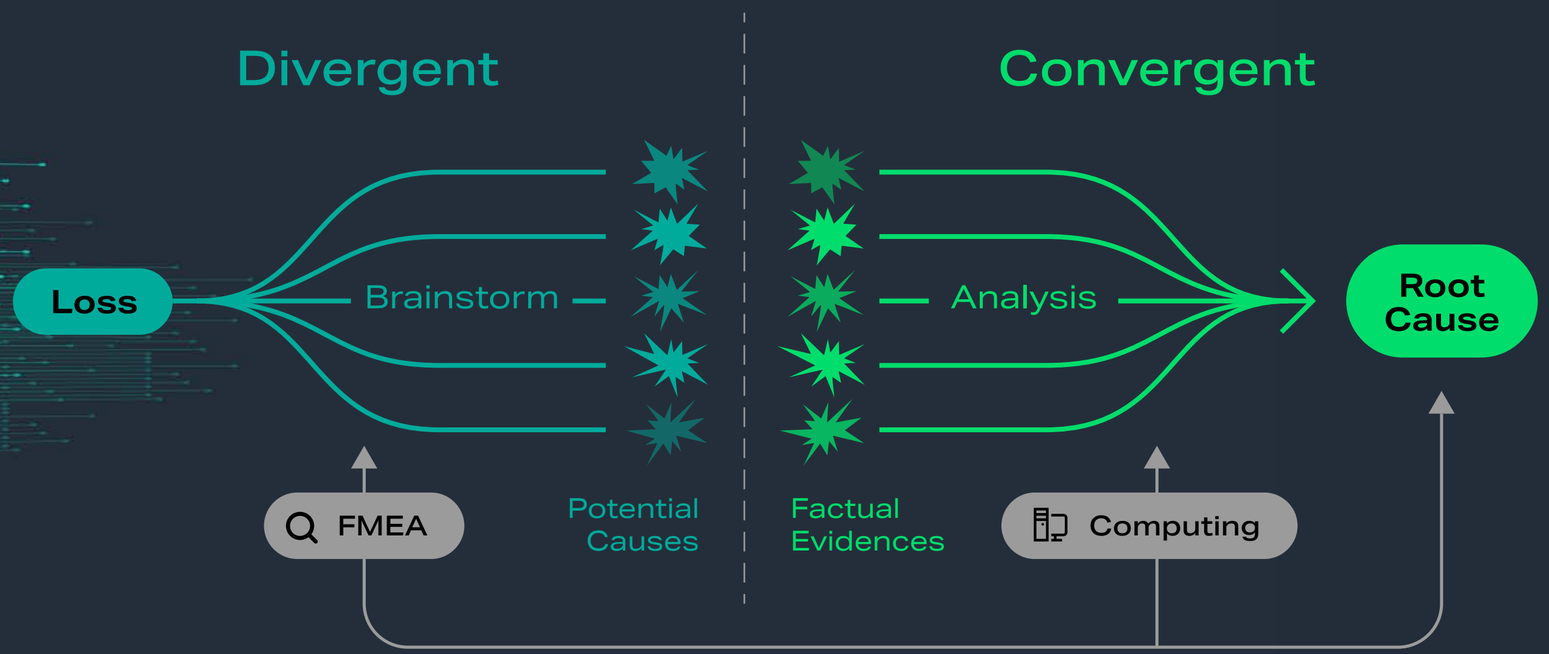
TYPICAL RCA PROCESS



Root Cause Analysis (RCA) forms an important part of the claims handling process, and can be determinative of policy coverage and potential mitigation strategies.

Techniques frequently used by RCA practitioners include 5-Why, Eight Disciplines (8D) and Fishbone (Ishikawa) Diagram. A common starting point is to brainstorm the potential causes based on the symptoms. Gathered evidence is then used to iteratively rule in or out the various options until the likely root cause is determined.

As with any expert-led process, there is always a concern that the RCA is run in a consistent and reliable manner. Effective RCA requires the input of high-level specialist skills which are not common to all experts.

Evidence gathering versus prediction

Failure Mode and Effects Analysis (FMEA) is a structured, proactive approach that allows organisations to anticipate failures during the early stages of a project by identifying possible causes.

Although the FMEA methodology has been available for decades, it has become increasingly relevant in the modern era as Industrial Internet of Things (IIoT) gains ground in the world of processing, manufacturing, maintenance and asset management. Abundant sensors built into or attached to real world devices provide accurate insights into contemporaneous conditions. This enables the manufacturer to detect possible failures during ‘design and prototype’ stage, and the end-user to monitor the asset’s conditions during its lifetime.

Coupled with increased computing power, the data gathered from field sensors can be processed more efficiently and accurately to understand the interaction between components and overall performance. For example, most manufacturers of advanced gas turbines are now able to simulate possible failures at a system level. In a hypothetical case where a turbine blade fractures and exhibits surface burning features, an RCA expert may wish to review the design FMEA to pinpoint potential causes that have already been identified, such as blocked cooling holes, fuel nozzle overflow or incorrect alignment of vanes, instead of scratching their head attempting to recreate all the possible scenarios.

FMEA for identifying design flaws

Improved computing techniques make it is possible to clearly determine causative factors. In a case where a large supporting system in a concentrated solar power (CSP) plant cracked shortly after commissioning, there was a dispute between the designer and the construction contractor over who was responsible for the loss. Whilst the designer initially blamed the contractor for fabrication imperfections, simulations in various scenarios clearly demonstrated that the design would have eventually failed in a very short time period, even if the fabrication had been reasonably sound. In hindsight, the loss could have been avoided if the designer had conducted a detailed FMEA properly. Simulation techniques used to determine the remaining life of components can also be applied if there are disputes about component replacement and whether a repaired part would last until the end of the equipment's expected lifespan.

Domain knowledge versus digital capability

While technology advances bring us complementary computational tools, there is a danger that RCA is treated as a 'black-box' process performed by computers. The success of simulation relies on sound algorithms and reliable data. An example of this involved the large-scale replacement of insulators across the railway system of a tropical country. The insulator manufacturer, who had no previous experience of supplying equipment to the region, failed to consider the possibility that the insulator material would undergo creep in warm weather. It is always beneficial to test the assumptions behind the prediction tools to ensure they are reasonable and complete.

Accessing the right expertise

For these reasons, to bridge this gap and successfully reach a clear RCA conclusion it is crucial to involve the right expert who understands both existing and cutting-edge techniques and their limitations. Any expert engaged to assist with the RCA process needs to understand that the intention is to provide clarity so that policy coverage can be determined, rather than undertake a full and detailed engineering RCA which goes beyond such scope and attempts to address other extraneous matters which cloud the process.

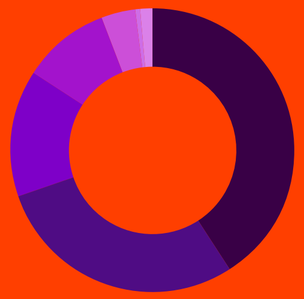
Integra's in-house experts have a rich and varied experience in RCA and are able to apply that successfully to the world of insurance claims.

GROWTH FOR INTEGRA IN 2020

Integra has gone from strength to strength over the past year. We have become a global network of 48 loss adjusters and grown our alliance of strategic partners.

Visit us at **integratechnical.com**

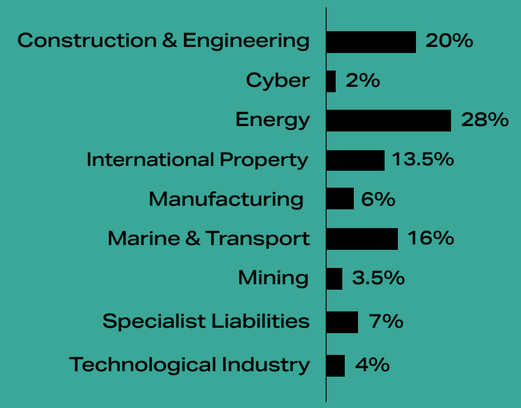
VALUE OF CLAIMS HANDLED



69% of claims handled under $5m

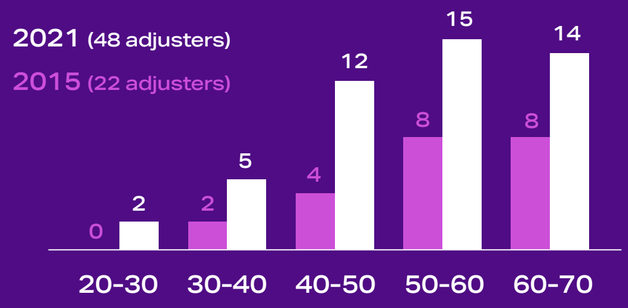
$	%
< 1m	40.9%
1m – 4.999m	28%
5m – 9.999m	15.2%
10m – 49.999m	10%
50m – 99.999m	3.9%
100m – 499.999m	0.8%
500m+	1.2%

% CLAIMS SETTLED BY SECTOR



RECRUITING THE NEXT GENERATION

40% of our adjusters are under 40. By nurturing young talent and blending experience we are creating the loss adjusting firm of the future.



No. of adjusters per age group

INSTRUCTIONS BY REGION

TOTAL: 693

5 NEWEST STRATEGIC ALLIANCES

EGYPT
INDONESIA
MALAYSIA
MEXICO
NIGERIA

HANDLED CLAIMS IN 66 COUNTRIES

NEW OFFICES: MIAMI, ABU DHABI

OVER 70 CLIENT WORKSHOPS AND TRAINING SESSIONS DELIVERED

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ISSUE 09

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