



ThinkTWENTY20

Issue No.11

Winter 2021

The Magazine for Financial Professionals



How XBRL Supports More Meaningful Corporate Financial Reports in Regulatory Filings

COP26 Unleashes Passionate Support for the Digitization of Sustainability Information

Who's at Your Keyboard? Two-Factor Authentication and Trends for Accessing Accounts and Online Resources

How XBRL Data Can be Used for Macro-Analysis

Mining Data Assets

Quantum Computing vs. Encryption

Number 11, Winter 2020/21

Editor in Chief: Gerald Trites

Managing Editor: Gundi Jeffrey

Contributing Editor: Eric E Cohen

Email: info@thinktwenty20.com

Telephone: (416) 602-3931

Subscription rate, digital edition: To subscribe or buy an issue, go to our online store at <https://thinktwenty20-magazine.myshopify.com>.

ISSN 2563-0113

Cover Photo from Pixabay.com

Submissions for the magazine are invited from people with an in-depth knowledge of accounting or finance.

Submissions can be made by email attachment to info@ThinkTWENTY20.com. Articles should be in Microsoft Word in 12 pt Calibri Font. They should be 2000 to 3000 words and be well supported as evidenced by the inclusion of references, which should be numbered and included at the end of the article. Bibliographies are also encouraged.

FOUNDING PARTNER



Table of Contents

Editorial..... 5

**In Their Own Words: How XBRL Supports More Meaningful Corporate Financial Reports
in Regulatory Filings 7**

By Gundi Jeffrey, Managing Editor

ThinkTWENTY20 decided to learn more about how regulators in the US, Europe and Canada use XBRL to provide better insights and transparency to the marketplace.

**COP26 Unleashes Passionate Support for the Digitization of Sustainability Information 16
By Liv Watson and David Wray, CPA**

To hold enterprises to account, we need robust and reliable sustainability information disclosures, particularly when demonstrating alignment toward a sustainable global economy.

**Who’s at Your Keyboard? Two-Factor Authentication and Trends for Accessing Accounts and
Online Resources..... 25**

By Eric E. Cohen, CPA

Going beyond login names and passwords, this article speaks to trends in two-factor authentication and multifactor authentication, related tools, and challenges.

**How XBRL Data Can be Used for Macro-Analysis..... 34
By Phil Gaiser, CPA, CMA**

Follow the logic in this set of tables drawn from public records of XBRL data for public companies, which reveals much about overall performance.

**Mining Data Assets..... 42
By Mark O’Connor, CPA, CMA**

Data scientists and other data whisperers can be used to train data for use by artificial intelligence and analytics to make better business decisions.

**Quantum Computing vs. Encryption..... 48
By Gerald Trites, FCPA, FCA, CISA**

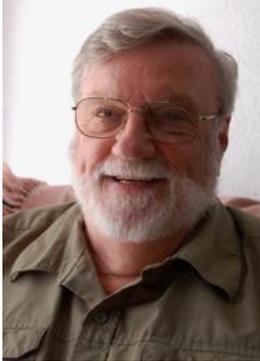
Quantum Computing is based on quantum physics, which posits that some things can exist in several different states, even at the same time. It’s a field that is counterintuitive for most of us.

**Book Review: “We Really Can Do Better”..... 55
By Jonathan Andrews, CPA**

James Dyson takes the reader on a journey, providing a personal insight into his life as an inventor, engineer, manufacturer, marketer, sales person, entrepreneur, farmer and educator.

Editorial

Gerald Trites, FCPA, FCA, CISA
Editor-in-Chief



The past year has been eventful, to say the least. But two major stories have dominated the accounting/finance scene. The pandemic and the move of sustainability to the mainstream. The two stories have had different impacts but both are pervasive.

The pandemic has led to a restructuring of business organization and management, with offsite and hybrid workplace strategies, increase in use of technology (like Zoom) to collaborate and communicate and even a rethinking by many people of their priorities in life.

The rise in attention to sustainability has led to major changes in the development of corporate strategy, with a greater emphasis on such matters as environmental impact than existed previously with perhaps a little less on profitability. Corporate reporting has been highlighted with a renewed emphasis on environmental, sustainability and governance (ESG) reporting. This has manifested in a proliferation of new standards, and notably the consolidation of previous standard setting bodies into the International Sustainability Standards Board (ISSB).

The pandemic and sustainability awareness have much in common. They both fit well into a dystopian even apocalyptic vision of humanity. Addressing them is made difficult by their being politicized and by the resistance of a segment of the population to taking the steps necessary to address them. But mostly they have in common the level of future change they are both likely to precipitate in the new year and in future years.

There is also a major difference. We have little control over the course of the pandemic. But we do have a lot of control over the development and adoption of sustainability reporting and the supporting standards, as well as the incorporation of sustainability thinking into corporate strategic development. Let's hope we are up to the challenge in the new year and coming years.

oio

180Systems
CONSULTANTS WITHOUT BIAS

Unbiased ERP Guidance

We will assist you on the journey from establishing a business case, through selection to a successful ERP implementation. We know the way and will work hard to get you to your destination on time and on budget as well as help you avoid the pitfalls. A new system is a journey, not a destination

Michael Burns
416-485-2200
www.180systems.com

The advertisement features a background image of a hiker with a large red and blue backpack walking on a dirt trail through a canyon. The text is overlaid on the image.

Beyond compliance: Promoting excellence in financial reporting in Canada

Keep up to date with the latest in financial reporting at Canada's Centre for Financial Reporting.

The centre features:

- An extensive collection of news and resources on financial reporting, assurance, and regulatory developments relevant to the Canadian marketplace;
- Daily summaries of the activities of the accounting, assurance, and regulatory boards;
- Summaries of developments in the United States that are closely related or might have an impact on IFRS standards; and
- The CFO's corner, where you will find editorials on top-of-mind issues for CFOs.

Website: <https://www.iasplus.com/en-ca>

Contact us: financialreporting@deloitte.ca



ThinkTWENTY20 is proud to be a media partner of
Blockchain Dubai 2021

How XBRL Supports More Meaningful Corporate Financial Reports in Regulatory Filings

By Gundi Jeffrey, Managing Editor



Gundi Jeffrey is an award-winning business journalist specializing in writing about the accounting profession for various publications. In 1985, she co-founded The Bottom Line, then Canada's only independent publication for the accounting and financial professions, serving as its executive editor.

Last November, the Securities and Exchange Commission (SEC)'s Commissioner Caroline Crenshaw said, at the XBRL Investor Forum 2021: Data that Delivers, that "XBRL has made it easier and less costly to extract, filter, compare and analyze the information in SEC filings. XBRL facilitates the comparison of a company's information across time periods, against other companies and between data in SEC filings and other agency filings. It allows faster and more sophisticated analysis by regulators, investors and academics."

As most accountants now know, XBRL converts financial reports into data that can be imported directly into various analytical tools and made more useful to investors, the SEC, other regulatory agencies, academic researchers and financial analysts. According to Crenshaw, "all of this user activity adds up to more market transparency and more efficient markets."

ThinkTWENTY20 decided to discover more about how regulators use XBRL to provide better insights and transparency to the marketplace. To that end, we spoke to an official at the SEC, Mike Willis, an Associate Director in the SEC's Division of Economic and Risk Analysis (DERA) and the Founding Chair of XBRL International. The SEC mandated the use of XBRL for its corporate filing as of 2009. We also interviewed Kim B. Eriksen, the founding partner and CEO of the company ParsePort, which specializes in providing XBRL solutions, to give us insights on how and why the European Securities and Markets Authority (ESMA) decided to go with the European Single Electronic Format (ESEF), an XBRL-type of filing, for its constituencies. And we had a word with Canadian Securities Administrators, who have chosen not to go down that road.

Instead, their spokesperson said that the current XBRL program in SEDAR has always been voluntary. "The new SEDAR+ system is moving the CSA towards a more data-focused filing and disclosure system so that companies and the investing public can securely submit and use meaningful data for raising capital and making sound investment decisions. Through this transition, international data standards will be adopted and supported through time. Given the limited usage, and as requested by the industry, XBRL will not be supported in the initial release of SEDAR+ and has been deferred to future releases."

And now to the interviews, beginning with Mike Willis and the US experience. **Disclaimer:** The Securities and Exchange Commission disclaims responsibility for any private publication or statement of any SEC employee or Commissioner. This interview expresses the staff's views and does not necessarily reflect those of the Commission, the Commissioners, or other members of the staff.

ThinkTWENTY20: *When and why did the US decide to adopt XBRL for filings with the SEC?*



Willis: In 2009, the Commission began requiring companies to file financial statement disclosures in XBRL to improve their usefulness to investors. In 2004, the Commission had begun to assess the benefits of interactive data and its potential to improve the timeliness and accuracy of financial disclosure and analysis by proposing a voluntary XBRL filing program, which became effective in April 2005. When the Commission proposed the requirement for XBRL filings in 2009, the consensus within the Commission was that the benefits of requiring interactive data submissions justified the costs and that, specifically, XBRL was mature enough to handle the reporting requirements for SEC filings.

Using the machine-readable structured data language XBRL makes it possible to automatically process the reported disclosures for analysis (e.g., compare disclosures across filers or time) in a matter of minutes.

ThinkTWENTY20: *What is the main usefulness to regulators of having filings done using XBRL?*

Willis: The most obvious one is the effectiveness in consuming the reported disclosures. As you can imagine, even if we were to narrow down the population of filers to, for example, only publicly traded companies for a certain accelerated filer status, in a specific industry group, we're still talking about millions of data points. Using the machine-readable structured data language XBRL makes it possible to automatically process the reported disclosures for analysis (e.g., compare disclosures across filers or time) in a matter of minutes. As for XBRL specifically, it strikes a good balance between the existing structure specifically designed for business reporting and flexibility for taxonomy writers to incorporate new features as reporting requirements change.

ThinkTWENTY20: *What is the main usefulness to filers of having their filings done using XBRL?*

Willis: The effectiveness in disclosure consumption mentioned above is applicable here as well for automating and supplementing an organization's internal drafting and analyses processes, including benchmarking disclosures, performing the disclosure checklist, applying risk assessments, math checking the draft report, time series reviews, red-lining against previously reported disclosures, data quality checks, and automating other process and control steps. In addition, empirical research has shown additional benefits have resulted from the XBRL requirements, including increasing the breadth

of companies that financial analysts cover, increasing the liquidity of company stock, and lowering companies' cost of capital.

ThinkTWENTY20: *I understand that there were some quality issues with filings when the system first went into operation at the SEC. What were they and are they under control now?*

Willis: Some of the more blatant issues – such as not including XBRL exhibits at all, or not detail-tagging the notes to the financial statements – used to be more prevalent, but are now very rare. Other quality errors, such as using a wrong tag (e.g., tagging a revenue disclosure with a liability tag) or unnecessary custom tag (e.g., creating a custom tag for a property and plant and equipment disclosure when standard taxonomies provide the tag), still happen more frequently than we think they should. We expect, however, that with Inline XBRL now being required, those types of errors should decrease. Filers are encouraged to leverage the freely available XBRL US data quality rules and also review the DERA staff's observation on data quality, custom tag analyses and data quality reminders on our site: <https://www.sec.gov/structureddata/osdstaffobsandguide>.

There are many benefits available via iXBRL, and those can accrue to both investors/consumers and filers/producers.

ThinkTWENTY20: *What is the current attitude of filers and prospective filers toward XBRL?*

Willis: As noted above, academic research has shown that filers benefit from XBRL requirements in multiple ways, such as through lowering their cost of capital, increasing their stock liquidity, increasing the extent to which they are covered by analysts, and improving their investment efficiency. XBRL has been out there long enough now, and the taxonomies have matured enough, that we hope most people (including filers) can see the supply chain standardization benefits both to the producers and consumers. Prospective filers may have more reservations due to having to undergo a relatively larger incremental change, but that's going to be the case anytime a company wants to change its ownership structure. Through outreach and education, we hope that current and prospective filers and other market participants might understand and realize the benefits of supply chain standardization.



ThinkTWENTY20: *How has inline XBRL helped or hindered?*

Willis: Inline XBRL (iXBRL) provides the reported disclosures in both a human (html) AND a machine readable (XBRL) manner. This can be very useful for both filers and investors in that it enables new capabilities directly within the Inline XBRL open-source viewer including enhancements in:

- Transparency: Identify and access disclosures in the context of the report, a dynamic table of contents.
- Search: Enhanced search capabilities in finding ‘concepts’ or ‘topics’ in addition to ‘words’ (e.g., stock compensation).
- Context: A report centric view (e.g., contextual view) for analytical capabilities.
- Compliance: reference links offer insights as to what disclosures are included and excluded (e.g., disclosure checklist). What used to be a manual ‘treasure hunt’ approach to identifying required disclosures is now a ‘mouse click’ capability.
- Benchmarking directly within the report: Time series charting of any value; the registrant compared with peers or other best practice examples.
- Risk profiling: In the context of the report (e.g., augmented insights). Identify disclosures that meet specific risk profiles.
- Quality: Quickly identify common quality errors (e.g., negative values, inappropriate extensions, etc.)
- Red-lining: Identify changes in narrative disclosures from prior period filings.

Also, of relevance in today’s pandemic-impacted supply chains: a useful structured disclosure in the financial statement footnotes that is easily accessible for analysis is the material suppliers and customer disclosures from which a relationships diagram can be established and analyzed for risks, liquidity, etc. for the broader supply chain.

ThinkTWENTY20: *Is iXBRL more useful for users? For regulators?*

Willis: Yes. For both. iXBRL is a useful next step of the disclosure supply chain standardization effort. Like other supply chain standardization efforts, the process enhancements are available to all participants. There are many benefits available via iXBRL, and those can accrue to both investors/consumers and filers/producers.

Inline XBRL also allows easier navigation. For example, using the Inline Viewer on the Commission’s website, the HTML is presented just as the filer wants, but the ability to jump straight to a specific footnote or data point is made possible by the XBRL data. Another example of analytical capability with iXBRL is the accounting codification reference function that allows users to review tagged disclosures associated with a specific accounting codification. These references enable the identification of disclosures by ‘topic’ as a supplement to the more traditional word queries. iXBRL also allows users to sort structured disclosures tagged with standard tags or custom tags and filter data by certain scale.

Readers may be aware of our data quality [reminder](#) on scaling errors found in public float. With the filtering function, anyone can review a filing and quickly sort which amounts are in thousands, millions and so forth, and identify which amounts may have scaling errors. The same enhanced analytical

functionalities through Inline XBRL that data producers and users are able to take advantage of also applies to regulators.

ThinkTWENTY20: *Is there merit in requiring disclosure via XBRL in the corporate websites? And what will stakeholders do with this information?*

Willis: A consideration here may be to ask: “who are the website visitors?” Are the website visitors machines or are they individuals? In the case of the SEC EDGAR site, well over 95% of the visitors are machines, so enabling those visitors to more effectively consume and then analyze the reported disclosures would appear to have merit. Further, the EDGAR XBRL API¹ and XBRL RSS Feeds² and Financial Statements and Notes Data Sets³ are useful examples of making the disclosures more accessible and reusable to the machines used by investors for disclosure discovery and analysis.

Requiring disclosure on a corporate website may raise concerns with respect to the persistence of availability over time, assessing compliance, ease of accessing the disclosures (e.g., behind a user name, password, captcha), authentication and validation; and others.

What stakeholders will do with the information may be largely dependent on the nature of the disclosures. That said, ‘analyze it’ is likely the most common thing that they will do with the information.

ThinkTWENTY20: *Looking back over the past 20 years, what have been the main challenges with XBRL for the SEC?*

Willis: As noted earlier, XBRL is broadly part of supply chain standardization effort and, as such, has all of the same challenges and benefits associated with other supply chain standardization efforts. Those can be summed up into a simple challenge that anyone in business can relate to: “overcoming the inertia of the status quo.”

This broad challenge manifests in concerns over costs/burdens; timing delays; quality; opacity; inhibiting processes and controls; and many others that are, in fact, the precise targets of supply chain standardization efforts. The approach in addressing these concerns includes a long-standing awareness, education and feedback effort for both the public market participants, and the Commission staff and readers should expect it to continue.

ThinkTWENTY20: *What is the future of XBRL and how are you managing the potential for technological obsolescence?*

Willis: This is a great recurring question. Let’s restate the question using an analogy: “What is the future of English and how are you managing the potential for technological obsolescence?”

¹ <https://www.sec.gov/edgar/sec-api-documentation>.

² <https://www.sec.gov/structureddata/rss-feeds-submitted-filings>.

³ <https://www.sec.gov/dera/data/financial-statement-and-notes-data-set.html>.

Few would ask about the technological obsolescence of the English language, yet this is a very common question for XBRL, which is often confused with a technology. XBRL is an acronym that is short hand for “Extensible Business Reporting Language,” with the operative word being at the very end – language. Just like English. And, just as the English language is expressed in a variety of methods (e.g., stone tablets, paper, electronic paper and Internet digital formats), we would likewise expect that the methods used to express XBRL will evolve over time. The future migration of how the language (e.g. XBRL or English) is expressed in file formats, such as XML, JSON, CSV and others, will enhance how the machine-readable disclosures are accessible by investors and other market users. In summary, the formats, not the language, is where technological obsolescence is addressed.

The future of XBRL via the development of taxonomies continue to evolve and adapt to changes in the reporting community. We continue to see more reporting frameworks adopt XBRL – such as the Federal Energy Regulatory Commission (FERC), Sustainable Accounting Standards Board (SASB), European Single Electronic Format (ESEF) – so its market use and thereby relevance continues to evolve.

Part 2 of this interview is with, as noted above, Kim Eriksen, who provides the European perspective.

ThinkTWENTY20: *Why did the ESMA choose to use ESEF as the corporate reporting language for European financial filings?*

Eriksen: The EU passed the transparency directive back in 2013, and ESEF became a part of it more or less from the very beginning. ESEF stands for European Single Electronic Format. And, as it says, the idea is to make “one format” or as we like to say, “one source of truth.”

ThinkTWENTY20: *Why did ESMA then opt for the iXBRL (inline XBRL) version as the go to version of XBRL?*



Eriksen: There were several good reasons for the choice of iXBRL. First, the two other major European organizations EBA (banking) and EIOPA (insurance and pensions) already had chosen to use XBRL as their reporting standard. The reason they weren’t using iXBRL yet is that they both worked in table taxonomies. So, the “visual” need was not that urgent.

Second, XBRL was already starting to be adopted across the EU. A lot of the member states either used XBRL for tax reporting, annual reporting or statistical reporting purposes. So, the experience with XBRL, or the iXBRL format, was already present in some member states.

Third, iXBRL is the “one source of truth” that the EU was looking for with ESEF. You can combine the visual and the technical dimensions in one “package” and, after field testing and talking to member states and the consortium, the obvious choice was made.

ThinkTWENTY20: *I believe the implementation date was to be this year but, because of Covid, has been postponed. What is the new implementation date and have companies filed in the new format voluntarily in the meantime?*

Eriksen: Correct, the EU gave each individual member state the opportunity to postpone the deadline for one year due to Covid. Germany and Austria opted not to postpone iXBRL implementation, so it is now mandatory for all public companies (PLCs) in those two countries. All other EU member states, however, chose to postpone the deadline for one year. This means that companies with a balance sheet date of 31/12/2021 and after have to deliver their annual report in iXBRL.

ThinkTWENTY20: *What implementation challenges have you seen so far?*

Eriksen: We have seen three main challenges, which we call “GMT.” The first is G = Graphics. Many PLCs are used to making high-quality glossy annual reports with a lot of design content in them. The reason is obvious, as this is the main “sales catalogue” they have for their investors. The second part is M = Mapping. Many PLCs, consultants, auditors, system vendors, etc., have not worked with mapping into a taxonomy, especially one such as the ESEF taxonomy. This means that the education curve has been very steep and challenging. The final element is T = Timing. Most companies are making a lot of last-minute edits to their filings. This means that they need to find a solution for preparing their filings that takes the “timing” into consideration, as they need to be able to make these edits. Further, a lot of companies have been “late deciders” when it comes to what solution they will use. This can challenge the production time, as auditors also need to approve and review the mapping and this, too, will be time consuming.

The ESEF taxonomy is multilingual, meaning that it will attract more investors across borders and provide the ability to analyze and benchmark companies against each other across the EU.

ThinkTWENTY20: *How are companies reacting?*

Eriksen: Because some markets are reacting late, a lot of companies have had to move fast. I actually think that companies have been very open and positive about using ESEF for their regulatory filings. I have spoken to hundreds of companies now, and I cannot count many with a negative reaction to ESEF. But a lot of the companies also understand the many benefits we will have once ESEF is implemented across the EU.

ThinkTWENTY20: *What might those benefits be?*

Eriksen: ESMA expects to benefit in many ways. There will be a central EU file repository for all ESEF files. This means that investors, analysts, governments, scientists, etc. can have a “one stop” repository, where they will be able to access all European PLCs annual reports. Furthermore, the ESEF

taxonomy is multilingual, meaning that it will attract more investors across borders and provide the ability to analyze and benchmark companies against each other across the EU. And, finally, the long-lasting effect will also be that we will see many more harmonized reports across the EU, as the structure of the taxonomy shows companies “the way” toward harmonization, even though it is very flexible at the same time.

The next reporting “wave” – ESG reporting (on the environmental, social and governance) – is already on the roadmap, with the same concept and format as the ESEF.

ThinkTWENTY20: *Is this the way for the future of corporate filings in Europe?*

Eriksen: Definitely – and it has been for years already with “plain” XBRL. And, as a lot of the member states have to setup the “receiving” mechanisms for iXBRL, they will be able to use it for even more than ESEF reporting, for example, for preparing ordinary annual reports, tax, statistics, etc.

ThinkTWENTY20: *And how might the use of this type of reporting evolve further? Can you look in your crystal ball?*

Eriksen: The next reporting “wave” – ESG reporting (on the environmental, social and governance) – is already on the roadmap, with the same concept and format as the ESEF. The plan is to place ESG reporting inside the same “framework” and have it implemented within a foreseeable number of years. After this, we will also see governmental reporting from member states, public institutions and other non-financial and financial reporting forms. This is only the beginning.

As a concluding note, the Ontario Securities Commission’s Chief Digital Officer, Manjish Abraham, shared that “Modernizing technology is a key priority for the OSC. The plan for the digital transformation program is to increase efficiencies of internal regulatory operations and corporate services supported by modern platforms, tools, technologies and streamlined processes. This will result in improved insights, efficient information sharing and increased collaboration between branches and with industry stakeholders, enabling data driven policy development and decision making.”

OIO

COP26 Unleashes Passionate Support for the Digitization of Sustainability Information

By Liv Watson and David Wray



Liv Watson is leading the IMP's facilitation on digitisation, on secondment from Advisers SAS. She chaired the IMP's Non-financial Digital Transformation Working Group. She is the current Chair of Cluster 9 - Format and digitization on the EFRAG Project Task Force on European sustainability reporting standards (PTF-NFRS) to elaborate sustainability standards in project mode until the European Sustainability Reporting bodies are established. As the co-founder of XBRL and the XBRL International consortium, Liv works internationally with leading market regulators, accounting associations and institutions. She has held several speaking engagements on financial and business reporting standards, its benefits, potential applications and adoption in corporate governance and social responsibility reporting. Liv has also held several leadership positions related to XBRL.



*David Wray, ACA, CPA, CGA, MBA, BFP, has held finance executive roles in the technology industry for 25 years and is the President of the DFCG International Group. He is a transformation expert, sharing his views on sustainability, accounting governance, digitization, large-scale transformation, and change management. He writes and speaks internationally about digitization, sustainability, automation and transformative technologies. David recently published his Amazon best-selling book *The Power of Potential: A Straightforward Method for Mastering Skills from Personal to Professional*.*

The Backdrop

This year's United Nations Climate Conference, COP26, grabbed global headlines with a "last hope approach" to collectively collaborate to prevent more severe consequences of the climate changes facing our planet and future generations.

A positive outcome from COP26 was the signing of the [Glasgow Climate Pact](#), which, after some tense moments throughout the two weeks, kept the 1.5 degree goal alive. That said, a growing number of voices are raising concerns that the 1.5-degree goal, and the supporting finance initiatives are insufficient to respond to the worsening climate change impacts. With this backdrop, more than 200 countries signed the agreement building on progress in curbing deforestation, reducing methane emissions, and accelerating the transition to carbon-free energy amongst the many steps underway.

In order to hold signatories, and their country enterprises, to account we need robust and reliable sustainability information disclosures. Particularly when demonstrating alignment toward a sustainable global economy as defined by the United Nations Sustainable Development Goals. So, reporting will become increasingly important as we collectively understand, assess, and make purchase decisions that will directly affect the achievement of sustainable economies and a healthy planet.

How we collaborate to achieve this, on the other hand, will quite likely take a momentous digital transition to support policy commitments made. It will require us to also reimagine the digital transformation of climate data to enable stakeholder decision making, facilitate accountability and streamline regulatory oversight activities. This journey is arguably one of the most significant digital transitions we've faced!

Where Exactly Are We Today?

It is probably obvious, based on the introduction, that we are a long way off of where we need to be. Our starting point is the pressing need for end-to-end governance of the data lifecycle (see Figure 1), namely from data creation through consumption.

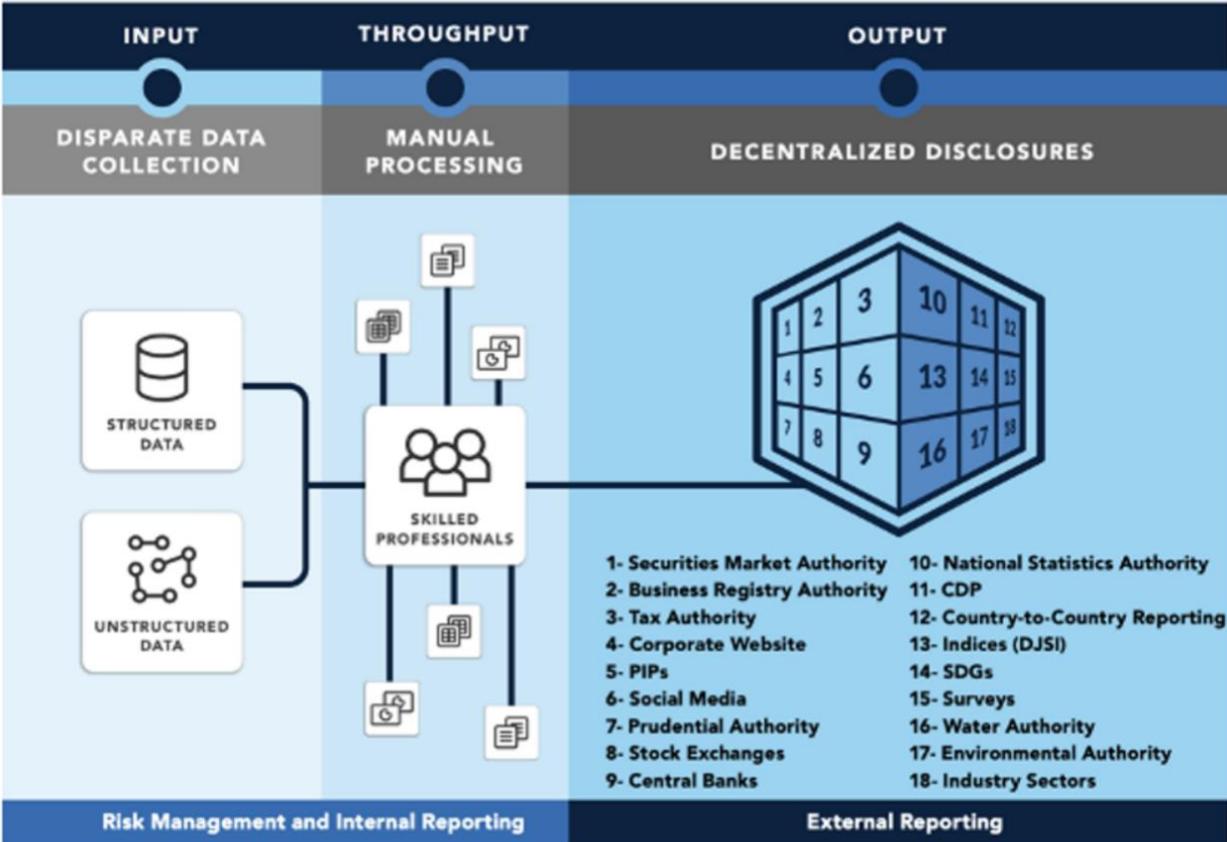


Figure 1 Source: A Digital Transformation Brief: Business Reporting in The Fourth Industrial Revolution <https://www.imanet.org/insights-and-trends/external-reporting-and-disclosure-management/a-digital-transformation-brief-business-reporting-in-the-fourth-industrial-revolution?ssopc=1>.

Let us elaborate, preparation (INPUT & THROUGHPUT), dissemination (OUTPUT) and usage (CONSUMPTION) challenges exist today that result in insufficient and inefficient sustainability information data flow. The same data needed to support decision making, within an entity and by its ecosystem stakeholders. This, naturally, negatively affects stakeholders' abilities to manage their own impact on people, the planet and their community. Research we undertook identified several common challenges including, in part:

- Stakeholder objectives of the ESG Ecosystem across different sectors, regions and regulators increase the complexity of objectifying and harmonizing the sustainability information Data Flow Framework, without a global agreement on a structured digital solution.
- Inconsistent mandates, rules, regulations and governance across the sectoral and regional regulatory bodies make widespread adoption and digital transformation to the necessary level uncertain.
- Multiple taxonomies or other digitization approaches/initiatives by various standard setters and international professional bodies tends to add confusion for ecosystem stakeholders, leads to high compliance costs and hinders the ability to efficiently integrate information for both internal decision-making purposes and reporting.
- Product/Software/Solution Providers tend to localize solutions because of the lack of taxonomy interoperability. The lack of interoperability directly impacts both the data management complexity and the cost of dissemination and consumption.

The costs, for context, were estimated by IFAC at 780 billion USD annually for the financial services industry alone! Extrapolate that to every industry and the number is mind boggling.

The practical questions quickly become:

1. How do we solve the issue when existing data is not fit for purpose (lacking quality, reliability and timeliness)?
2. How do we move forward in creating an environment where accurate, comparable, and machine-readable data is readily available and easily integrated into the investment process?

These were the simple, yet tough, questions we posed at a side event, hosted at COP26 in Glasgow, on digitally transforming sustainability information. The working session called for regulatory authorities, accounting and compliance professionals, standard setters, policymakers, preparers and service providers to collaborate in developing an interoperable digital data lifecycle framework that will dramatically increase data usefulness and drive down the cost of compliance.

Why Do We Need a Data Interoperability Infrastructure Framework to Support the Information Flow of Sustainability Information?

Interconnectivity has always been important in advancing system efficiency. For instance, in 1961 the ISO technical committee ISO/TC 104 established global standards for freight containers. Containerization is a system of intermodal freight transport designed to optimize

cargo utilization. This decision standardized almost every aspect of containers. From their overall dimension, through stacking and defining the twist lock norms that securely fasten them to ships' decks or truck trailers, to the terminology used to describe them.

If we analogize this to consider the data necessary for climate change related analysis and decisions, we can start to understand the significant challenge this poses because the existing technical infrastructure supporting the data flow life cycle is highly fragmented, from a technical point of view. The concept of data life cycle flow is not new; it is only recently that the term has come to emphasize information management with the sustainability information life cycle.

Climate information matters to both private and public sectors. This data is transforming the way in which citizens, consumers, investors, regulators and other stakeholders behave considering the information received. Companies know this, so they are paying more attention than ever to their own actions, and those of their upstream and downstream stakeholders, in all ESG related areas because it affects their financial bottom line.

Several stakeholders are showing renewed interest in meshing climate data with other financial, environmental and socioeconomic, or supply chain data so these extended areas need to be interoperable with climate information. These additions will enhance the information disclosure by providing a holistic view of the entity's risks and opportunities.

These issues play in at both a local and global level. Why?

Today, decision makers from both private and public sectors typically want timely digitally accessible, readable and trustworthy climate data that reflects the environment within which they either operate or that they focus on. In most cases, there is a gap between what is currently available and what is needed, meaning data that is not readily accessible, discoverable (in a format that lends itself to be machine-readable and human-readable) or trustworthy (only 29% of S&P companies had externally assured sustainability data according to the Governance & Assurance Institute Inc). Today, climate information services (such as data aggregators) often carry quite a price tag, that some cannot afford, and leaving others unprepared to manage risks and leverage opportunities.

We need to increase the availability and dissemination of audited (and auditable) data that becomes trusted for decision making and fulfils integral parts of the compliance and regulatory process. As we know from financial audits, they are a helpful vehicle for assessing the success of processes, products and systems – existing and newly implemented – which will become increasingly critical in ESG related areas. They will become a tool for objectively verifying or evidencing processes and information, thereby becoming the proverbial stick for reducing and eliminating problem behaviours. For instance, armed with information, consumers can make immediate decisions to stop buying a good or service from entities lacking good corporate citizenship in ESG matters. This creates a new decision-based accountability model that will be effective quicker than a regulation could be.

What Data Sharing Strategy Could Address the Trust Challenge?

Data sharing, in our context, depends on a global trusted digital data exchange framework with a supporting governance model that facilitates the sharing of internal and external use data in a non-partisan fashion between systems.

This presents two key challenges:

First, there's a large plethora of ESG measurement methods, frameworks, guidance, protocols, rankings, indices, standards – and we could go on! Each of which is generally disconnected from corporate reporting processes.

Second, the reporting ecosystem is truly broken. Although all of the aforementioned methods have been put in place with good intent, ESG reporting is bordering on being “counteracting.” By this we mean, today and in its current form, it breeds confusion, inconsistency, is contradictory, lacks credibility and reliability, and lacks meaningful assurance of the data. The sustainability standards consolidation actively underway, particularly with the newly formed ISSB (international Sustainability Standards Board) and the integration expected in mid-2023 of the Value Reporting Foundation (created in mid-2021 through the merger of SASB and IIRC) and CDSB, does start to address the standards fragmentation issue but it does not solve the global interoperability issues.

For instance, each standard setter develops its own taxonomy approach and structure – which generally do not correlate to or with each other. We see this with the two-speed sustainability standard development underway within EFRAG (European Financial Reporting Advisory Group) and the ISSB, and we haven't even mentioned the US efforts under discussion within the SEC (Securities and Exchange Commission) around climate. Europe is fundamentally looking to transfer its economy into a sustainable one using the European sustainability standards as the regulatory stick for change, whereas the ISSB is focused on investor impact reporting and has no regulatory leverage at its disposal. The US's position is a little more nebulous as there is no clear agreement within the political stakeholders on a path forward.

So, absent a global harmonized standards approach, which seems increasingly unlikely, interoperability is the bridge we need to allow for data integration across the ecosystem for stakeholders. Interoperability, in human readable or machine-readable form, is achievable but we need an agreed common approach for the underlying technical plumbing system supporting information flows, and do so by using established open data formats, hosting protocols and semantics.

Here is a very simple example to illustrate what this means. The same term can hold different meanings for different regulatory bodies and, because of differing market needs or regulatory priorities, siloed digital taxonomies are actively under development around the world. This siloed effort will compound the magnitude of issues around the lack of global interoperability and the resulting misaligned data definitions and mismatched taxonomy structures. This means

another alphabet soup, a soup of digital taxonomies not easily embedded into commercial software products for multi-taxonomy reporting.

What It Will Technically Take to Achieve Interoperability of Climate Data

Before we get too far into technical concepts, it helps to define some important interoperability terms.

Syntactic interoperability: Semantic interoperability is the ability of computer systems to exchange data with unambiguous, shared meaning. Semantic interoperability is a requirement to enable machine computable logic, inferencing, knowledge discovery and data federation between information systems. While syntactic interoperability allows two or more systems to communicate and exchange data, the interface and programming languages are different. To be effective, the design of any interoperability solution must be considered and accounted for the granularity of data to be shared

Semantic interoperability: Data transfers where a receiving system can understand the meaning of exchanged data, reusing it appropriately. Higher bar, greater potential for automation and data/model reuse. Semantic interoperability is the ability of computer systems to exchange data with unambiguous, shared meaning. This is accomplished by adding data about the data (metadata), linking each data element to a controlled, shared vocabulary. Without semantic interoperability among disparate IT systems, sharing data in a useful way is impossible.

Semantic interoperability is the ability of computer systems to exchange data with unambiguous, shared meaning.

So, in our context we are suggesting that semantic interoperability, the process of assigning meaning to data, should be examined more closely. Specifically, identifying what meaning needs to be included with a given data point to ensure that it is clearly understood by and between systems and people. This is the first step toward determining how that data and its relevant contextual information needs to be structured.

It then takes a few concrete steps to make technical interoperability a reality:

- ***A purpose driven network:*** Data achieves higher-level semantic interoperability, as opposed to merely syntactic interoperability, through networks specifically designed for semantic interoperability.
- ***A plan for data compatibility:*** Using open, widely available standards and ensuring that associated metadata are complete, correct, and semantically meaningful.
- ***Data access principles:*** Hosting tabular data in machine-accessible formats and providing an Application Programming Interface (API) for access whenever possible.

- **Community/stakeholder buy-in:** Digital data modeling has generally struggled to achieve interoperability and reusability. While our proposals have attracted a high level of interest in improving data interoperability, the technical community has yet to coalesce around a solution to the interoperability problem.

We believe that there is no better time than today to form a global community and establish a path toward data and model interoperability to solve these sustainability information issues. In theory this all sounds great, however where is the market on these issues?

Where the Market is Today

Since the adoption of the Paris Agreement in 2015, data insights show a significant increase in the number of both mandatory and voluntary climate-related information disclosure requirements. This increase was particularly relevant in 2015 and is again in 2019. In 2015, the Financial Stability Board (FSB) concluded that climate change poses a material risk to worldwide financial stability and the issues are, in fact, global in nature. The board's international industry-led Task Force on Climate-related Financial Disclosures (TCFD) was immediately launched and has since established the basic framework necessary to assess, manage and report on climate-related risk and opportunities.

- Since 2017, the publication date of the TCFD recommendations, they have been endorsed, supported and adopted by emerging sustainability reporting standards boards, governments, regulators, international organisations and the private sector around the world. TCFD themselves indicated that "In 2020 more than 9,600 companies, representing greater than 50% global market capitalization disclosed on climate change through CDP's TCFD-aligned disclosure platform, including 84% of the FTSE100."
- Regulation via the national or regional Companies Acts is actively simmering in the background while consumer, media, employee, and shareholder voices are growing and demanding greater accountability for and transparency on key issues.

Looking at the European market. The evolution from the EFRAG Non-Financial Reporting Directive (NFRD) to the Corporate Sustainability Reporting Directive (CSRD) has seen an expansion of scope, but most exciting is the evolution of design thinking. European sustainability standard setting is now mandating a "Think Digital from the Start" approach in standard development. A summarized timeline of events over the last two years helps contextualize the current European sustainability standard-setting approach and progress against its CSRD objectives (Figure 2).



Figure 2: Preparatory Timeline leading preceding the CSRD.

In June 2020, Executive Vice-President Valdis Dombrovskis invited Jean-Paul Gauzès, EFRAG Board President, to provide recommendations about potential changes to the governance and financing of EFRAG, if the latter were entrusted with the development of EU sustainability reporting standards. Gauzès’ recommendations were published in March 2021. These recommendations foresee that, following the creation of a new sustainability reporting pillar within EFRAG, the current Board’s administrative responsibilities over matters related EFRAG’s budget, human resources, etc., will be transferred to a single Administrative Board that will oversee both the existing financial reporting pillar and the future sustainability reporting pillar.

EFRAG currently expects to complete the reform of its governance structures in line with Jean-Paul Gauzès’ recommendations by the end of March 2021. In parallel, Executive Vice-President Valdis Dombrovskis also invited EFRAG to establish a multistakeholder task force, under the auspices of the European Corporate Laboratory, to carry out preparatory technical work for the development of possible EU sustainability reporting standards. The recommendations of the task force were also published in March 2021.

This means that European sustainability standards are being designed to ensure digitally compatible outcomes, as well as human readable ones. Similar discussions are actively underway within the ISSB (via the Transition Working Group), and early signs point in the same direction within the US stakeholder discussions.

Where Are Businesses in This Journey?

To better meet the requirements of diverse global statutory reporting environments, forward-thinking businesses are developing their own enhanced frameworks built on ‘a single source of data truth’ to enable its users to unify, enrich, and explore data at scale — and then create a single connected data source for reporting and analysis. Given that information changes at the source, cloud platforms automatically disseminate updates across all linked instances within, for instance, presentations, reports and spreadsheets. This not only streamlines reporting itself, but it dramatically improves transparency, collaboration, and accountability within distributed work teams.

Final Thoughts on The Global Digital Solution Going Forward

The COVID crisis has crystallized the need for digital solutions. Businesses face mounting pressure to streamline and improve performance, create value, provide greater transparency, become more accountable to stakeholders, while minimizing their impact on natural resources and being socially responsible. To accomplish this, businesses need new methods for gathering and communicating the expanded information sets (increasingly focused on ESG information) sought by investors, analysts and others.

We can all keep an eye on progress with EFRAG, the ISSB and SEC and hold them to account if they do not work together to ensure an ecosystem ready interoperable digital solution for sustainability information! In truth, sustainability disclosures can only be sufficiently addressed through such an unprecedented digital collaboration. The planet deserves no less...



Legend: From right to left are event speakers David Wray, John Turner and Michal Piechocki.

Who's at Your Keyboard? Two-Factor Authentication and Trends for Accessing Accounts and Online Resources

By Eric E. Cohen, CPA



Eric is a prolific author, engaged in virtually every effort to standardize accounting and audit data, a national expert on a wide variety of standards efforts, and co-founder of XBRL.

He is a contributing editor to *ThinkTWENTY20*.

As more aspects of our personal and business lives, finances and other confidential information move online, with the catalyst of the Pandemic making in-person contact inadvisable and traditional postal mail becoming more unreliable, we need comfort

that only we (or those we authorize) have access to our online information and only we can authorize online activities on our behalf. Beyond login names and passwords, the trend has lately been to the use of an additional authentication method that provides evidence that you are, indeed, you. This article speaks to trends in two-factor authentication (2FA) and multi-factor authentication (MFA), related tools, and challenges associated with the growth of 2FA.

If your email inbox is like mine, you have seen an increasing number of incoming messages with a common theme. They begin “Your sign-in method is about to change” (or, more urgently, “Your sign-in has changed”). That message goes on to say two-factor authentication (or 2-step verification – 2SV – more on that to come) is going to be required, or the requirements will be made more stringent “for your protection.”

Facebook, for example, is pushing more and more “at risk” accounts to mandatory 2FA. Google has started requiring 2FA for its users after a few years of recommending it. Twitter has a number of interesting options involving 2FA. Other services that required one form of 2FA raise the bar from older 2FA methods to newer ones.

In this article, we will speak to 2FA: Why is it helpful or necessary? How can it be implemented? What are some of the key advantages and disadvantages of the choices, where some of the best-known options include text messages/SMS, authentication apps and hardware? What’s next on the horizon?

Why Is 2FA Helpful, Or Even Necessary?

In the Fall 2021 edition of *ThinkTwenty20*, I wrote about the evolution of payment methods, leading up to the cryptocurrency era. We focused, in particular, on cryptographic key management, a major change from traditional sign-in approaches.

As part of that discussion, I spoke to passwords and how, 30 years after the Web got its beginning in 1991, enterprise breaches disclosing login names and passwords increasingly make the headlines, and passwords alone seem to do more to keep honest people out than criminals. As time moved on, users were told to make their passwords more difficult to guess, forced to change their passwords on a periodic basis and required to include variations, such as numbers, upper and lower case characters and punctuation. The question was whether the cost of inconvenience was compensated for with the benefit of safety; I had a sign-in to my first email account for 20 years before being forced to change the password.

Looking at the emergence of 2FA is the flip side of looking at the failure of password protection and the shortcomings of other methods of proving that you are who you say you are.¹ If we can use other means to reinforce or replace passwords, perhaps we have a chance in the fight for authentication of our own online identity. Three factors the community considers in authentication:

1. Who you are (e.g., using a fingerprint or facial scanner).
2. What you know (e.g., passwords).
3. What you have (your mobile phone, a hardware token).

Two-factor authentication will involve two of these three factors. *Two-step* verification will involve at least one of these factors, but in two stages. For example, entering a password and then a pin, or your mother's maiden name, or your favorite musical instrument, are both based on knowledge, so these are examples of two-step verification. Where you need to use your password (what you know) and a fingerprint scan (who you are), however, involves two different factors.



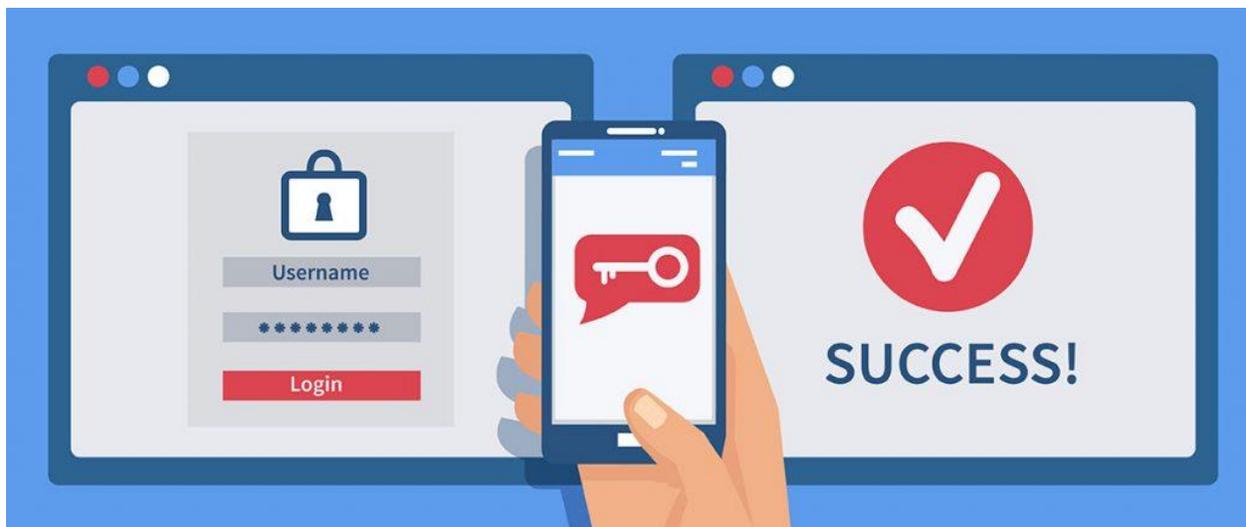
One group dedicated to dealing with the problems of people and their passwords is called the FIDO Alliance, an open industry association started in 2013 with the mission to come up with standards to “help reduce the world’s overreliance on passwords.”² The Alliance shared this information,³ explaining their passion for replacing passwords:

- Passwords are the root cause of over 80% of data breaches.
- Users have more than 90 online accounts.
- Up to 51% of passwords are reused.

This is probably not news to any of us. As our use of online services began to grow, having and tracking site-specific logins became more difficult. One site requires punctuation marks, another prohibits it. One requires eight characters or more, another limits it to six. We may visit one site daily, another monthly, another annually at most, and the requirements change.

As our use of multiple devices (from PC to smartphone to tablet) began to increase to be able access those services wherever and whenever we wished – as, after all, the Cloud led to the expectation that we can access all of our information and services anywhere, from any device – it made us want easy access from our PC, our phone, our tablet, from the hotel business center ... from anything that could access the Internet. Sadly, that also meant an attacker could get at our information and services anywhere and any device if they know what we know and can imitate what we have.

Entering a password was a common ability across all devices, the least common denominator. Although I have a fingerprint reader on all of my devices, they are not synchronized, as my identity is not standardized across my devices. My password managers on my devices are also not synchronized and represent multiple operating systems. Even on my iPad, the Apps don't all go to the same resource for passwords as the web browsers, so each installation or update may require manual steps to try to keep an App and a website from the same organization in synch. This is particularly painful when an App is updated (which may happen infrequently) and the update does not remember the password previously used in the App – which wasn't automatically stored in the device's password manager.



The problem with passwords, in particular the ease of guessing them, isn't lost on government standards setters. In the United State, the National Institute of Standards and Technology (NIST)⁴ has been raising an alarm for a long time, such as encouraging users to avoid passwords exposed in data breaches. One popular website used to find such exposed sign-in credentials and passwords is haveibeenpwned.com.⁵ The etymology of "pwned" is up to some debate, but whether from mistyping ("You have been owned" becomes "You have been pwned"), taken from chess (where you are treated like a pawn and I have ownership of your login credentials by taking advantage of your weakness or other failure) or some other origin, such as when evil doers can take advantage of failures in security and access your resources, "you have been

pwned.” Resources such as Firefox Monitor (from the Firefox browser people) can track your email addresses and warn you as the addresses are found in the latest breaches, leveraging the ihavebeenpwned database.

So, we know that passwords are the easiest and most common safety tool for our sign up, but no amount of requiring users to make them more difficult to guess has stopped the bad guys from getting them. Password security alone has let us down, in some part because we are too lazy to create passwords that are not easily guessed, because enterprises that demand passwords are involved in leaks where our passwords have been exposed as clear text, because we are easily fooled by social engineering and deliver our login credentials to people who pretend to be technical support, and for numerous other reasons. In one situation I find particularly troublesome, people who wish to buy cryptocurrency from the well-known exchange Coinbase, using their bank funds, are asked to provide their login credentials (name and password) for their online bank account to Coinbase for a service called Plaid Technologies.⁶ That raises many issues.⁷

Where passwords fail, then, we look to 2FA as an adjunct or alternative. The need to use a fingerprint scan or have your mobile phone at hand may not be perfect, but it raises the bar to get access to your resources.

So, 2FA moves beyond “what you know” (such as a PIN or password) to what you have:

- A phone for voice calls or text messages.
- A device that can receive email.
- Special “authentication software,” such as offerings from Google, Microsoft.
- Some other physical object or token that works in conjunction with security systems.

Implementing 2FA

In my last *ThinkTwenty20* article, I noted:

Although two-factor authentication (TFA) devices – combining “who you are” (such as fingerprints or eye scanning) or “what you have” (such as a separate piece of equipment) to “what you know” (your login and password) – were widely available 20 years ago (in 2003 RSA SecurID,⁸ as a “what you have” device, held 70% of the market as a hardware device to make logging into systems more secure), it has only been the recent highly publicized privacy breaches that have led more information environments to strongly encourage or require TFA. For example, I can access my email or systems for a university with which I am associated only with the use of one of my smart devices as an authenticator, using Microsoft Authenticator⁹ for TFA. Cryptocurrency exchanges, such as Coinbase, highly recommend TFA; Coinbase supports Yubico’s YubiKey.¹⁰

Shared secret via phone, text or email

Where the ability to type a password, was the first and simplest step across devices and locations, the next common denominator for most people who need mobile access to their resources is a mobile phone (not necessarily a smart phone). For that reason, two of the most common ways that services have authenticated users is with a phone call or text. The use of a “shared secret” – a code delivered on demand – is conveyed either with a text message (SMS) or delivered using text-to-speech via a phone call. With the advent of smart phones, email became another common channel by which the shared secret can be sent.

The costs and timeliness of receiving the code varied between these options. The costs are amplified for people who are travelling away from their home. Text messaging is often the most reliable and least expensive of these depending on the user’s phone plan.

Some services have yet to move to this level; others consider it as inadequate for some or all of their users. While the most casual thief may be delayed by these methods, they are anything but foolproof. Any access to the phone may offer a view of the code from an email or text message in the notifications area, even if the phone is locked. Hackers have been able to clone the SIM cards, use social engineering to get the phone number changed to one they control,¹¹ or remotely access voicemail or text systems. One-time passwords can be intercepted or social engineering used to have the user provide the code to the bad guys.¹² This has led to calls that the security minded move from SMS to other methods.¹³

Server-based authentication with a token

For environments where additional security is required (financial services, accounting and others who might be targeted with potential greater risks), the use of a separate security device, often in a design to fit in with keys (keyfob token) or credit cards (credit card token), began to rise.

Twenty-five years ago, Security Dynamics¹⁴ introduced a system called SecureID,¹⁵ part of a system known as ACE/Server.¹⁶ Key to the

process was the SecureID device carried by users. It came in different form factors, including a small key fob, a credit sized “standard card” or a PINPad. Each looked a bit like a clock, with a screen displaying a code that updated frequently on it (so even if someone saw the code, it would likely have changed by the time they went to enter it). EY and other CPA firms used these



for additional security in the days before we all carried smart phones. While these are still in use, virtual versions, known as a soft token app, grew in popularity for their convenience.

The special code was generally generated based on an agreement of the time between the device and the service (producing a time-based one-time password, or “TOTP”) or based on the hash of the previous password (sounding a lot like blockchain’s foundation, a hash-based message authentication code (HMAC)-based one-time password, or “HOTP”). In either case, both are based on secret algorithms and, in a 2011 cyberattack, there was a leak of some of those secrets. At the time, there were 40 million of the hardware tokens and 250M users of the mobile software.¹⁷ In 2021, 10 years having passed and non-disclosure agreements lapsed, many RSA executives bound by non-disclosure agreements have come out to tell the story of the experience.¹⁸

Dedicated authentication software

Microsoft, Google and others now offer dedicated authentication software that can run on your various devices. Along with the ability to display a time-based, one-time password for the user, they themselves can communicate the OTP with servers autonomously to authorize a connection. For example, when I need to access the resources at Bryant University using my laptop, such as my email or my class schedule, it sends a signal to my Microsoft Authenticator on my mobile device, which I can authorize or ignore. On my mobile device, it works seamlessly, so I don’t have to go through the second action of having to click a few buttons to authorize the use. Google Authenticator is another option, and can work with Office 365 with the right settings.¹⁹ Likewise, Microsoft Authenticator can be used with Google’s product suite.²⁰

YubiKey and physical security keys

Physical security keys offer a level of security and flexibility beyond that of a software authenticator. Having mentioned the work of the FIDO Alliance previously, the development of Universal 2nd Factor (UTF) means you can access any number of online services using a single security key instantly and with no need for loading drivers or special software.²¹ As long as the service is compatible with FIDO and UTF,²² access is a snap, in theory. Unlike a password or authentication app, delegating access to someone else is as easy as handing them a copy of your key. Making multiple keys is simple at setup, and very difficult afterwards.

While the Google Titan security key and other third parties are in the market, YubiKey from Yubico²³ is an acknowledged leader in the field. Services that support the YubiKey include the major platforms from Microsoft, Google and Amazon; social media sites Reddit and Twitter; and cryptocurrency exchanges Coinbase and Binance.²⁴

To provide a review of the YubiKey, I received two of the different models in the YubiKey 5 series.

Obviously, there is no keyhole in your devices – only USB-A (older “desktop” USB), USB-C (the newer oval shaped port) and Lightning (common to iPhones and iPads). While Bluetooth is not available for YubiKey, NFC (near-field communication, available on most Android phones) is available.

Testing on a laptop with USB-C, an iPad with Lightning and two Android phones (each with NFC, one with micro-USB and one with USB-C), I tested two units, each of which looks a bit like a flash drive:

- YubiKey 5Ci: works with USB-C and Lightning (so, laptop and iPad).
- YubiKey 5C NFC: works with USB-C and NFC (so, laptop and Android through NFC).

There are also keys with higher levels of security, including additional biometric checks.



For my own safety, I will not name the accounts for which I tried to set up the YubiKey. The online instructions on how to set up the key for each service was complete, but the process was not always intuitive. You go to the service you wish to associate with the key; find the security settings page; find the option to associate a security key; and follow the instructions to insert the key and tap the device. Part of the challenge is that the services themselves may have only partially adopted the standards on which the YubiKey

is based. In particular, mobile versions/Apps may be behind desktop adoption. If I access the service on my iPad through the App, it uses the traditional security, but on the same device, through a browser, it requires the YubiKey.

Once the setup is done, accessing the service with the key is relatively painless. When you go to log in, you are prompted to insert the key or place it near the NFC receiver. A light on the device will start to blink, indicating you need to interact with the device – by putting your finger on a gold disk in the middle of the key (5C NFC), or metal bumps on the side of the key (5Ci). After being plugged in and tapped, it does the rest for you.

For those of us who enjoy the convenience of any device, anywhere, having to keep a key at hand appropriate to your device is a bit of an inconvenience, but so is dealing with the “robust” passwords suggested by password managers as you move between devices. There is more of a learning curve in the setup than I anticipated. When you read about account takeovers, however, and the problems people have with other methods, these durable units that require no batteries have a bright future as long as services support them. Few financial institutions do at this point in time.

What's Next on the Horizon?

Where do we go from here? How do we get past the compromises between confidence and convenience? How do we get past the groups that say global identity systems will make all of this go away, while others are concerned that global identity systems will be misused and cause far more problems than they are worth?

In the future, private and public key technology could be used as part of facilitating the secure exchange of configuration and credential data between multiple user devices and provide end-to-end security.

My own exploration into this area began with the early days of XBRL, as we wanted to consider how to bring the auditor's report into the electronic age and have a trustworthy auditor's signature on the report. In my collaboration with groups like the World Wide Web Consortium on digital signatures and XML encryption, I had the opportunity to meet a gentleman named Phillip Hallam-Baker.²⁵ Our names jointly appear on W3C XML security standards.²⁶

Catching up with Phillip a few years ago, he told me that he was working on an idea called "The Mathematical Mesh."²⁷ He told me that, in his dealings with Sir Tim Berners-Lee²⁸ (known as the "inventor" of the World Wide Web), Sir Tim had tasked him with coming up with a better answer to accessing web resources than logins and passwords, but only 25 years later was he able to get around to it. In his vision, private and public key technology (as used in blockchain and cryptocurrencies) would be used as part of facilitating the secure exchange of configuration and credential data between multiple user devices and provide end-to-end security.²⁹

Where the Mathematical Mesh will go is a good question. What is obvious is that, if cryptocurrencies continue to grow in popularity, the need to efficiently deal with wallets and keys, as well as with online accounts, will amplify the demand for safe and user-friendly tools.

Final Thoughts

Twenty-five years ago, our information and accounts began migrating to the World Wide Web in earnest. Password requirements expanded from allowing MyCatFluffy to looking like a stream of epithets from Mad Magazine ("#\$5-66yY-@Tty") and access to accounts required having the account holder's text or email to login. Google and others tell us that even that's not enough. Why can't we just put the car in the ignition and move forward? And does the demand for the convenience to start the car remotely mean the key needs to move back to the phone?

Whichever direction this goes, tools like Yubico's YubiKey may be an important part of the solution.

- ¹ <https://workos.com/blog/a-developers-history-of-authentication>.
- ² <https://fidoalliance.org/overview/> - FIDO stands for “Fast IDentity Online”.
- ³ <https://fidoalliance.org/what-is-fido/>.
- ⁴ <https://www.nist.gov/identity-access-management>.
- ⁵ <https://haveibeenpwned.com/>.
- ⁶ <https://plaid.com/how-it-works-for-consumers/>.
- ⁷ Along with giving someone else your password, which you should never do, a different abuse of the relationship was evidenced in a recent class action lawsuit, resulting in a \$58 million settlement about data privacy issues. <https://fingfx.thomsonreuters.com/gfx/legaldocs/dwprkgbdrvm/Plaid%20settlement%20memo.pdf>.
- ⁸ <https://www.rsa.com/content/dam/en/data-sheet/rsa-securid-hardware-tokens.pdf>.
- ⁹ <https://docs.microsoft.com/en-us/azure/active-directory/user-help/user-help-auth-app-overview> See also Google Authenticator at <https://www.google.com/landing/2step/>.
- ¹⁰ <https://help.coinbase.com/en/coinbase/getting-started/getting-started-with-coinbase/2-factor-authentication-2fa-faq>.
- ¹¹ <https://www.techrepublic.com/article/two-factor-authentication-cheat-sheet/>.
- ¹² <https://krebsonsecurity.com/2021/09/the-rise-of-one-time-password-interception-bots/>.
- ¹³ <https://www.pcmag.com/opinions/leave-sms-authentication-behind-get-an-authenticator-app>.
- ¹⁴ <https://www.youtube.com/watch?v=Luqi12VWB3o>.
- ¹⁵ https://en.wikipedia.org/wiki/RSA_SecurID.
- ¹⁶ http://media.corporate-ir.net/media_files/NSD/RSAS/ar_1997.pdf.
- ¹⁷ <https://www.cnet.com/tech/services-and-software/rsa-cyberattack-could-put-customers-at-risk/>.
- ¹⁸ <https://www.wired.com/story/the-full-story-of-the-stunning-rsa-hack-can-finally-be-told/>.
- ¹⁹ <https://docs.microsoft.com/en-us/microsoft-365/admin/security-and-compliance/set-up-multi-factor-authentication?view=o365-worldwide>.
- ²⁰ <https://support.microsoft.com/en-us/account-billing/add-non-microsoft-accounts-to-the-microsoft-authenticator-app-7a92b5d4-d6e5-4474-9ac6-be0b6773f574>.
- ²¹ <https://www.yubico.com/authentication-standards/fido-u2f/>.
- ²² <https://www.ftsafe.com/article/620.html>.
- ²³ <https://www.yubico.com/>.
- ²⁴ <https://www.yubico.com/works-with-yubikey/catalog/?series=3&sort=popular>.
- ²⁵ https://en.wikipedia.org/wiki/Phillip_Hallam-Baker.
- ²⁶ <https://www.w3.org/TR/xmlenc-core1/>.
- ²⁷ <https://mathmesh.com/>.
- ²⁸ https://en.wikipedia.org/wiki/Tim_Berners-Lee.
- ²⁹ <https://www.ietf.org/id/draft-hallambaker-mesh-cryptography-08.html>.

How XBRL Data Can be Used for Macro-Analysis

By Phil Gaiser, CPA, CMA



Phil Gaiser is the Chief Financial Officer for Beaumont Select Corporations Inc., a former publicly traded investment company. Beaumont was one of the first companies to publish their IFRS financial statements in XBRL format, starting in 2012. He has been working with XBRL for a number of years, and has published an app to the Google Play store that analyzes SEC financial statements. Phil is a Chartered Professional Accountant and a graduate of Western University's Ivey School of Business.

You've probably seen the common headline, something along the lines of "S&P earnings up 10%." It's something that most of us take on faith, simply because there is no data provided, and not something that many of us can or will, in fact, check. That would mean going through 500 financial reports, making a detailed spreadsheet, and then updating it frequently. Sounds easier just to accept the headline.

But in the past 10 years, the financial performance of the stocks in the Standard and Poor's (S&P) 500 index of listed companies has been filed with the SEC in a format called Extensible Business Reporting Language (XBRL). XBRL is intended to produce computer-readable financial statements and, with a bit of work, it should be possible to copy the data into a database.

So, the question becomes: Could XBRL be used to see what is happening across these 500 companies, and maybe glean some insights that haven't been published yet? Let's see how that might work.

As each of the 500 companies in the S&P 500 index publish four reports annually, we have 2,000 reports to deal with each year. And, if the data is to be examined in aggregate, it makes sense to write some software to import this data into a database.

The XBRL financial statements are available on the SEC web site and consist of a series of up to six files, depending on the purpose. For example, one file will contain all the items and data, another will show how it is to be presented (ie current assets before total assets), and another will show how the data is to be calculated (ie current assets are added to total assets). Each one of these files is in XML format and there is some software available for reading files of this format. For this project we needed just the file with all the items and data. We wrote a couple of programs in Java that read through this file, determined the elements and its value and date, and stored that into a database.

The Challenges to Analysis

Once that was done we still had a number of challenges to overcome. They include the following:

How comparable is the data? To answer this question, we must compare and aggregate all the data to ensure that companies are using consistent currencies and XBRL elements. If we look at

the element “Assets,” all 500 companies have stated a value for this within their last XBRL statements. But, looking at the element “Liabilities,” there are 161 companies that do not use this term. Companies such as Accenture will provide values for “Liabilities-Current” and “Liabilities-Noncurrent,” but not a total amount for the two. So, for the terms where values are missing, those will need to be calculated.

At other times, there will be a need to look at more than one element name. For instance, 237 of the 500 companies use the XBRL tag “Revenues.” There are 277 that use the tag “RevenueFromContractWithCustomerExcludingAssessedTax,” 44 use “RevenueFromContractWithCustomerIncludingAssessedTax,” and nine use “OperatingLeasesIncomeStatementLeaseRevenue.” If you are quick with math, that totals 567 companies. That means that some will use two or three terms, so they need to be gathered in a particular order to ensure that every company has a revenue amount.

When does the fiscal year end? To make comparisons easy, it would be nice to see that all the financial years end on the same date, expected to be December 31. But, of the 500, 361 match the calendar year with the fiscal year, with the remaining 139 scattered over 38 other possible year-end dates.

How long is a fiscal quarter? It seems like a stupid question, as there are 12 months in a year, and three months in a quarter. What is less obvious is that the number of days can vary, and not just for leap years. The first three months of the year have 90 days (sometimes 91), the second quarter has 91, and the third and fourth quarters have 92 days each. If revenue grew two percent between the first and third quarters, is that really growth at all, or just a couple of extra days?

Some companies attempt to use a consistent number of weeks in an attempt to be more comparative. Consider the explanation from Apple:

The Company’s fiscal year is the 52- or 53-week period that ends on the last Saturday of September. A 14th week is included in the first fiscal quarter every five or six years to realign the Company’s fiscal quarters with calendar quarters. The Company’s fiscal years 2020 and 2019 span 52 weeks each. Unless otherwise stated, references to particular years, quarters, months and periods refer to the Company’s fiscal years ended in September and the associated quarters, months and periods of those fiscal years.

They are trying to take the year and divide into consistent quarters, each consisting of 13 weeks, or 91 days. That leaves an extra day or two per year to deal with, which they adjust every five or six years. This last happened in 2017, when their first quarter was 97 days long. It caused an alarm in the first quarter of 2018, when sales fell 4.5%. This, however, was not surprising when the duration of the quarter fell 6%.

So how about years? Are they comparable? Well, no. Of the 500, 389 have a 365-day year. Twenty-five had a 370-day year, 50 at 363, and 35 at 364.

We have challenges slicing across the various elements and periods, but analysis can be done. If we start with the cleanest element of all – Assets – what do we get?

GICS Sector	2021 Q3	2020 Q3	Change \$	Change
Communication Services	2,633,339,940,000	2,452,815,649,000	180,524,291,000	7.36%
Consumer Discretionary	2,068,736,248,000	1,899,245,430,000	169,490,818,000	8.92%
Consumer Staples	1,359,796,612,000	1,355,812,647,000	3,983,965,000	0.29%
Energy	1,351,653,028,000	1,297,994,199,000	53,658,829,000	4.13%
Financials	25,101,038,710,000	22,663,426,506,000	2,437,612,204,000	10.76%
Health Care	5,676,659,355,000	5,395,631,644,000	281,027,711,000	5.21%
Industrials	2,245,291,965,000	2,209,888,226,000	35,403,739,000	1.60%
Information Technology	2,680,653,763,000	2,452,626,596,000	228,027,167,000	9.30%
Materials	739,637,606,000	701,132,967,000	38,504,639,000	5.49%
Real Estate	640,764,656,000	585,726,017,000	55,038,639,000	9.40%
Utilities	1,626,763,340,000	1,556,519,049,000	70,244,291,000	4.51%
Grand Total	43,281,541,739,000	39,809,552,563,000	3,471,989,176,000	8.72%

So, all sectors in the S&P 500 have grown in assets, with an average increase of 8.7% over the 12-month period, with the 500 companies combined adding \$3.472 trillion to their growth. But, while all sectors overall increased their assets, 108 companies saw their assets decrease by a combined \$321 billion. While there is no key industry that decreased, nine of the top 10 increases occurred in the finance sector, led by JP Morgan, whose assets grew by \$511 billion.

Looking at equity, we find that two possible elements are needed to gather the full list. The first element "StockHoldersEquity," is used by 460 companies, while the remainder have chosen the element "StockHoldersEquityIncludingPortionAttributableToNoncontrollingInterest."

GICS Sector	2021 Q3 Equity	2020 Q3 Equity	Change	Percent
Communication Services	1,035,552,914,000	970,164,985,000	65,387,929,000	6.74%
Consumer Discretionary	463,393,310,000	370,663,003,000	92,730,307,000	25.02%
Consumer Staples	412,313,771,000	392,681,511,000	19,632,260,000	5.00%
Energy	585,508,987,000	561,314,926,000	24,194,061,000	4.31%
Financials	2,892,776,791,000	2,690,203,123,000	202,573,668,000	7.53%
Health Care	986,189,718,000	898,724,086,000	87,465,632,000	9.73%
Industrials	568,315,221,000	520,116,870,000	48,198,351,000	9.27%
Information Technology	961,441,613,000	857,398,622,000	104,042,991,000	12.13%
Materials	303,116,734,000	271,838,860,000	31,277,874,000	11.51%
Real Estate	245,774,416,000	226,328,862,000	19,445,554,000	8.59%
Utilities	432,870,307,000	416,086,445,000	16,783,862,000	4.03%
Grand Total	8,887,253,782,000	8,175,521,293,000	711,732,489,000	8.71%

Here we find a near identical overall percentage change in equity as in assets – 8.7%. But this is overall; some sectors had higher increases in equity, while others saw lower increases. The Consumer Discretionary sector's equity gained 25%, while raising assets by less than 9%; 40% of

the sector growth came from Amazon, which had a combination of additional retained earnings and additional paid-in capital. Of Amazon’s \$37.8 billion increase in Shareholders’ Equity, \$26.2 billion came from earnings and \$11.6 billion came from paid-in capital. All equity was issued as part of stock-based compensation and the employee benefit plan.

Taking a look at the various income statement items adds an extra degree of difficulty, as now we must pay attention to the start date and end date for those statements. After all, nine-month statements will show both the three and nine months ending on the same date and, when we take this together with the differing year ends, we cannot determine what has been published in the latest quarter.

Looking at revenue, we know that there will be three different XBRL elements that need to be gathered, depending on which one is utilized by each of the 500 companies. And here we will look at periods of 99 days or less, to capture the different-sized fiscal quarters. Note that, for fourth quarters, companies rarely show fourth-quarter specific data, so many will not have anything to present.

Given these criteria, there are 417 companies that had comparable data for the third quarter.

GICS Sector	2021 Q3	2020 Q3	change	Percent
Communication Services	274,525,674,000	236,212,391,000	38,313,283,000	16.22%
Consumer Discretionary	414,587,331,000	368,797,290,000	45,790,041,000	12.42%
Consumer Staples	351,914,820,000	340,911,798,000	11,003,022,000	3.23%
Energy	272,931,571,000	156,661,305,000	116,270,266,000	74.22%
Financials	271,760,741,000	242,166,683,000	29,594,058,000	12.22%
Health Care	557,483,082,000	496,335,164,000	61,147,918,000	12.32%
Industrials	311,609,583,000	261,920,523,000	49,689,060,000	18.97%
Information Technology	231,239,896,000	198,767,433,000	32,472,463,000	16.34%
Materials	95,323,272,000	74,022,034,000	21,301,238,000	28.78%
Real Estate	30,803,473,000	26,430,155,000	4,373,318,000	16.55%
Utilities	82,169,980,000	74,348,211,000	7,821,769,000	10.52%
Grand Total	2,894,349,423,000	2,476,572,987,000	417,776,436,000	16.87%

We can see that the S&P 500 companies came out of the Covid economy on a solid basis, increasing their revenue by about a billion dollars per company. The notable powerhouse was the energy sector, with all companies in that sector showing a positive increase on the back of rising crude and natural gas prices.

But does this increase in revenue translate to increasing profits? Here we again look at the latest quarter (Q3), and focus on two XBRL elements: “NetIncomeLoss” (405 records) and “NetIncomeLossAvailableToCommonStockholdersBasic” (47 records).

GICS Sector	2021 Q3	2020 Q3	change	Percent
Communication Services	51,563,241,000	34,889,860,000	16,673,381,000	47.79%
Consumer Discretionary	29,378,891,000	23,486,711,000	5,892,180,000	25.09%

Consumer Staples	22,114,462,000	25,835,356,000	(3,720,894,000)	-14.40%
Energy	23,173,457,000	(8,302,920,000)	31,476,377,000	-379.10%
Financials	79,493,991,000	81,154,323,000	(1,660,332,000)	-2.05%
Health Care	65,312,100,000	39,413,979,000	25,898,121,000	65.71%
Industrials	31,586,603,000	9,908,380,000	21,678,223,000	218.79%
Information Technology	55,873,243,000	39,568,673,000	16,304,570,000	41.21%
Materials	10,955,468,000	5,456,170,000	5,499,298,000	100.79%
Real Estate	6,965,121,000	2,699,351,000	4,265,770,000	158.03%
Utilities	10,183,447,000	11,143,631,000	(960,184,000)	-8.62%
Grand Total	386,600,024,000	265,253,514,000	121,346,510,000	45.75%

With only three of the 11 sectors seeing a decline in profits, the additional revenue did indeed boost profits overall substantially. The largest dollar increase was the \$7.7 billion improvement at Google, while the largest decrease was seen at Berkshire Hathaway (\$19.7 billion decrease).

There has been quite a bit of press coverage about supply chains and how they will affect inventory. Are the S&P 500 companies having trouble keeping inventory on their balance sheets? Here, we look at the XBRL Element "InventoryNet." The XBRL Taxonomy has elements for a few types of inventory (raw materials, work in process), but the most used is "InventoryNet," with a few companies using "InventoryFinishedGoodsNetOfReserves." What we find first is that only 300 of the 500 companies hold inventory, including many consumer-discretionary companies such as Ebay, Etsy and Facebook holding no inventory at all. Seventy-seven companies had a reduction in inventory, while Amazon, Walmart and Home Depot had a combined \$19.3 billion increase in inventory.

GICS Sector	2021 Q3	2020 Q3	change	percent
Communication Services	10,176,405,000	9,692,150,000	484,255,000	5.00%
Consumer Discretionary	180,315,173,000	141,665,689,000	38,649,484,000	27.28%
Consumer Staples	141,256,651,000	126,931,479,000	14,325,172,000	11.29%
Energy	41,702,891,000	39,307,047,000	2,395,844,000	6.10%
Financials	20,191,000,000	19,361,000,000	830,000,000	4.29%
Health Care	156,188,544,000	148,112,209,000	8,076,335,000	5.45%
Industrials	106,761,811,000	97,272,985,000	9,488,826,000	9.75%
Information Technology	75,061,866,000	64,124,864,000	10,937,002,000	17.06%
Materials	52,474,543,000	46,517,707,000	5,956,836,000	12.81%
Real Estate	499,000,000	411,000,000	88,000,000	21.41%
Utilities	7,271,000,000	6,207,000,000	1,064,000,000	17.14%
Grand Total	791,898,884,000	699,603,130,000	92,295,754,000	13.19%

So, all sectors increased their inventory, with the bulk of the increase coming in the Consumer Discretionary sector. Note that some of the sectors are light in the data collected, as Berkshire Hathaway is the only company in the Financials sector. The Real Estate sector has only one company as well – Weyerhaeuser.

Some companies in the Energy sector increased their inventory value without necessarily holding more goods. As stated in the Exxon filings:

Crude oil, products and merchandise inventories are carried at the lower of current market value or cost, generally determined under the last-in first-out method (LIFO). The Corporation's results for the third quarter of 2020 included a before-tax credit of \$153 million, as rising prices reduced the charge against the book value of inventories. This adjustment, which is included in "Crude oil and product purchases", together with a market adjustment to inventory for equity companies included in "Income from equity affiliates", resulted in a \$113 million after-tax credit to earnings (excluding noncontrolling interests) in the third quarter of 2020.

While commodity prices can have an effect on inventory, it doesn't explain the majority of this list. Supply chains have tightened because of increased demand, but the large corporations of the world continue to get the goods they ask for. And, given rising sales and profits, these large companies are asking for more.

Turning to the cash-flow statement, we find only 47 companies that show cash flow for a three-month period ending around September 2021. If we widen the search to a longer period, in this case more than 260 days (to capture 9-month statements), we produce 384 with comparable numbers to 2020.

GICS Sector	2021 Q3	2020 Q3	change	percent
Communication Services	229,850,579,000	183,304,807,000	46,545,772,000	25.39%
Consumer Discretionary	108,922,614,000	100,532,291,000	8,390,323,000	8.35%
Consumer Staples	59,572,685,000	51,611,688,000	7,960,997,000	15.42%
Energy	111,250,825,000	49,511,521,000	61,739,304,000	124.70%
Financials	203,218,816,000	80,675,072,000	122,543,744,000	151.90%
Health Care	213,781,308,000	169,428,477,000	44,352,831,000	26.18%
Industrials	102,959,544,000	67,537,167,000	35,422,377,000	52.45%
Information Technology	268,958,175,000	221,130,925,000	47,827,250,000	21.63%
Materials	43,470,702,000	35,844,740,000	7,625,962,000	21.27%
Real Estate	32,102,803,000	26,805,038,000	5,297,765,000	19.76%
Utilities	52,493,518,000	59,702,593,000	(7,209,075,000)	-12.07%
Grand Total	1,426,581,569,000	1,046,084,319,000	380,497,250,000	36.37%

Not surprisingly, cash flow from operations has grown along with net profits. Even with more cash consumed for greater inventories, cash flow jumped substantially. Utilities appears to be the outlier, with only 12 of the 27 reporting entities showing a positive change. The largest decrease in the utilities sector – Atmos Energy Corp – provides a reason in their notes:

A historic winter storm impacted supply, market pricing and demand for natural gas in our service territories in mid-February. During this time, the governors of Kansas and Texas each declared a state of emergency, and certain regulatory agencies issued emergency orders that impacted the utility and natural gas industries, including statewide utilities

curtailment programs and orders encouraging or requiring jurisdictional natural gas utilities to work to ensure customers were provided with safe and reliable natural gas service.

Due to the historic nature of this winter storm, we experienced unforeseeable and unprecedented market pricing for gas costs, which resulted in aggregated natural gas purchases during the month of February of approximately \$2.3 billion. These gas costs were paid by the end of March 2021.

This would not be the only S&P Utility to suffer the same fate.

If cash flow from operations went up, was less cash needed from financing operations?

GICS Sector	2021 Q3	2020 Q3	change	percent
Communication Services	(77,969,966,000)	(53,597,907,000)	(24,372,059,000)	45.47%
Consumer Discretionary	(31,830,521,000)	50,495,505,000	(82,326,026,000)	-163.04%
Consumer Staples	(54,475,393,000)	(23,714,551,000)	(30,760,842,000)	129.71%
Energy	(80,098,276,000)	9,587,491,000	(89,685,767,000)	-935.45%
Financials	558,382,152,000	1,280,186,941,000	(721,804,789,000)	-56.38%
Health Care	(96,401,640,000)	(19,083,974,000)	(77,317,666,000)	405.14%
Industrials	(68,131,381,000)	53,596,109,000	(121,727,490,000)	-227.12%
Information Technology	(173,953,882,000)	(134,900,745,000)	(39,053,137,000)	28.95%
Materials	(29,028,852,000)	(2,782,157,000)	(26,246,695,000)	943.39%
Real Estate	8,161,852,000	(1,891,460,000)	10,053,312,000	-531.51%
Utilities	24,008,762,000	21,835,707,000	2,173,055,000	9.95%
Grand Total	(21,337,145,000)	1,179,730,959,000	(1,201,068,104,000)	-101.81%

Absolutely, the S&P 500 went from a consumer of financing to a provider, changing by \$1.2 trillion. More than half of this change came from the finance sector, which incurred the top six decreases. In the case of JP Morgan, the change was due to taking in fewer deposits than the year before. Boeing, in the industrials sector, made a \$33.5 billion reversal and repaid more in 2021 than it borrowed. Whether or not their plane troubles are over is unknown, but it appears that financing is not a problem.

The final cash-flow category is cash for investing activities.

GICS Sector	2021 Q3	2020 Q3	Change	percent
Communication Services	(159,832,564,000)	(114,276,469,000)	(45,556,095,000)	39.86%
Consumer Discretionary	(84,859,967,000)	(82,896,615,000)	(1,963,352,000)	2.37%
Consumer Staples	(5,787,159,000)	(10,581,608,000)	4,794,449,000	-45.31%
Energy	(16,904,148,000)	(52,529,075,000)	35,624,927,000	-67.82%
Financials	(393,465,670,000)	(765,468,966,000)	372,003,296,000	-48.60%
Health Care	(97,733,376,000)	(127,373,041,000)	29,639,665,000	-23.27%
Industrials	(43,804,044,000)	(42,628,661,000)	(1,175,383,000)	2.76%
Information Technology	(101,443,810,000)	(71,019,963,000)	(30,423,847,000)	42.84%

Materials	(14,821,111,000)	(11,061,594,000)	(3,759,517,000)	33.99%
Real Estate	(39,157,143,000)	(14,677,270,000)	(24,479,873,000)	166.79%
Utilities	(74,689,429,000)	(69,956,817,000)	(4,732,612,000)	6.77%
Grand Total	(1,032,498,421,000)	(1,362,470,079,000)	329,971,658,000	-24.22%

There is no doubt that the S&P 500 companies are continuing to invest, with seven of 11 sectors increasing investment as the economy expands and shakes off its pandemic woes. The overall decrease came from the finance sector as JP Morgan purchased fewer securities than last year.

Promise Fulfilled

XBRL does (eventually) deliver on its promise to be machine readable. With this feature alone it means that simple and complex analysis can be done right from the XBRL files. Coupled with a database to allow for faster retrieval over multiple companies, it becomes easier to make corporate and industry comparisons. However, the lack of software available to move files on the SEC web site into the accountant friendly excel format will restrict its usage for a while.

Standardization of terms used for the same elements is a bit of a challenge, but not insurmountable. The taxonomy of terms has reached the point where there is little need for extensibility; instead, there is often a choice between two or more suitable terms. But, with all the technology now available, usage and refinement should get us to the point where it becomes trivial to compare multiple financial statements. Hopefully this happens soon.

○

Mining Data Assets

By Mark O'Connor, CPA, CMA



Mark has more than 30 years of experience in Financial Management, technology developments and change management. Qualified as a CPA, CMA with the office of the Auditor General of Canada and advanced to senior executive, where he designed and architected the first electronic audit briefcase called AuditPro. He implemented auditor team use of technology tools including IDEA, a data extraction tool of client databases and accounting records. He advised State Chief Audit Officers world-wide and shared implementation of the auditors' toolsets and methodology. After leaving the Government of Canada as an employee, he expanded his experience into the banking and high-tech sectors while founding the private business consulting practice Multi-Access Systems Ltd.

Data Whispering

Taming and harnessing corporate data assets can be a challenge for business data workers. Data scientists and other data whisperers can be used to train the data for use by artificial intelligence and analytics to make better business decisions. Data whisperers can prepare the data to be used for artificial intelligence, analytics and drive better business decisions.

Any business leader with data analysis and IT resources (the Data Whisperers' ¹ team), can now unlock, cleanse and harvest business data to drive the reporting, execution and control of operations. The data science needed is becoming more available through new modern applications, such as Power BI, that can look and perform a lot like a smart spreadsheet. Ironically, data assets – often a priceless treasure – do not have a monetary value that has to be reported on the balance sheet. Data is not alone in this respect. Other digital assets or business capabilities share the same balance sheet recognition anomalies.

Data is stored in business applications and in associated business processes. Some applications provide the option to export data, and some applications already use Business Intelligence (BI) to have readily available data. To make periodic extractions, IT can establish scheduled

¹ An analogy in this is to succeed in gaining control of data and adding value. The term is derived from how a practitioner can understand the psychology and soul to mold or gain control and appear to succeed in achieving dominance.

downloads of data. To create more added value, and make data extractions more widely shareable, catalogues could be created, combining the data extracted with other data and repurposing it to create new data assets. These data assets can also be profitably used in improving the basis for management decision making.

Extracted data can be organized, stored, and combined into Data Warehouses (DW). These data containers are used for BI reporting activities and are sometimes developed into Data Lakes of raw data for *ad hoc* analytics. Data warehouses are fundamentally used to read only snapshots of data. The standard is that they should not be edited directly. Though process workflow can be established to perform systematic edits of the applications.



DW data containers are forming the basis of AI processes and proving to be highly accessible for reporting and use in self-serve systems. Without effective Data Warehouses, corporate data value can be buried permanently in corporate application silos. In applications, this data is not always designed for high availability and frequent use. IT applications are often not integrated with other activities, difficult to use, not be available to business users and the data whisperers for deep understanding. Data Warehouses are maturing and becoming more complete and more accurate. Therefore, these data containers are becoming the single source of truth for business and customer queries.

A Priceless Asset or a Liability?

IT applications that are antiquated, with mostly manually processes, minimal or no automation, low functionality and poor vendor support can easily become a liability and a technical debt. Pulling data together and linking it by relationships, on the other hand, will add value to the assets and stave off technical debt. This value – good or bad will – not, however, be consistently and clearly disclosed on the balance sheet under current accounting principles. But the value of data can be represented as part of capitalizing an IT system asset or, indirectly, as an intangible asset on the balance sheet. This can also be done when a company has been sold and if the new market price exceeds book value.

Data Warehouses are maturing and becoming more complete and more accurate.

A key to success in building a Business Intelligence Data Warehouse or designing Artificial Intelligence processes is to fully understand the data and data relationships as well as ensure the quality, integrity, completeness and organization of the data. To gain competitive advantage with BI or AI, the quality of the data must be also at an appropriate degree of granularity.

With Intelligence

The “intelligence” part of BI and AI can suggest using meaningful comparisons to other industry participants to facilitate and improve the understanding of your own business. External reference data can be paired with corporate data to factor in business environment influencers such as weather event history or predictions, demographics, seasonal variations, supply shortages or anomalies, regulation, public health,² and politics.

BI is used to illustrate such business comparisons, to dashboard key indicators, to monitor controls and to bring a better understanding of customers, stakeholders and the market. It can highlight the efficacy of business operations and new strategies. Artificial Intelligence can use high-quality data to drive business operations and processes.

How data is being used to drive decisions factors into the degree of quality assurance that is required. Having meticulous AI data for this purpose is critical. While financial statement audit opinions may provide assurance of quality for reporting on financial statements, they may not be granular or precise enough for making operational decisions.

Data management tools and BI visualizations can be helpful in remediation, cleansing and establishing a quality data foundation of data and metadata.

Precision

In the case of executing machine learning (ML) processes, guiding rules or algorithms³ are part of a set of automation processes. Algorithm workflow is used to categorize transactions, make precise calculations and solve problems.

For some data environments, attaining acceptable data quality can be difficult without the help of highly skilled data scientists, data stewards, IT analysts and data whisperers who also have deep business operations knowledge. The science of data can be complicated and labour intensive. Preparing and staging data to be “fit for use” is important. The knowledge gained from exploring the data science can help make a difference.

Depending on data strategies and available resources, doing data analysis and cleansing the data at the same time can be the most effective approach to making efficient use of data over the long term. For at least the critical and highest valued data assets, the basis, foundation and relationships of the data need to be determined in curating and adding value to those data assets. Once a data asset or group of assets have been uncovered, cleansed and sequentially catalogued, they can be reported through BI and re-purposed to drive AI-based processes.

² Nextstrain is an open-source project to harness the scientific and public health potential of pathogen genome data. It provides a continually updated view of publicly available data alongside powerful analytic and visualization tools. (<https://nextstrain.org/>).

³ For example, a robotic corrective algorithmic rule to solve a data element quality issue that might cause significant inaccuracy or incompleteness. The automated rule, sometimes called a “Bot,” could retrieve a new quantity from some specified location and replace the data element with something that is more appropriate.

Data management tools and BI visualizations can be helpful in remediation, cleansing and establishing a quality data foundation of data and metadata. The data should be well documented to be effectively shared. Concepts and categories applicable to the subject area should indicate data properties, relationships, information flows and ontologies of data.⁴ This is the soul of the business.

Data Discovery

Safeguarding a business's data assets inventory (its catalogue) opens the door to having the right people discover company or industry data at the right time. The catalogues can be useful to help maintain and secure the data, as well as standardize metadata to facilitate discovery.⁵ Many AI projects fail when this is not properly in place. As companies expand and mature and realize the value of their own data assets, they are, or will be, in a position to leverage this information for BI and AI.

When data is intended some governments and catalogue, or available samples of can be used for market reference sources, for trading between

The data samples and to closed or open over a data catalogue is and ensure privacy. Not any part of the data, secret national privacy.

For some datasets, redacted, by way of



to be widely shared, as seen with industry associations, the metadata,⁶ should also have the data records. The datasets studies and information example, in resource commodity countries.

the data itself can be distributed groups. Creating access controls essential to secure information everyone should see the data or especially when it comes to, say, interests, market competition or

parts of the data could be implanted field-specific

⁴ The documentation or metadata should contain an information architecture framework, sometimes called an ontology. Ontology is a complex word and may be too complicated given that business has a long history in philosophy, in which it refers to the subject of existence. An ontology for data can be defined as an explicit methodical description or the narrative of a conceptualization.

⁵ Data scientists, business managers or data workers need to review their datasets to ensure that they are "fit for use" and to learn about relationships between datasets, ontologies, data taxonomies, associated processes and other metadata.

⁶ Metadata is information about the data, but not the data itself. Metadata is as important as the data. Metadata includes descriptions of data, features, attributes, facets, properties, fields and columns. It can classify and include information regarding legal ownership, the origins of Data/pedigree/lineage and provenance, and required permissions.

encryption⁷ to prevent and block exposures of privacy or secrecy breaches. The bulk or the remaining data set can, however, still be available provided it will not contain referential data that allows the re-creation of the secret or private information.

The Gartner Group has software reviews and recommendations for continuous data assessments of quality.⁸ Organizations wanting to move into more complex data quality management and preparation for data discovery may be interested in:

- [SAP Data Services](#).
- [IBM InfoSphere](#) using [IBM Watson](#).
- [Informatica's Talend](#).
- Cloud-based products such as [Atlan, which](#) can help provide tools that help to ensure quality

Teams Can Produce Intelligence Such as a Data Whisperer

Sophisticated but less complicated data analysis tools are evolving and changing the landscape and use of data. Data discovery, AI and BI should not be the sole purview of technical resources or data scientists. Data management tools and specialist business architect skill sets can be helpful for documenting and explicitly describing the intended flows and ontologies. Powerful tools can help moderate the risks of not using dedicated data scientist resources.

We are learning rapidly and sometimes painfully how to distinguish and discern the quality of data on the web

Microsoft Power BI, for example, can offer the integration of views of internal and external company and data. By using the spreadsheet-like view metaphor, tools can help in providing an initial view under the hood of the existing company data assets, as well as for published external data. The tool's spreadsheet capability can produce a visually high-quality prototype and can employ agile iterations that form the basis of periodic reporting, such as that produced by Tableau or IBM Cognos.

Catalogue Discovery Tools and Metadata Management

An organization's data priorities are often strongly reinforced if a Chief Data Officer (CDO) is installed in the C-Suite. Safeguarding data assets is becoming more of a focal point at the senior levels. Increasingly, companies with a data strategy emphasis are inventorying their data assets into catalogues and building data capabilities to turn data into their advantage. Data is becoming available to staff and external stakeholders via the web. Authorized stakeholders can preview data to determine that it is "fit for use" and can be used to create business iterations and analysis. Being approved for a company's data catalogue implies assurance that the datasets are of top quality, current and ready to be used. Quality is enhanced when users' comments and feedback about the quality of a digital asset are attached to the datasets in

⁷ Encryption of selected fields is not a common technology yet.

⁸ *Gartner Magic Quadrant for Data Quality Solutions*, Published September 29, 2021. ID G00733919.

discovery. While cataloguing data on an enterprise basis is new and growing, it has been quickly evolving through application products that can help provide tools to ensure quality and metadata management.



Some examples of publicly available catalogue discovery tools and metadata management⁹ include:

- [Atlan, which](#) acts as a private virtual hub for data assets ranging from tables and dashboards to models and code.
- [Data World](#) for data discovery, agile data governance and actionable business insights.
- Google and social media have become favourite places (or catalogues) to discover facts (and conspiracy theories) about people, places, food, meds, techniques and things to do. We are learning rapidly and sometimes painfully how to distinguish and discern the quality of data on the web.

Some jurisdictional governments offer data as “Open Data.” Some departmental digital data, including registries, service metrics, national census data, aircraft registries and company stock market financial filings, are free to use. Some of this data is useful in marketing and product development. As well, data obtained from public company annual reporting and

filings is being collected by data aggregators, who then repackage them for sale.

Some externally available data (such as XBRL, an XML standardized structure), comes with fully embedded metadata. It is available for streaming directly into commercial or proprietary trading models that may be used to induce AI and ML-driven automated or semi-automated buy or sell orders. In this same financial reporting and sustainability category, countries and continents are offering portal services. Services such as the US Security and Exchange Commission’s EDGAR, Japan’s EDINET and the European Securities and Markets authority’s ESAP have single points of access for digital data in various formats and for taxonomies such as XBRL and JSON.

It is a noble calling indeed to be recognized as a data whisperer for an organization.

○

⁹ Guido De Simoni, Alan Dayley, Mark Beyer, “Market Guide for Active Metadata Management” (Gartner: July 2021).

Quantum Computing vs. Encryption

By Gerald Trites, FCPA, FCA, CISA
Editor in Chief



Jerry is a retired partner of KPMG, and a retired, tenured Professor of Accounting and Information Systems at a Canadian university. He also served for 12 years as Director of XBRL Canada and has published 12 books and numerous articles and papers.

He is Editor in Chief of ThinkTWENTY20 and has recently published a book on Corporate Financial Reporting on the Internet.

Quantum computing is at the gates and is likely to disrupt our information systems. It is much faster than conventional computing and can handle tasks that are impractical or impossible for conventional computers. While quantum computers have not reached the mainstream yet, the overall consensus is that they will in time. How much time depends on who you talk to, but generally estimates range from five to twenty years. Given the rate of change in the past few years, there is a growing realization that the shorter time span is more likely. Google, IBM, Microsoft and Honeywell already have quantum computers. For an extensive discussion of the quantum computers in place in various industries, see this article from *ISACA Magazine*.¹

As is common knowledge, conventional computers (which include all the desktops, notebooks, laptops and smart phones we currently use along with more traditional computers) are based on a binary numeric system. The smallest of the components are bits, which can reflect one of two states, such as on or off, positive or negative.

Given their speed and power, quantum computers could have a major impact on encryption, which is the backbone of modern IT systems security.

How Does Quantum Computing Work?

Quantum Computing is based on quantum physics, which posits that some things can exist in several different states, even at the same time. It's a field that is counterintuitive for most of us and difficult to understand, yet it has been mathematically demonstrated to be sound. In a technological sense, quantum computing is accomplished through the use of qubits, superposition and entanglement.

¹ Ahmet Efe, PhD, CISA, "Anticipating the Disruptive and Incremental Innovations Brought by Quantum Computing" (COBIT 5 Foundation: *ISACA Magazine*, January 1, 2020). https://www.isaca.org/-/media/files/isacadp/project/isaca/articles/journal/2020/volume-1/anticipating-the-disruptive-and-incremental-innovations-brought-by-quantum-computing_joa_eng_0120.pdf.

Qubits are the smallest of the components in quantum computing, rather like a bit in conventional computing. One suggestion is to “think of a qubit as an electron in a magnetic field. The electron's spin may be either in alignment with the field or opposite to the field. External influences, like a laser beam, can change the electron's spin from one state to another, but if the strength of the charge is sufficient only to stop the spin but not change it then according to quantum law, the particle then enters a superposition of states, in which it behaves as if it were in both states simultaneously. Due to the phenomenon of superposition, the measured particle has no single spin direction before being measured, but is simultaneously in both a spin-up and spin-down state.”²

Enter entanglement, which is a quantum mechanical phenomenon in which the quantum states of two or more objects have to be described with reference to each other, even though the individual objects may be spatially separated. This leads to correlations between observable physical properties of the systems. In a computer, they need to be close together in order to avoid outside influences on their stability.



The state of the particle being measured is decided at the time of measurement and communicated to a correlated particle, which simultaneously takes on the opposite spin direction to that of the measured particle. This is accomplished in an engineering sense by inserting two charged slivers into a silicon slab, all at a micro level, to represent the two correlated particles. To keep them in superposition and entangled,

it is necessary to maintain them in an environment free of all external influences, by freezing them to a very low temperature.

It follows that each qubit utilized, consisting of two correlated particles, could take a superposition of both 0 and 1. Thus, the number of computations that a quantum computer could undertake is 2^n , where n is the number of qubits used. A quantum computer comprising 500 qubits would have a potential to do 2^{500} calculations in a single step; 2^{500} is a huge number – more than all the atoms that exist in the known universe.

To illustrate the speed, “In 200 seconds, the (Google) machine performed a mathematically designed calculation so complex that it would take the world’s most powerful supercomputer, IBM’s Summit, 10,000 years to do. This makes Google's quantum computer about 158 million times faster than the world’s fastest supercomputer.”³

² <https://whatis.techtargget.com/definition/qubit>.

³ <https://medium.com/predict/googles-quantum-computer-is-about-158-million-times-faster-than-the-world-s-fastest-supercomputer-36df56747f7f>.

“Goldman Sachs [recently announced](#) that they could introduce quantum algorithms to price financial instruments in as soon as five years. [Honeywell](#) anticipates that quantum will form a \$1 trillion industry in the decades ahead.”⁴

Given their speed and power, quantum computers could have a major impact on encryption, which is the backbone of modern IT systems security.

The threat of quantum computing to encryption is widely known. But it has not been acted on with much alacrity because of the widespread feeling that quantum computing is far away in the future

Encryption is in Danger

Modern encryption is based on the fact that conventional computers are limited in their ability to solve problems other than in a linear way. They have always had an issue dealing with permutations and combinations, because they need to identify and solve every possible outcome and then compare the result to the desired outcome.

“A particular problem they struggle with is a category of calculation called combinatorics. These calculations involve finding an arrangement of items that optimizes some goal. As the number of items grows, the number of possible arrangements grows exponentially. To find the best arrangement, today’s digital computers basically have to iterate through each permutation to find an outcome and then identify which does best at achieving the goal. In many cases this can require an enormous number of calculations (think about breaking encrypted passwords).”⁵

“Researchers have identified combinatorics problems in banking and finance that might benefit from quantum computing, including portfolio optimization, foreign exchange arbitrage, and credit scoring.”⁶

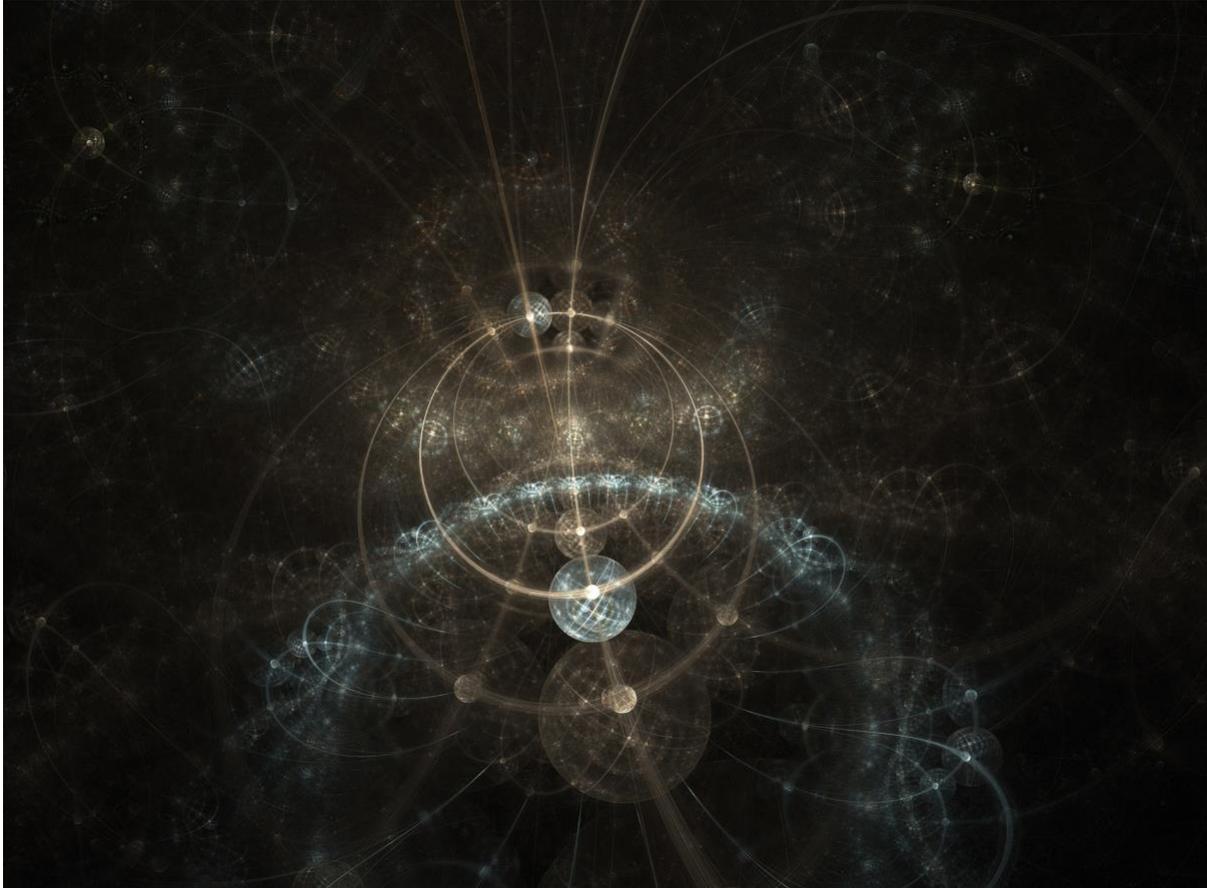
Encryption is a standard technique to protect most systems, particularly mission-critical ones. It’s the norm with banking and other financial systems. In its most basic form, encryption works through the use of encryption keys that, when applied to plain text, yield, through an algorithm, the cipher text, which can’t be read without the key for decrypting it. So, the recipient is sent a decryption key, which is the only key that can decrypt the cipher text. A hacker would need to obtain the decryption key or intercept it when it is sent to the authorized recipient. Interception of keys is an important risk and much effort has been expended to make key transmission secure. Encryption is part of blockchain for its role in public/private keys, and that’s an important role.

⁴ Francesco Bova, Avi Goldfarb and Roger Melko, “Quantum Computing Is Coming. What Can It Do?” (*Harvard Business Review*, July 16, 2021).

⁵ *Op. cit.*, HBR.

⁶ Francesco Bova, Avi Goldfarb¹ and Roger G. Melko, “Commercial applications of Quantum Computing” (*EPJ Quantum Technology*).

Much of the encryption used today can be easily broken with quantum computers. This poses a real challenge for all kinds of computer systems. The World Economic Forum has said that quantum computing could make today's cybersecurity obsolete.



Meeting the Challenges

The threat of quantum computing to encryption is widely known. But it has not been acted on with much alacrity because of the widespread feeling that quantum computing is far away in the future – but the future is coming quickly these days. Given the likely timeframes of events, it is advisable that IT systems managers consider what action they might take today to protect their systems in the future.

“If a fully functioning sufficiently coherent quantum computer becomes available, many files encrypted using current standards would be more easily decipherable. Therefore, if something needs to remain encrypted for many years, the threat that a quantum computer may be available in a decade or two means that it is worthwhile investing in quantum-safe encryption today.”⁷

⁷ *Ibid.*

There are several ways to invest in quantum-safe technology already. Commercial applications are available that are not dependent on having quantum computers available but, rather, make use of some of the quantum computing concepts. Increasing key sizes is an obvious starting point. Use of different algorithms is another tactic. Various white papers and directives are available.⁸

Another tactic for addressing the problems with key transmission is QKD (Quantum Key Distribution) which is based on the quantum idea that any observation of data fundamentally alters those data. The state of the data after exposure cannot be predicted. Therefore, if a key transmission is intercepted and observed, even briefly, then it will change and become useless for purposes of decoding the cipher for which it was intended. QKD is used in the banking and finance industries now, not using quantum computers, but rather using a process inspired by quantum physics to detect the presence of a third party and developing a new key known only to the parties to a transaction.

This is only the beginning. As quantum computers become more widely available, and to the extent that current encryption models are not updated, there will almost certainly be significant cases of system intrusion and data loss.



OIO

⁸ For example, https://pqshield.com/quantum-threat/?gclid=Cj0KCQiAnuGNBhCPARIsACbnLzqLL6lwhXYLPkMocdwg7EHZDHC8Vp1cM4RH4WpgOWrNo-r5-v6qJHYaAp7pEALw_wcB and <https://www.etsi.org/technologies/quantum-safe-cryptography>

“We Really Can Do Better”

By Jonathan Andrews, CPA



Jonathan Andrews, CPA, lives in Victoria, BC. He is the owner of Netlearn.ca, a provider of e-learning content and delivery services.

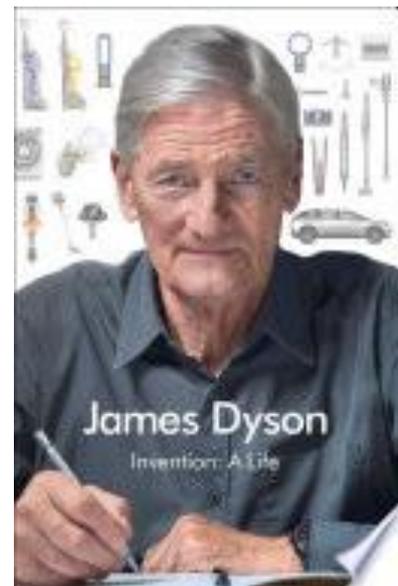
Autobiographies provide an excellent understanding of an eventful, successful career and life. James Dyson’s *Invention: A Life* is no exception. A designer and an inventor from the outset, Dyson has built a considerable global empire, estimated to be

worth over \$20 billion.

Journey of a Lifetime

James Dyson takes the reader on a journey, providing a personal insight into his life as an inventor, engineer, manufacturer, marketer, sales person, entrepreneur, farmer and educator. It becomes clear that he has achieved what he has with energy, grit, perseverance and determination, all bound together with an unshakeable curiosity.

Invention – A Life was published by Simon and Schuster on September 7, 2021. The book is 352 pages long, and includes an introduction, 12 chapters, two postscripts, drawings and photographs. The audio version, narrated by the author, lasts 11 hours and 33 minutes. There is a Kindle version that also contains drawings, although no photographs.



While Dyson has acquired many skills, he is, at heart, an inventor. When he describes key stages in his life, readers will expect detailed descriptions of his inventions, illustrated by drawings and photographs, all of which he is justifiably proud. They will not be disappointed.

“Folklore depicts invention as a flash of brilliance. That eureka moment! But it rarely is, I’m afraid. It is more about accepting failure to be able to achieve that moment of ultimate success.”

Let’s take a quick look:

Growing up (1947 – 1964): The author describes his early childhood on the North Norfolk coast in England. The youngest son of a schoolmaster in a private school, he refers to the many influences that would guide him through his life. One of these was cross-country running: *“Stamina and determination, with creativity, are needed to overcome seemingly impossible difficulties.”*

Having lost his father to cancer, Dyson learned at the age of 13 to make decisions for himself, to be self-reliant and be willing take risks – these attributes would be significant influences on his life. (Chapter 1)

Art school (1964 – 1968): *“When you design something, everything about it has to have a purpose. There has to be a reason.”*

Two years into his four-year course at Royal College of Art in London, the author fell in love and married a fellow student, Deidre (this is a marriage that has lasted ever since and is without doubt a key foundation of his success). Right from the beginning, the author’s design skills, creativity, energy and increased interest in engineering soon became apparent to others. This led to his first practical experience when Jeremy Fry, a mentor for Dyson in his early years, asked him to help engineer his (Fry’s) invention, the Sea Truck. (Chapter 2)

Sea Truck (1969 – 1974): *“If you want to pioneer and invent new technology you need to step into the unknown and, in that realm, experience can be a hindrance.”*

Dyson spent next five years developing and selling a special boat that could carry two vehicles, and was able to plane at 40 knots. In the first month, he built one and sold one. By the fifth year, he was building and selling 200 a month. The lessons he learned along the way proved invaluable – how to design, engineer, manufacture, market and sell a product. The Sea Truck having become well-established, the author decided to go into business for himself. (Chapter 3)

Ballbarrow (1975 – 1978): *“If you have new technology and a new product, a journalist’s opinion is more important than an advertisement.”*

Annoyed that his traditional wheelbarrow kept falling over, the author replaced the wheel with a ball, and the “Ballbarrow” was born. It became very successful, eventually taking half the wheelbarrow market. As the business expanded, Dyson turned the patent for the Ballbarrow over to his company, something he learned to do never again. To make matters worse, an employee left the company for a US firm who began to make their own Ballbarrows and even used Dyson photos in their own adverts!

Yet, inspiration was to strike again. The Ballbarrow factory had a dust problem, so Dyson fixed it with an industrial cyclonic dust extractor. Noting how inefficient domestic vacuum cleaners were with household dust, Dyson became very keen on developing a replacement. The Ballbarrow company was not, however, keen on the idea and fired him! (Chapter 4)

The coach house (1979 – 1991): *“One of the important principles I applied was changing only one thing at a time and to see what difference that one change made.”*

The author and his family had just moved to a half-finished nineteenth-century house, with a dilapidated coach house as a workshop. With Deidre providing the income, the author drew on his reserves of energy and enthusiasm and, for the next four years, worked on the cyclonic vacuum cleaner. After 5,126 failed attempts and, having overcome many obstacles, in 1985, he flew to Japan and licensed his first “G-Force” cyclonic vacuum cleaner. Meanwhile, Amway in the US copied this Dyson technology. A five-year lawsuit ensued, finally being settled in Dyson’s favour. (Chapter 5)

DC01 (1992 – 1998): *“You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.”*

The first UK Dyson cyclonic vacuum cleaner was manufactured in 1993. The company was now making profits, expanding rapidly and had managed to pay off all of the bank loans. The time had come to build a new factory and reduce reliance on suppliers. During this period, the author was coming up with new ideas that seemed good at the time, such as **The Diesel Trap** to catch diesel fumes (couldn’t attract enough interest) and the **Dyson Contrarotator** washing machine (too expensive to manufacture). (Chapter 6)

Core technologies (1992 – 2020): *“This is all part of our quest to make products that use less energy and fewer resources.”*

Not satisfied with standing still, Dyson’s creative energy kept improving existing models and initiating new design projects that took many different forms. Dyson introduced a new electric high-speed motor, the “Dyson Digital Motor.” Markets for Dyson products were now opening up all over the world. The focus was on developing small, highly efficient batteries for a new range of hand-held Dyson vacuum cleaners. Other products were to follow: hand dryers, fans, air purifiers to “sniff,” cleanse, heat and cool the air, and hairdryers and stylers. The move into robotics, artificial intelligence and vision systems resulted in a robot vacuum cleaner. With all the new products being introduced, Dyson began research into pseudo-plastics. (Chapter 7)

Going global (1998 – 2020): On expanding into Japan, *“The last thing I want is someone who knows what they are doing. I want a young Japanese person to run this business, because we’re doing something different.”*

In the late 1990s, Dyson began expansion into Europe and beyond. In 2002, after being refused planning permission for expansion in the UK, Dyson decided to move vacuum cleaner production to South-East Asia. The reasons were many and made good business sense. Based in Singapore, Dyson developed a new perspective on the world. With manufacturing solely in Asia, and with R & D still in the UK, Dyson had a staff of more than 115,000 worldwide. Fourteen production lines with autonomous robots were manufacturing digital motors every 2.6 seconds. Ninety-five percent of his products were being sold in 83 countries around the world. (Chapter 8)

The car (2014 – 2020): *“I’ve always been horrified, even as a child, by the clouds of black smoke emerging from the back of vehicles, especially diesels.”*

By 2014, Dyson had developed efficient motors and batteries and so decided to pursue the idea of an electric car. Over the next five years, the team grew from 10 to 500 with the goal of engineering a pure Dyson car. By 2019, however, it was clear that the car would be too expensive and so Dyson reluctantly decided to cancel the project. As a consolation, the R&D experience gained in batteries, robotics, motors, air treatment and lighting had been immense. Much was learned about virtual engineering and how to make products more quickly and at less expense.

One year later, having acquired an airfield (Hullavington) earlier for the car project, Dyson repurposed the location to produce air ventilators as part of the UK government pandemic response. A succession of government consultants modified the designs and, in the end, the government cancelled the contract, leaving Dyson with costs of \$27 million, which characteristically, he accepted with good grace. (Chapter 9)

Farming: *“I’m hopeful that Dyson Farming will contribute toward the necessary transformation of agriculture, while protecting the countryside, and that it will drive meaningful advances in sustainability.”*

From Dyson’s perspective, farming is not very different from manufacturing; both activities produce something. In 2013, he bought his first farm, an 8,000-acre estate with a difference – the farms and outlying areas had an interconnected railway system. With this new venture, Dyson learned much about another aspect of farming – navigating government subsidies, dealing with wholesalers and retailers and developing new markets. Dyson added his own twist,

anaerobic digesters to contribute power to the national hydro grid. Dyson's sustainable farming operations now extend to 36,000 acres of prime agricultural land. (Chapter 10)

Education: *"... should be about problem solving rather than retaining knowledge simply to pass exams."*

The national education system in the UK did not encourage an interest in engineering. To address this, the James Dyson Foundation was formed in 2002 to go to high schools to share the author's "excitement about the world of engineering." Initiated by the Foundation, the James Dyson Award was introduced in 2007 to challenge young people, at first in the UK and then internationally, in over 27 countries, to "design something that solves a problem."

Dyson became involved with 27 universities, often providing funding. In 2017, the first 40 students began their four-year degree course at Dyson's own Institute of Engineering and Technology. Unlike their fellow students at other universities, when they leave at the end of their course, they will (or should be) be debt free. There are no tuition fees, the students live on a newly designed campus and work three days a week on research projects alongside Dyson engineers. (Chapter 11)

Making the Future: *"The challenges of the future will be met and resolved by people who are young now, who can see the problems we face, and have the urge – the impulse – to solve them."*

In reflecting on his life, the author explains that his interest in the future is deeply rooted in the past. Not from nostalgia but "celebrating the progress that has been achieved, learning from it and building on it." His view of the entrepreneur is of someone who creates new products, opportunities and employment. Someone, he adds, who has to anticipate change as "there are traps around every corner." For him, it's not about the money. That was not the reason he worked on 5,127 vacuum cleaner prototypes. It was because he had a burning desire to do so.

"Invention is so very important today because young people are passionate about saving the planet, improving the environment, and finding cures for life-threatening diseases. I believe that these problems can be solved by the diligent application of research and development. (Chapter 12)

Postscripts: *"He [James] doesn't just hope for the best, he simply believes everything will work out."*

The Dyson group of companies is still a private family business. Deidre Dyson, James Dyson's wife, has been involved and fully supportive from the beginning. As a truly creative end to this autobiography, his eldest son, Jake, and his wife, Deidre, provide postscripts that provide an added dimension to this detailed and larger than life autobiography.

Anything but Dull

Dyson's life has been extraordinary, and his new autobiography provides the details of his achievements in rich detail. Each page is full of energy and enthusiasm. Whether he is researching problems, coming up with ideas, creating and encouraging new design projects, admiring past inventions, commenting on the ever-changing political landscape, interacting with politicians (successfully or otherwise), he always has his eye on the challenge and looking for a solution.

For him, life is full of possibilities. In *Invention: A Life*, Dyson describes his experiences in such a way that the lessons he learned are easily discernible. The first half of his book is chronological, focusing on his early life and his key inventions. The second half describes the constant improvements he and his engineers are making to newly established products. It dwells, somewhat uncomfortably, on the car project which began with immense enthusiasm yet met with such an unfortunate end. Then there was the logical, more successful entry into farming and the public-spirited efforts to raise the profile of engineering, encouraging youth, first in the UK and then in many different countries to think creatively and productively.

His actions reflect his values. When others attempt to discredit his motives, he fights back and invariably gets retractions and apologies. When competitors plagiarize his inventions, he tirelessly defends his patents.

Damn the Torpedoes – Full Speed Ahead

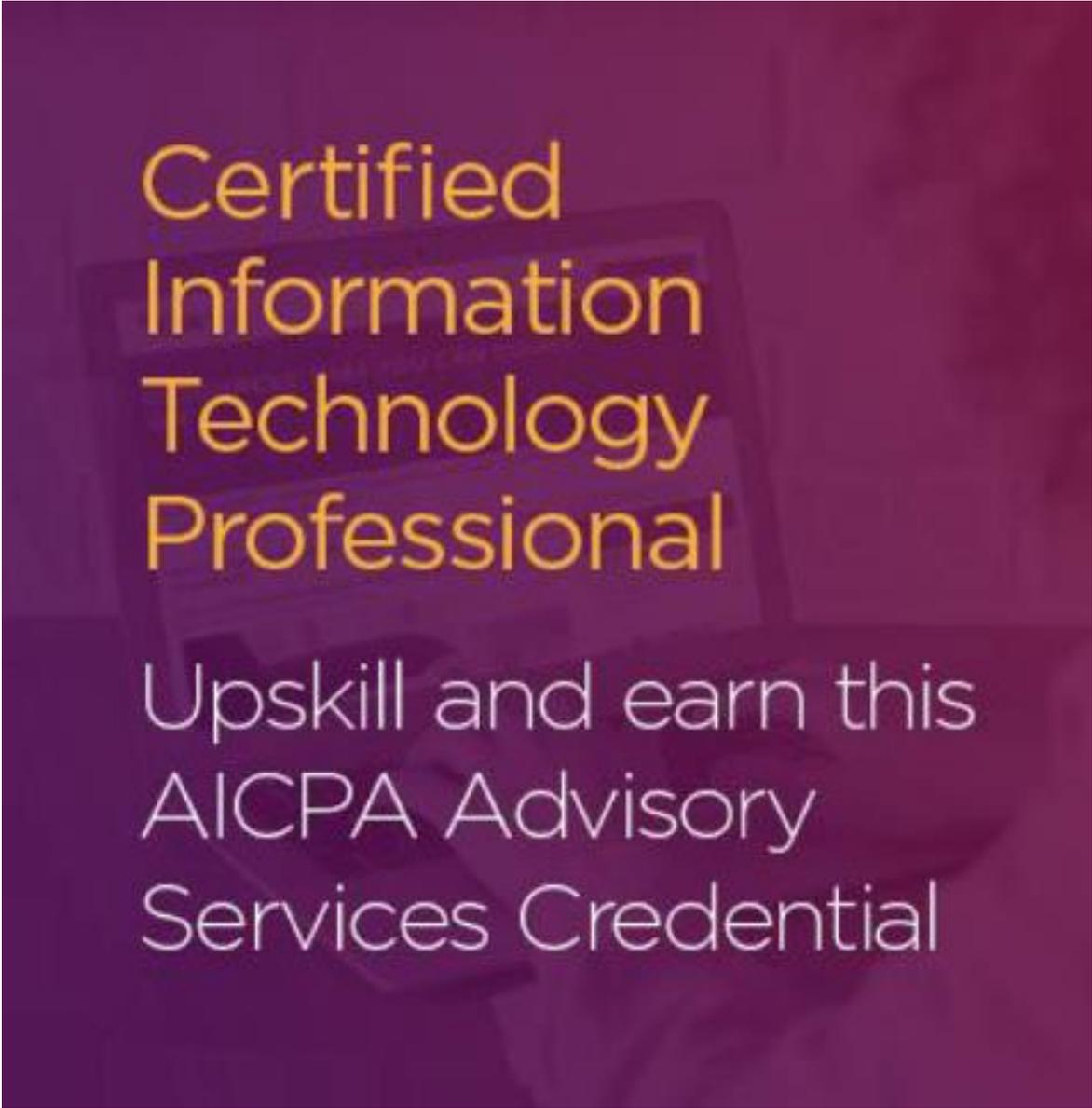
Dyson's autobiography is set against a rich and colourful backdrop with such features as social unrest, fickle politicians, intransigent bureaucrats, ruthless competitors and libellous reporters. An incessant curiosity and an unstoppable spirit have driven the pace of the author's life. He has a force of character, not unlike that of an Arctic icebreaker, and an unshakeable belief that everything will work out in the end. Yes, Dyson has had his failures, but they have been, and will continue to be, key to his success.

An Engaging Read

This is a personal autobiography, full of detail. The author takes you on a journey and describes his achievements in an honest and sincere manner. His boundless energy and curiosity drive the narrative. One of his favourite phrases, "We really can do better," has been his protection against complacency and self-satisfaction. Of course, the author may feel that he can do better

with *Invention: A Life*, but it is an engaging read about an extraordinary life, and it's fine just the way it is.

oo



Certified Information Technology Professional

Upskill and earn this
AICPA Advisory
Services Credential

Twenty-First Century Corporate Reporting: Effective Use of Technology and the Internet

How and why do corporations use the internet for reporting to their stakeholders? How and why has corporate reporting extended beyond financial reporting to include environmental, social, and governance (ESG) reporting and even integrated reporting. The major drivers of modern reporting have changed, to include data driven decision making, big data, and advanced analytics, as well as the use of electronic representations of data with tools such as XBRL.

Here we explore the various vehicles for using the internet, including social media and blogs as well as corporate websites and the websites of regulators. And we delve into the impact of portable devices, like smartphones and tablets.

Corporate reporting on the internet is changing fast because of changes in technology and stakeholder expectations. Companies are having a hard time keeping up. This book offers a roadmap to follow—a roadmap to start on now. Most importantly, the book lays out a strong case for integrated reporting and shows how reporting on the internet is ideally suited to the creation of integrated reports.

This book is of interest to executives in charge of the reporting function for their companies, students of accounting and management, and to serious investors and others with a strong interest in corporate reporting and the direction in which it is headed.



Gerald Trites is a CPA with a history of writing and publishing and a unique background. He was a partner in KPMG for seventeen years, and a tenured professor of accounting and information systems for ten. He also served for twelve years as director of XBRL Canada. He has published twelve books and numerous articles and papers. He worked as a research associate for the Canadian Institute of Chartered Accountants and served as chair of the Auditing Standards Board. He currently serves as editor-in-chief of ThinkTWENTY20 magazine, a publication he started in 2019 with the objective of publishing well-researched articles of substance.

**Order your
copy now!**



www.businessexpertpress.com



1.800.632.0880



58
orders@aidcv.com