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The Virginia 811 Dirt

WORKING AS ONE TO GET THE JOB DONE

LETTER FROM THE CEO

B. Scott Crawford

IN THIS ISSUE

Change is arguably one of the very few constants on which we can depend. The winds of change are constantly in motion. Possibly one of the stronger reflections of this is Machiavelli's treatment of Cesare Borgia, whom he, in The Prince, presents as a model leader but who loses power through the intervention of fate, or "fortune." The death of Pope Alexander VI resulted in Borgia's fall from power – change, random change, undermined the ability of Borgia to retain power, even as he evinced the qualities of a strong leader! Resiliency requires a commitment to identifying possible changes on the horizon and creating strategies to overcome those changes. However, of course, there must be a recognition that unforeseen changes may occur requiring a possible "pivot" at near lightning speed.

Over the past five years, we in Virginia, as well as other states, have witnessed growing locate requests brought on by a host of factors. In 2020 and 2021, the pandemic led to COVID puppies driving an increase in "fence install" work types. As the United States government recognized the need for broadband expansion, as rural households were at a disadvantage remaining isolated during the pandemic, an infrastructure bill brought on a tsunami of broadband expansion efforts in rural America. "No Shows," "Make Ready," and issues with crossing railroad lines, magnified by a pressure to meet certain deadlines affecting access to federal funding for rural broadband expansion created new and arguably unprecedented pressures on the 811 process. Broadband Equity, Access, and Deployment (BEAD) program funding has now sought to relieve some pressure through workforce and efficiency development. Yet, change still unfolds as a new administration is reviewing this government spending.

Add to this, change is challenging the status quo in relation to cybersecurity efforts supported through CISA, the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency. Possible layoffs may be impacting that department. Virginia 811 has had a strong relationship with CISA over the past roughly seven years, receiving a host of services, for free, to ensure Virginia 811's cybersecurity efforts are optimal. Changes in funding may impact this relationship, but Virginia 811 has already taken several steps to enhance cybersecurity efforts outside of CISA.

Change is a constant, and with change comes not only apprehension but also the opportunity for continuous improvement. Resiliency is something arguably engrained in the human spirit. I cannot state how fortunate Virginia is to have a Virginia 811 team that exemplifies this so strongly. The Virginia 811 team constantly strives to find solutions to any challenges that changes produce, tackling new situations in a manner that ensures damage prevention remains at an optimal level – the team truly strives to reflect its "passion to serve, dedication to safety."

I hope you will read this newsletter, with all of its important insights an updates in a manner that allows you to grasp how committed this team is to the protection of life, property, and Virginia's underground utility infrastructure. We truly are living through an interesting time, and Virginia 811 believes that together, we will remain strong and vigilant in making our communities safer and stronger. Recognize that Virginia 811 is focused on changes, both real and perceived, to adapt and improvise in a manner to ensure we serve stakeholders and reinforce safety. This is an area that simply will not change.

- B. Scott Crawford
President & CEO
Virginia 811

Center Software Conversion Update:
Virginia 811's Transition to the Exactix Software System
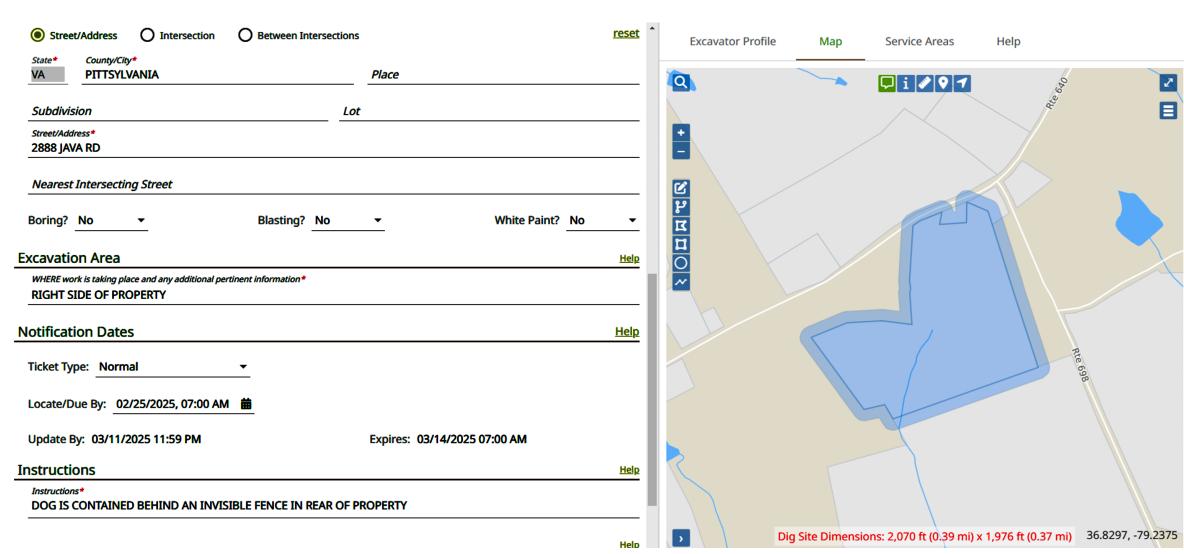
- B. Scott Crawford

The center software conversion involving the adaptation of Irth's Exactix platform continues to move forward, with a tentative launch in mid-June 2025. Currently, the Exactix platform has been successfully set up in a test environment. Virginia 811 team members have been actively engaging the platform in this test environment, providing Irth programmers with feedback for modifications and to increase Virginia 811's overall familiarity with the system. Based on this, work has begun on developing both internal and external future training content for Irth's Exactix training platform, Irth Training. Along with this, reporting capabilities are being refined and data migration, along with data cleanup initiatives, are advancing.

Irth is also working on the ability to utilize Electronic White Lining (EWL) within the web users locate request process. It is tentatively planned that EWL will be available to web users upon launch! Unique Virginia 811 functions, such as the two-way Code 60 Positive Response, recommendations to schedule locate requests due to request volume in a specific area, AI auditing of web entered locate requests, and the use of the Alert Server, to name a few, are all being examined to ensure those features continue at, or soon after, launch.

The project remains on track. Working with Yotta Tech Ports (YTP), Virginia 811 has secured a dedicated project management team to ensure effective oversight of this complex initiative. Utilizing third-party project management has been instrumental in successfully navigating this multi-faceted project while maintaining exceptional service to stakeholders and upholding our mission to protect life, property, and Virginia's underground utility infrastructure. June will be here before we know it, so stay informed about the center software conversion through Virginia 811's website, emails, social media, and stakeholder meetings.

Sample Exactix Locate Request Entry Screen

WHAT IS ELECTRONIC WHITE LINING

Electronic White Lining (**EWL**) is an advanced tool that enhances the accuracy and efficiency of locate requests by allowing excavators to digitally mark their excavation area on a map when submitting a locate request. Instead of solely relying on verbal or written descriptions, EWL provides precise, visual representations of dig sites, reducing confusion and improving communication between excavators, locators, and utility operators.

KEY BENEFITS OF ELECTRONIC WHITE LINING:

- **Improves Accuracy:** Ensures that the requested area is clear and precise, reducing unnecessary markings and miscommunications.

- **Saves Time:** Eliminates the need for physical pre-marking and allows for quicker processing of locate requests.

- **Reduced Costs & Damages:** More precise marking means fewer unnecessary locate requests and a lower risk of excavation-related damage.

- **Enhances Efficiency:** Helps locators and utility companies better understand the exact area needing markings.

- **Reduces Over-Marking:** Prevents excessive marking of areas outside the true excavation area.
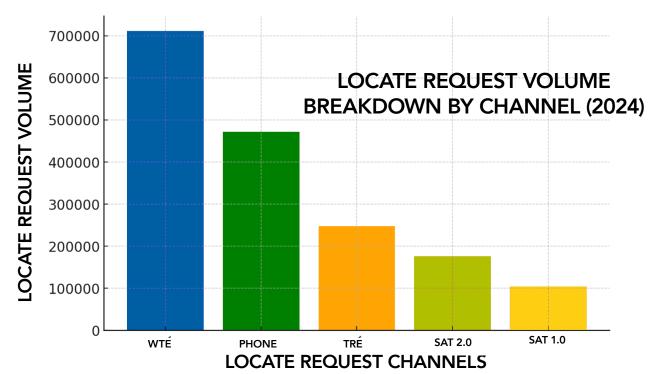
VIRGINIA 811 2024 YEAR END REPORT

In 2024, Virginia 811 processed a record-breaking 1,713,080 locate requests, a 10.4% increase over 2023's total of 1,551,340. Internet Originated Tickets (IOT) accounted for 72.4% of all locate request volume, up from 70.8% in 2023, highlighting the continued shift toward web options like Web Ticket Entry (WTE) and Single Address Ticket (SAT).

LOCATE REQUEST VOLUME BREAKDOWN BY CHANNEL:

- WTE: **711,696**
- Phone: **472,370**
- Ticket Revision Express (TRE): **248,302**
- SAT 2.0: **176,215**
- SAT 1.0: **104,497**

LOCATE REQUEST VOLUME BREAKDOWN BY CHANNEL (2024)

LOCATE REQUEST TYPES PROCESSED:

- Emergency: **61,683**
- New/Normal: **1,047,913**
- Re-Mark: **50,215**
- Update: **397,883**
- Design: **2,010**
- Meeting: **354**
- 3HR Notices: **122,424**
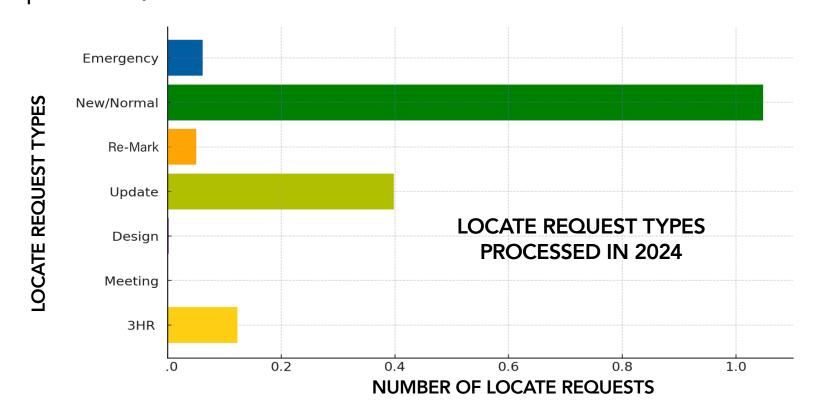
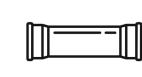(NOTE: CNCL, 3HRD, and CRCT are <u>not included</u> in this summary)

LOCATE REQUEST TYPES PROCESSED IN 2024

TOP WORK TYPES:

For years, "**FENCE: Install, Repair Or Replace**" has been the **leading work type**, and it held onto the top spot in 2024 with 86,010 locate requests. However, "FIBER - INSTALL" came incredibly close with 85,022 locate requests, a 37.8% increase from 2023. This dramatic increase can be attributed to ongoing grant-funded broadband expansion occurring throughout the state.

TOP FIVE WORK TYPES:

FENCE
Install, Repair or Replace
86,010

FIBER
Install
85,022

COMMS CABLE
Install
84,694

CONDUIT
Install
78,495

GAS SERVICE
Repair, Replace or Abandon
68,073

CODE 60 RESPONSES:

In 2024, there were **298,271 logged Code 60 responses**, a **20.8% increase** from 247,010 in 2023. These responses, where utility locators requested and were granted extensions to respond to locate requests, accounted for 3.0% of all 2024 responses. By comparison, Code 60 responses made up 2.6% of all responses in 2023. This increase reflects both the growing demands on utility locators and the flexibility required to manage rising locate request volumes effectively.

LOCATE REQUEST SCHEDULING:

This year marked the successful launch of our locate request scheduling feature, which was utilized on **81,742 locate requests**, or **7.8% of all eligible locate requests** (1,043,838). That is a promising start for a tool designed to alleviate pressure for utility locators facing unprecedented locate request volume increases!

811 FAST FACTS

YTD 2025

CHANNEL	COUNT	PERCENTAGE
PHONE	47,502	24.7%
WTE	84,509	44.0%
SAT	25,437	13.2%
TRE	34,728	18.1%
Total	192,176	

Total Internet Originated Tickets YTD 2025
144,674
(75.28% of all locate requests)

WE'RE HONORED TO BE AMONG THE BEST!

Virginia 811 Named One of Virginia's Best Places to Work

Virginia 811 is proud to be recognized by *Virginia Business* as one of the **2025 Best Places to Work in Virginia**. This honor reflects our commitment to fostering a thriving, innovative, and supportive workplace.

As a 100% remote organization, we've embraced creative strategies to keep our team engaged, connected, and empowered. Through cutting-edge tools, trust-driven leadership, and a culture of collaboration, Virginia 811 ensures every team member feels valued—no matter where they work.

"Being named one of Virginia's Best Places to Work is a testament to the dedication and creativity of our team," said Scott Crawford, President & CEO of Virginia 811. "We've worked hard to build a workplace where team members thrive, and it's truly rewarding to see those efforts recognized."

For our stakeholders, this recognition underscores our commitment to excellence and service. A strong workplace directly translates into better outcomes—ensuring excavation projects proceed safely, efficiently, and without delays. By investing in our people, we continuously improve processes, adopt new technologies, and stay ahead of industry changes.

Virginia 811 isn't just a workplace—it's a mission-driven community dedicated to safety, service, and innovation. Our award-winning culture ensures that every interaction with us is guided by expertise, care, and a shared commitment to safe digging across Virginia.

#WeAreVA811

Virginia 811 Scholarship Opportunity

Virginia 811 is proud to support the next generation of professionals through our annual scholarship program. We will award one $1,500 scholarship to a student enrolling in a community college, accredited trade school, or four-year university in Fall 2025.

- Applicants may be a 2025 graduating high school senior or adult learner planning to pursue an accreditation or academic degree.

- For high school graduating applicant, parent or guardian is employed in the underground utility protection stakeholder community (excavator, locator, or member utility).

- For adult learner, individual is pursuing accreditation related to underground utility protection stakeholder community (excavator, locator, or member utility).

- Applicants must be planning to enroll beginning Fall of 2025 at one of the following:
  - Community College
  - Accredited Trade School Program
  - A four-year, accredited, college or university

Know a high school senior or adult learner with a connection to the underground utility protection industry?

If so, encourage them to apply!

For details and application information, visit:
https://va811.com/virginia-811-scholarship/

Recognizing Excellence
The Virginia 811 Golden Shovel Award

The Virginia 811 Golden Shovel Award honors team members who go above and beyond to make a significant, positive impact each quarter. Recipients embody exceptional service, leadership, and dedication—whether through outstanding customer service, mentorship, process improvements, or fostering a culture of safety and collaboration. Their contributions help drive Virginia 811's mission forward, ensuring a safer and more efficient damage prevention process.

For Virginia 811 and our stakeholders, the Golden Shovel Award is more than just a recognition—it's a testament to the dedication, hard work, and collaboration that keep Virginia communities safe and our underground utilities protected.

Each quarterly recipient is recognized for their achievements, and at the end of the year, one outstanding individual is selected as the final Golden Shovel Award winner to receive Virginia 811's highest recognition for excellence.

KAREN WISEMAN
Golden Shovel Award
4th Quarter 2024

JESSICA LASSITER
2024 Year-End
Golden Shovel Award Recipient

CONGRATULATIONS KAREN AND JESSICA!

HAPPY ANNIVERSARY

Team Members Celebrating Their Service to Virginia 811 This Quarter

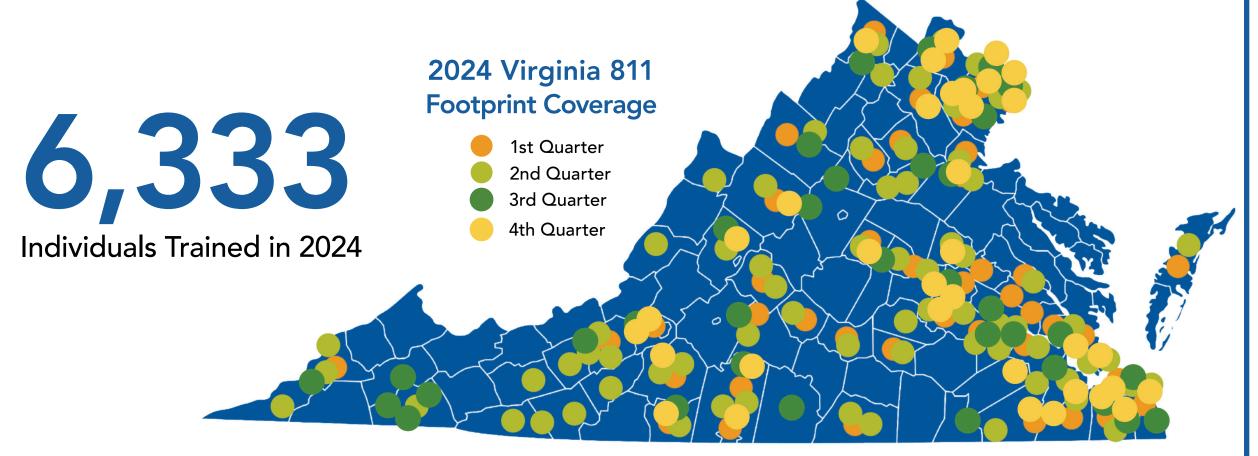|		
Rob Hogan 2/18/2002 | 23 Years of Service	**Kim Hermanson** 2/4/2008 | 17 Years of Service	**Dylan Mullins** 1/3/2023 | 2 Years of Service
Mike Hosey 3/17/2003 | 22 Years of Service	**Kenny Spade** 2/4/2008 | 17 Years of Service	**Annie Dahmen** 1/8/2024 | 1 Year of Service
Amy Wright 3/17/2003 | 22 Years of Service	**Robyn Divers** 2/14/2011 | 14 Years of Service	**Tina Kane** 1/8/2024 | 1 Year of Service
Kai Marxen 2/16/2004 | 21 Years of Service	**Anna Holtz** 2/25/2013 | 12 Years of Service	**Ashli Mullins** 1/8/2024 | 1 Year of Service
Stacey Clark 1/18/2005 | 20 Years of Service	**Connesha Waterfield** 2/25/2013 | 12 Years of Service	**Hollie Payne** 1/8/2024 | 1 Year of Service
Julie Rector 1/30/2006 | 19 Years of Service	**Caitlyn Goodchild** 1/22/2018 | 7 Years of Service	**Anita Scott** 1/8/2024 | 1 Year of Service
Stephanie Ferguson 2/21/2006 | 19 Years of Service	**Tiffany Uhl** 3/22/2018 | 7 Years of Service	**Jen Cogar** 3/25/2024 | 1 Year of Service
Melissa Ray 2/21/2006 | 19 Years of Service	**Gail Biggs** 2/4/2019 | 6 Years of Service	**Sarah Hatter** 3/25/2024 | 1 Year of Service
Janie Wilhelm 1/29/2007 | 18 Years of Service	**Joseph Sparrow** 3/28/2022 | 3 Years of Service	**Azure "Bleu" Lucas** 3/25/2024 | 1 Year of Service
Lauren McKenna 2/12/2007 | 18 Years of Service	**Randy Corvin** 1/3/2023 | 2 Years of Service	**Frank Giannini** 3/31/2024 | 1 Year of Service
	Jessica Lassiter 1/3/2023 | 2 Years of Service	

Together they bring a combined
311 years of experience to the Virginia 811 team!

THANK YOU FOR YOUR YEARS OF SERVICE

2024 Virginia 811 External Training

Public Awareness (PAT), Web Ticket Entry (WTE), & Member Services Team Efforts

6,333
Individuals Trained in 2024

2024 Virginia 811 Footprint Coverage

- 🟠 1st Quarter
- 🟢 2nd Quarter
- 🟢 3rd Quarter
- 🟡 4th Quarter

Virginia 811 Display Truck Efforts for 2024

Miles Driven: Approx. 14,000

Truck Displays: 139

Estimated Impressions: 2,085,000

Thank You to Our 2024 External Training Leaders

A huge thank you to the following dedicated Virginia 811 team members who led external training efforts in 2024! Their expertise and commitment played a vital role in promoting safe digging practices and ensuring our partners have the critical knowledge they need.

Frank Giannini
Manager of
Public Awareness

Fernando Mendez
Regional Multimedia
Marketing Liaison

Molly Avery
Regional Public
Awareness Liaison

Joseph Sparrow
Regional Public
Awareness Liaison

Anna Holtz
Supervisor
of QA/QC

Tim Poole
Communications &
Display Truck Specialist

Marty Mitchem
Member Services
Liaison

Jerry Altice
Web Ticket
Quality Specialist

Greetings from the
METAVERSE

Exploring the Future of Work Through Spatial Computing

This article comes to you from the Metaverse. In this case, specifically, a mixed reality environment where augmented reality and the real world are intermingled within a "spatial computing" experience. Through the power of Apple's AppleVision Pro headset, I am able to view a floating Word document projected, for my eyes only, into the real world. To the side, emails are visible – but only to me – along side other real world objects. Virtual reality and reality merge. With the simple turn of a dial, I can seamlessly block out the real world and enter a fully immersive virtual environment such as a snow covered field in Yosemite or possibly a beautiful peaceful lake in the shadow of Mt. Hood. Simply using hand gestures I can even transport myself to the surface of the Moon and work in an area I literally have no chance of visiting in the real world.

Spatial computing is arguably the direction interaction with computers is moving. While the current spatial computing experience requires, at least at a level of high fidelity, the user wearing a bulky and somewhat cumbersome headset, advances with wearable technology, particularly with smart glasses, is evolving and will dramatically impact computing in the coming years. However, even with the requirement of a headset, the spatial computing experience is one worth exploring. When I tested the AppleVision Pro, to my surprise, there was hesitancy from the sales representative as I requested the demonstration be focused on work applications and efficiencies. The focus was definitely intended to be on entertainment. While entertainment is important, for spatial computing to truly have an impact, ultimately, it needs to enhance a work environment. While the demo may not have been as strong in this area, what I did witness clearly suggested some interesting ways to find efficiencies with work.

For one, within this mixed reality, spatial computing environment, the user gains access to screens larger than any monitor he or she could hope to have on an office desk. Multiple screens can be open at one time, allowing the user to explore and engage content in ways not possible in a traditional office environment, even if the individual has more than one monitor. The size of the screens within this mixed reality are simply massive, making the traditional computing environment somewhat lackluster upon returning to a non-mixed reality reality. While a virtual keyboard allows the user the ability to "type" by moving fingers in mid air, the AppleVision Pro syncs to just about any Bluetooth wireless keyboard. The use of a physical keyboard, for me at least, is much more practical and allows for efficient creation of text and data within standard work applications such as Word, PowerPoint, and Excel, along with, of course, email and texting.

A second advantage spatial computing has over traditional computer interface is the ability to interact with screens in a fluid manner. Rather than moving a mouse around a screen your eyes become your "cursor." Simply look at a screen or an area and touch your thumb and index finger and you activate whatever your eyes are examining. Simple hand gestures allow you to manipulate and move these virtual screens, either around the real world you are viewing or the virtual world you have chosen to work within. The ability of the headset to track eye movement and hand movement is impressive. Also, with the spatial computing operating environment literally 360 degrees around the user, this feature is essential in allowing the mixed reality environment to be easily accessible and engaging.

Wearable technology, while not new, is reaching incredibly interesting heights. As it continues to evolve, it will eventually become increasingly integrated in excavation and damage prevention. It is projected that at some not too distant time, smart glasses will replace smartphones. Users will increasingly inhabit a mixed reality world during both work and play. As we continue to focus our efforts on damage prevention, we must be open to emerging technologies – and the best way to be open to new technology is to use it.

Oh – and as for entertainment? Well, the immersive video feature alone is an unbelievable experience! Not to mention the ability to watch TV shows and movies in a simulated theater!

– B. Scott Crawford

Reflections on Resilience and Positive Psychology During Uncertain Times

by ChatGPT+

The following essay was written by ChatGPT+, a Natural Language Generator developed by Open AI. The prompt to which ChatGPT+ responded was: "Write a 500 word essay discussing resilience, both personal and business, and positive psychology during times of extreme change".

Resilience is the capacity to withstand, adapt to, and recover from adversity. As the world undergoes rapid changes driven by technological advancements, economic shifts, and unforeseen crises, the ability to navigate uncertainty has become a critical skill. Coupled with positive psychology, resilience can help individuals and organizations maintain momentum, foster innovation, and achieve long-term success despite challenges.

Personal resilience is the psychological ability to bounce back from difficulties while maintaining mental and emotional well-being. This capacity is shaped by several factors, including self-awareness, optimism, and social support. Research in positive psychology highlights the power of a growth mindset – believing that skills and abilities can develop over time – as a key driver of resilience. When individuals embrace challenges as opportunities for learning rather than insurmountable obstacles, they can better cope with uncertainty and setbacks.

Another cornerstone of personal resilience is emotional regulation. Stressful situations, such as job loss, illness, or sudden change, often trigger emotional responses that can either hinder or enhance recovery. By practicing mindfulness, seeking support from social networks, and maintaining a sense of purpose, individuals can better manage stress and maintain perspective. The ability to stay flexible and open to change is essential for overcoming adversity, enabling individuals to transform setbacks into stepping stones for growth.

In a business setting, resilience refers to an organization's ability to anticipate disruptions, respond effectively, and emerge stronger. Companies that prioritize resilience build systems that enable agility, innovation, and strategic adaptability. Leadership plays a critical role in fostering resilience by establishing a culture of trust, transparency, and continuous learning. When employees feel supported and empowered, they are more likely to contribute creative solutions and maintain engagement, even in turbulent times.

The modern business environment is characterized by volatility, uncertainty, complexity, and ambiguity (VUCA). Organizations that successfully navigate VUCA conditions tend to focus on proactive problem-solving, scenario planning, and leveraging technology to enhance operational efficiency. For instance, companies that embraced remote work early in the COVID-19 pandemic demonstrated resilience by swiftly adapting their business models and digital infrastructures to sustain productivity.

Financial resilience is another key factor. Businesses with diversified revenue streams, strong cash reserves, and adaptive supply chains are better positioned to withstand economic shocks. Companies that invest in employee development and foster a culture of continuous improvement also tend to recover more quickly from crises, as they can pivot strategies and implement innovative solutions effectively.

Positive psychology – the study of strengths, well-being, and optimal human functioning – provides valuable insights into resilience. Practices such as gratitude, optimism, and fostering strong social connections enhance psychological well-being, making individuals and organizations more resistant to stress and adversity.
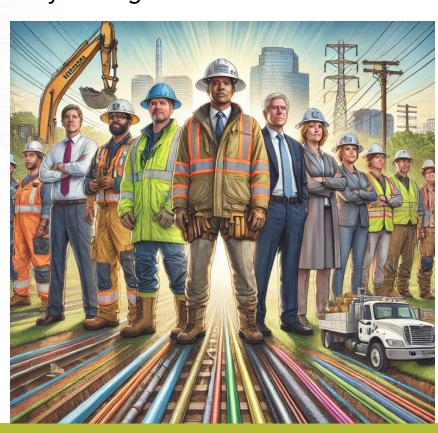
One of the most powerful applications of positive psychology in resilience-building is the focus on meaning and purpose. Studies have shown that individuals and businesses with a strong sense of mission are more likely to persevere through challenges. Whether it is an individual finding motivation through personal values or a company remaining committed to its core vision despite setbacks, purpose-driven actions fuel resilience.

Additionally, fostering psychological safety within organizations encourages innovation and problem-solving. When employees feel secure enough to express ideas, take calculated risks, and learn from failures, businesses develop adaptive cultures that thrive in changing landscapes.

Resilience and positive psychology are essential for navigating times of extreme change, both personally and professionally. By cultivating adaptability, emotional intelligence, and a growth mindset, individuals can better manage stress and embrace uncertainty. Likewise, businesses that prioritize strategic agility, employee empowerment, and purpose-driven leadership are more likely to survive and thrive in volatile environments. Ultimately, resilience is not just about surviving difficulties – it is about using them as catalysts for growth and transformation.

Illustration Provided by ChatGPT+

Virginia 811 Stakeholders Standing Together in the Face of Change,
Digital Art, ChatGPT+ and B. Scott Crawford, 2024

Approaching AI from Both a Historical and Philosophical Perspective:

Book Review of *Nexus: A Brief History of Information Networks from Stone Age to AI* by Yuval Noah Harari

- B. Scott Crawford

Yuval Noah Harari's work *Nexus: A Brief History of Information Networks from the Stone Age to AI*, is a thoughtful reflection on data, information, and human networking covering all of human history. While the scope and magnitude of the period covered requires the work to be general and high level, the work does identify interesting historical trends related to human networks that become relevant to the current questions and discussions revolving around AI. It is through this approach, exploring lessons from the past to inform us about the present, that Harari hopes "we can prevent the worst outcomes," especially in relation to such advanced technology tied to AI.

Harari argues that through a historical examination of information networks and how they operate, we can better manage the potentially threatening network that has emerged related to AI. Contrary to the "naïve view" of information, where some believe more information is better as it can ensure "bad" and inaccurate information is purged from the network, history has demonstrated that inaccurate information, at times dangerous information, has not been purged from information networks but has been strengthened.

Pointing to the witch-hunt craze in Western Europe spanning the 16th century, Harari demonstrates that the printing press magnified and enhanced the reach and impact of a book, The Hammer of the Witches, that perpetuated the persecution of perceived witches. Just as, yes, the printing press helped propel the Scientific Revolution, it also supported very unscientific prejudices and conclusions to influence society, resulting in thousands of deaths. The printing press, a revolutionary invention, allowed for more information, but this did not prevent bad information from being purged from the network.

Similarly, with the advent of artificial intelligence and the Internet, a communications network that is unprecedented in human history, more information is not necessarily helping humanity become wiser or move closer to Truth. AI bots can learn behaviors of individuals and feed information to them that may or may not be accurate, which in turn can lead to human action that can be dangerous and even deadly.

Citing the persecution of the Rohingya people in Myanmar in the mid 2010s, Harari demonstrates how social media, driven by algorithms programmed to increase engagement of Facebook users, quickly learned shocking and negative news about the minority Rohingya produced more "likes," "shares," and overall engagement. The algorithm fed this bias and moved such shocking and negative stories to the front, flooding Myanmar news feeds. This in turn resulted in real world outrage and persecution of this minority group, to the point of ethnic cleansing.

While Harari possibly exaggerates the power of algorithms, placing more blame on the algorithms than the people who designed them, his observations are worth reflection. Ultimately, we in business, as we embrace AI, need to recognize that more information, or more data, is not necessarily good. We as business leaders still must scrutinize data, identify bias, and make thoughtful decisions about how to leverage AI in an ethical manner.

There is much more to Harari's overview of such a broad and complex topic, so Nexus is definitely worth reading. However, while thoughtful and thought provoking, readers should beware that some sensationalism throughout the work could lead to undue concern about emerging technologies. In the end, as with information networks throughout human history, even the amazing advancements in technology tied to the Digital Age, human agency ultimately drives how technology is leveraged and utilized.
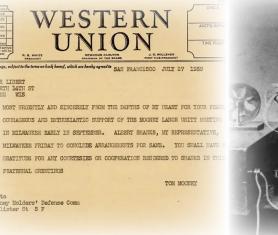
HISTORICAL EVOLUTION OF INFORMATION NETWORKS

| 43,000 B.C. Cave Drawings and Paintings | 3100 B.C. Egyptian Cuneiform and Hieroglyphics | 28,000 B.C. Public Forums of Greece and Rome | 500 A.D. Medieval Monastery Manuscripts | 1450 A.D. Gutenburg Press | 1837 A.D. Industrial Revolution Telegraph | 1920 A.D. Widespread Radio Broadcasting | 1946 A.D. General-Purpose Electronic Computer | 1978 A.D. Introduction of Personal Computers | 2010 A.D. AI Enters the Mainstream |

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