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CORPORATE INTELLIGENCE IN THE DIGITAL AGE

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Abstract

Digital transformation radically alters the scope and ability of companies to capture relevant intelligence to aid their decision-making process. This is both an opportunity and a threat to managements, given that their ability to discover relevant information on competitor increases; as does the risk of their own information being discovered by others. Intelligence will become a core skill within senior managements as the convergence of new technologies accelerates the rate of change in an increasingly aggressive business environment. Corporate Intelligence Units are starting to appear with direct reporting lines either into the CEO of CRO (chief risk officer). They view the business and its competitive environment on a holistic basis and are structured to deliver predictive intelligence for immediate use on both a tactical and strategic basis.

Key words: Corporate intelligence, business intelligence, economic intelligence, competitive intelligence, OSINT, open source intelligence, cyber security, information landscape, digital transformation, big data, artificial intelligence.

Resumen

La transformación digital altera radicalmente el alcance y la capacidad de las empresas para capturar inteligencia relevante para ayudar en su proceso de toma de decisiones. Esto es tanto una oportunidad como una amenaza para la dirección, dado que aumenta su capacidad de descubrir información relevante sobre los competidores al igual que el riesgo crece de que otros descubran su propia información. La inteligencia se convertirá en una habilidad central dentro de la alta dirección a medida que la convergencia de nuevas tecnologías acelere la tasa de cambio en un entorno empresarial cada vez más agresivo. Las Unidades de Inteligencia Corporativa están comenzando a aparecer con líneas de reporte directo, ya sea al CEO o al CRO (director de riesgos). Consideran el negocio y su entorno competitivo de manera integral y están estructurados para brindar inteligencia predictiva para uso inmediato tanto de forma táctica como estratégica.

Palabras clave: Inteligencia corporativa, inteligencia empresarial, inteligencia económica, inteligencia competitiva, OSINT, inteligencia de fuentes abiertos, ciberseguridad, panorama de la información, transformación digital, big data, inteligencia artificial.

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1. Introduction

The transition from the information age into the digital age is transforming the way that enterprises exist, creating a need for change that transcends the skillsets of many senior managements and puts a premium on the value of companies that succeed in the brave new digital world. The rapid acceleration of technological advances puts considerable pressure on managements to adapt and deliver, and to start their journey of digital transformation. Stock markets adore digital winners and the valuation placed on such companies only adds to the pressure on management to succeed. In this environment of immense pressure and immense reward, the role of corporate intelligence is also going through its own transformation and is set to become a core discipline within senior management.

Humans are generating vast quantities of data daily and this trend is accelerating. A recent study by IDC[i] stated that the amount of data generated worldwide ("the global datasphere") will expand from 33 ZB (zettabytes) in 2018, to 175 ZB by 2025; that same number was at 1.4 ZB in 2011. Whilst much of this data is private and stored behind firewalls and away from prying eyes, there is a significant percentage that can be accessed legally. This radically changes the scale and categories of information and thus intelligence that an enterprise can discover and use. It also makes the role of the Corporate Intelligence Unit core to the management's ability to envision of their own business and its competitive environment on a holistic basis.

Essentially any company with the necessary skillsets is now able to harvest significant amounts of relevant information on its competitors, which the latter may not even be aware that they are leaking. This ability can be used to considerable commercial advantage to both enhance profitability and gain market share. Given the sheer scale of discoverable data it is no longer a question as to whether larger corporations should or should not create internal corporate intelligence capabilities; instead it is simply a question of "eat or be eaten".

Before looking at how to create such a capability, it is important to define various issues. What is meant by the term 'corporate intelligence' and how has this evolved; what is meant by information and how is it different from intelligence; how is the information landscape structured and what are the implications as to the techniques and methods of information discovery? With these definitions in place, one can then start defining the required structure of the Corporate Intelligence Unit.

2. Defining Corporate Intelligence

What is meant by "intelligence" in the corporate sense of the word, today? Until recently the term was loosely used in the militaristic sense, describing the collection of information for commercial rather than military reasons. However, in the digital age, this industrial age definition is no longer apt. Information is the raw material of intelligence, and the so-called information age saw the emergence of various sub-sets of intelligence for use by corporations.

The first of these to emerge was **Economic Intelligence**, which evolved from being "the appraisal of the capability of a nation to support a war" carried out by designated government agencies, into being the collection and analysis of publicly available macro-economic data by public and private enterprises to enable the accurate forecasting of economic health. During the cold war the information gathered on "enemy" states, and its subsequent analysis, tended to be the work of government intelligence agencies, whilst international institutions such as the World Bank and the OECD co-ordinated the data collected ministries and central banks at the national level. Overtime the generation of Economic Intelligence and its analysis became more widespread, with private companies such as the Economist Intelligence Unit and Reuters offering global coverage of relatively detailed economic forecasting offers. Whilst economic forecasting has improved and whilst the ability of politicians and others to meddle with national data has declined, even today economic intelligence is still generated on the back of historic static data.

As management science developed in the post-war years, initially in the United States and then globally, **Business Intelligence** emerged as a critical discipline for corporates. Processing technology progressed from adding machines, through punch cards and onto mainframes, and larger corporates found themselves able to collect, sort and analyse increasingly larger amounts of their own internal data. This initially found impact through the delivery of increasingly accurate and detailed monthly management accounts and weekly sales reports, but as the information age got into its stride in the 1980's and as computing power expanded and

its cost declined, both the amount of data and its periodicity accelerated. Companies like SAP (founded in 1972) Oracle (founded 1977) and Sage (founded 1981) emerged to feed the demand for increasingly complex software solutions to enable companies to maximise the use of internally generated information so as to enable managers to gain a more effective understanding of what was driving profitability across the business lines and make effective tactical decisions.

In parallel to the rise of Business Intelligence came that of **Competitive Intelligence**. Some would claim that competitive intelligence and economic intelligence are the same but derived from two difference sources: economic intelligence from governmental sources and competitive intelligence from corporate sources but this confuses the focus of both the output and its origin. Competitive Intelligence focuses on the corporation's need to understand as effectively and quickly as possible its own industry or economic sector, the players in that sector and the abilities and plans of those competitors. Typically, the information collected is sourced externally and focuses on the company's clients and competitors, its markets and the products and services within sphere of influence. Most of the information gathered is openly available, but invariably there are corporates that resort to covert (i.e. illegal) means to source data. That is to say that for the greater part, the company gathers data and information from sources external to the company in a legal manner.

These are the three core categories of intelligence used in the corporate world. However other nomenclatures are used that can cause confusion: **Strategic Intelligence** is one of the most common. All intelligence, be it military or corporate, tends to be used for different temporal objectives: either tactical or strategic. Tactical intelligence (sometimes called 'operational intelligence') is the use of extracted analysis for short term operational impact or gain, whereas strategic intelligence will tend to use the similar raw inputs of internal and external information for the formulation of corporate plans, be those medium or long term in outlook. Hence the terms Operational and Strategic intelligence refer to the focus of the output rather that to a distinct category of intelligence generation.

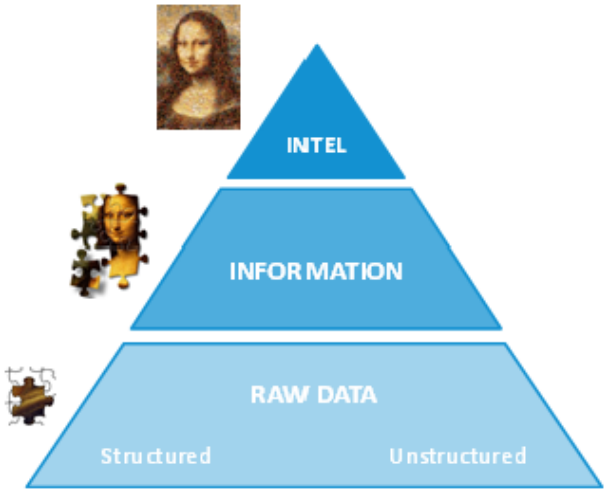
There is an emerging fourth category: **Cyber Intelligence**. This is not about the use of digital technologies to discover data, but specifically defence and offence activities related to cyber-security. Managements need to understand that "cyber" needs to become a core discipline within all companies, and that it needs to be led from the very top of the company and not relegated to management within the silo of IT. The reality of "eat or be eaten" is best understood within this realm. Cyber intelligence is currently a tactical discipline, but it is also becoming increasingly strategic given its symbiotic relationship with digital transformation.

3. Information & Intelligence

There is an important commonality across these categories which has to do with what constitutes the end-product called "intelligence". The raw ingredient of intelligence is data: this data can be in the form of words, pixels, numbers, sounds or whatever. By itself the item of data is meaningless until brought together with other items of data to form information. The initial piece of data, the molecule, will be in one of two forms: structured or unstructured. It might be in the form a series of digits in a spreadsheet, or a word embedded in document; or it will be unstructured, part of an image, a sound-file, a tweet or piece of video.

Imagine a single piece from a 4000-piece jigsaw. Unless it happens to be a corner-piece or an edge-piece it has little relevance or meaning until one correctly joins it to other neighbouring pieces and it becomes recognisable. In this semi-assembled state where multiple pieces are drawn together, they create "information" – in the case below initially the piece is meaningless, until the human face becomes apparent. As more and more "information" becomes available the expert (be they an analyst, investigator or simply an experienced party) can start making assumptions and conclusions - the face belongs to the Mona Lisa. Hence "intelligence" is a series of conclusions drawn by experts from a myriad of different pieces of information, that information having been ascertained to be verified to a greater or lesser degree.

This intelligence-pyramid shows clearly just why the explosion of data is so important to corporates both from an offensive and a defensive position. One the one hand there is the opportunity of discovering data in a legal manner and hence possibly relevant information regarding competitors. On the other hand, all companies face the risk of leaking data without knowing it.



The Intelligence Pyramid *Source: author*

4. The Information Landscape

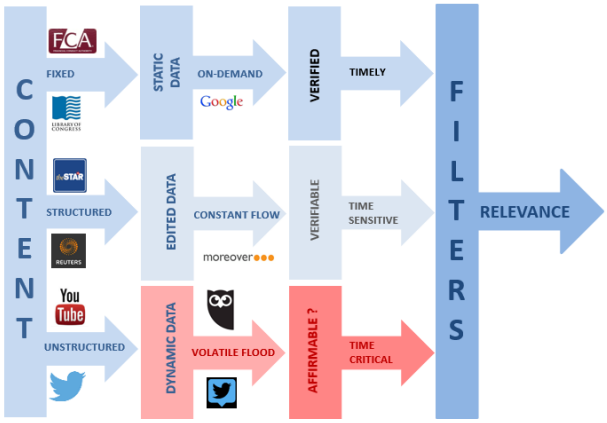
Information comes in three distinct categories and these define the means and methods used to discover and capture relevant information: it will typically be static, real-time structured or dynamic.

Static information will typically refer to information that has been structured, edited and "published". It will have been stored in an accessible place, such as a library or a publicly accessible database. The analyst or investigators will typically go to "find" this information; it will not come to them. The information will tend to be in a format that aids at least the verification of the source: a book, a magazine, a pdf. It will be historic; which is to say the information is not live and changing. A book will state the name of the author the publisher and the date of publication; a pdf will often leave metadata that enables a similar process of verification of its origin. It is important to note that this verifies the source, it does not verify the content.

When talking of **real-time 'structured' information,** the method of discovery is different for various reasons. It should not be confused with real-time "data", i.e. share prices, commodity trades etc. For the corporate the most common type of real-time "structured" information is news-flow. Here the analyst is standing in the middle of a real-time flow of edited content that can be filtered and sorted; but it is a flow that is coming to the individual and they must filter and sort within that flow. Hence the analyst knows what to look for, or what themes interest them, today's technology can ensure that they will receive the relevant news regarding the subject in almost any language (see next section) on a timely basis. Again, within the area of news flow, the information at hand is to a varying scale "verifiable", but the veracity of the content will depend on a series of external factors: triangulation, expertise of the source and so on.

Finally, there is **dynamic 'unstructured' information** – social media for instance. Here neither the source nor the content is necessarily verifiable. At best it might be affirmable. Fake news tends to be delivered in this form. True there are low-quality newspapers that specialise in publishing rubbish, but they tend to be well known for just that, and therefore dismissed as being irrelevant sources. Yet on Facebook, or Instagram, or Twitter it is often impossible to know the identity of a source. That said, the immediacy of platforms like Twitter still make them a vital platform on which to monitor for issues.

As the diagram below shows, each of these content types have their own methodologies by which the analyst can "discover" relevant information. The simplest way to find static information is to use a search engine such a Google and run a structured search. The constant flow of edited information requires tools such as FactSet or the LexisNexis Newsdesk. To discover potentially relevant content in social media, the analyst will need to harness tools such as Tweetdeck or Hootsuite.



The Information Landscape. *Source: author*

Whilst the challenge of "how" to discover is complex, it is relatively straight forward. The real challenge for the intelligence analyst lies in the sheer volume of data that is now accessible; and this is without taking account of the data flow from the Internet of Things. It is estimated that this year some 188 million emails will be sent every minute of every day; 42 million messages are sent on Facebook Messenger or WhatsApp; 18 million texts are sent; 1 million people login to Facebook… and so the list goes on. Were it not for further advances in hardware and specifically data transmission and storage, all this traffic would have ground to a halt years ago.

5. Open Source Intelligence

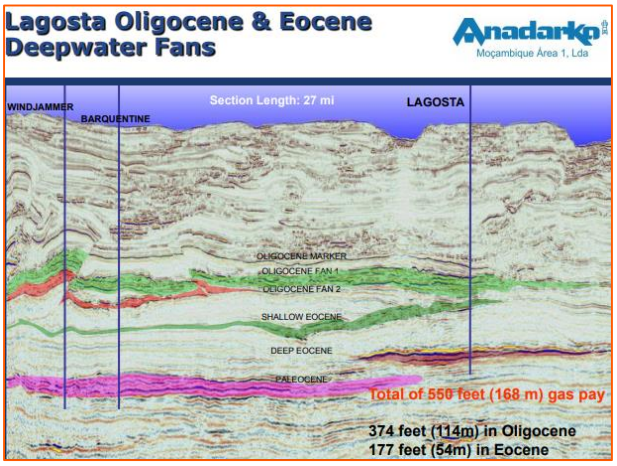
Open Source Intelligence, "OSINT" for short, is "publicly available information that appears in print or electronic format, including radio, television, newspapers, magazines, Internet, commercial databases and video, graphics and drawings". Essentially it is intelligence that has been generated from data and information collected from **publicly available** sources in almost any imaginable format. In the commercial arena the terms tends to include satellite imagery, social media and human intelligence as well: but the critical issue is around the legality of discovering and extracting the information. Specifically, information and or intelligence captured by covert means (hacking, industrial espionage etc.) are not included.

Having an in-house knowledge and capability to access and analyse open source information is critical to the corporation's risk management. OSINT spreads across all walks of corporate intelligence. It is relevant to the discovery and capture of economic, business and competitive intelligence. It enables companies to monitor social media effectively and importantly it puts a discipline in the heart of the organisation when it comes to working with intelligence material using the "intelligence cycle".

A core methodology to Open Source Intelligence is the conducting of 'structured searches' in the surface web and the deep web. The exponential growth of content in the web means that the world's biggest search engine, Google, now only indexes 1 in 3000 pieces of new content even though it is said to be processing over 5.4 billion searches daily (20+ Petabytes per day). Web content that is not indexed resides in the "deep web" where there are few tools to help the searcher to navigate. There is no accurate data as to the amount of information accessible on the world wide web, but Google is calculated to index 60 billion webpages, and this is thought to represent less than 3% of total web content. Consequently, the ability to search accurately and effectively across the web in a structured manner is a critical intelligence skill.

The issue here is the possibility to discover relevant information and or intelligence put on the web, but in a fashion that the author or owner of the information believes it not to be "publicly available". An example from the oil & gas industry shows just how potent structured search can be. In April 2012 the Italian company ENI started to drill a well offshore of Mozambique. The previous year the American group Anadarko had discovered gas in the same region, and whilst talking about a "major discovery" at its Langosta well, gave little further data. ENI had stated where it was to drill, and this was but a few kilometres from Anadarko's discovery well. A structured search using Google resulted in direct access to a private presentation available in the deep web made by Anadarko's geologists in which they gave considerable detail.

This information had not been made public by the company and had not been indexed by Google or any other search engine but was openly available to those that knew what to look for and how to search. It did not show up in natural language "browsing" in any search engine but did appear when a structured search was carried out. The Anadarko information included sections of where the ENI well was to be drilled and showed that it would intersect the same (massive) gas formation. It was therefore no surprise when ENI announced a massive gas discovery at its Mamba South well: the share price of ENI rose a few percent on the news, but the share price of its junior partner, Cove Energy, tripled over the following three months.



Source: AAPG

Companies need to understand that if they can discover relevant information about competitors, allies or customers, that there is then a significant risk as to their own critical information being (unintentionally) leaked out on to the web. How many companies carry out regular information audits? The answer is probably none.

6. Three key building blocks: digitisation, big data and AI

Three streams of technological advances have come together to radically augment both the ability to collect relevant information for intelligence purposes and the ability to manage and manipulate that information real-time. These are digitisation, big data and artificial intelligence. When brought together and focused on the generation of real-time intelligence and predictive analytics these three factors radically change the role that intelligence can play within the corporation.

Digitisation should not be confused with "digital transformation". It refers to the process of information be stored in a digital format, thereby making it both legible to a machine as well as instantaneously transferable from one place to another. This "digitisation" in turn leads to "digitalisation", which is that process of leveraging this digitisation to enhance business processes. The principal impact of digitisation has been one of enabling the leveraging of new technologies and thereby expanding the data threshold of the corporation. At the end of the last century companies were still largely reliant upon spreadsheets, documents and images to hold information that tended to be stored in relational databases. The emergence of Web 2.0, of social media and more recently the internet of things and cloud-technology has meant that so long as the raw data is digital it can be rendered useable. This means that the scale and complexity of information that is accessible and usable by the company has changed radically. It has been suggested

that the entire written output of humanity from the beginning of time to the end of the last century is in the order of 5 Exabytes, and as Eric Schmidt of Google pointed out in 2010 mankind was by then generating 2 exabytes of information per day. By 2016 this number had grown to 44 exabytes/day, and IDC forecast that it will have risen to 463 EB per day by 2025.

In parallel there has been a tendency to convert old data into digital formats: this "back-filling" means that the data-threshold is not only being expanded forwards, but also historically, which is of considerable importance in areas such as due-diligence and content verification.

The management of such vast amounts and varieties of data would not be possible without the technologies and processes loosely called "**Big Data**". The important point here is not how or what big data achieves, but what the impact it has on corporates and their ability to gather relevant information that can be distilled into corporate intelligence. Where there is big data, there is obviously "big content". A good example of this would be the change in the accessibility of structured news content for corporate consumers. Ten years ago, larger (and richer) corporates paid to have access to top-end news suppliers such as Thomson Reuters and Bloomberg. These providers both had teams of about 2,000 professional journalists, with offices in 145 countries publishing high quality news content. Supplementing the content generated by their own teams, both companies had agreements with "affiliates" that enables the publication of external independent content through the Reuters and Bloomberg networks.

In 2009 a company called Moreover Technologies entered the market with a service that offered feeds from some 84,000 verified newsfeeds around the world capturing news in over 80 languages, with built-in auto-translate for 50 of them. As if that wasn't enough, in the same package one had access to over two million blogs and specialist RSS feeds plus a level of soft and hard filtering that neither Bloomberg nor Reuters were able to match. Essentially Moreover enabled the end user to filter and search across nearly all the "relevant" news outlets on the planet, and to receive the output in a machine-readable format.

Whilst the scale of the content offering represented a major shift in market accessibility, the product offering also opened the door to many professional and semi-professional users that could not afford the lesser but expensive news offering from the two bigger players. Essentially "big content" was being made available to the smaller buyer, with the technology issues fully resolved. Corporates were now able to access most news outlets on the planet via a single portal and were fully in charge of creating the search algorithms and setting the hard filters. In many cases they were now capable of receiving relevant information well ahead of both Bloomberg and Reuters, meaning in financial terms that they could be "ahead of the market". Whereas Bloomberg might publish some 600 news items per day from its own journalists, the Moreover platform was processing over 2 million articles per day.

With content almost totally digitised and big data technology (including here cloud technology) becoming increasingly mainstream, two critical building blocks are in place for **Artificial Intelligence** to finally move out of the laboratory and into the corporate mainstream. There is still a considerable amount of "smoke" being sold in this area, so caveat emptor! AI projects and products focused on numeric data tend to be more successful that natural language products. Google's outstanding success with AlphaGo is rooted in the reality that games are numeric, not natural language.

Yet the impact of AI and machine-learning on corporate intelligence should not be under-estimated and AI is still widely misunderstood at the corporate level. Google developed a programme to play the Korean board game, Go. This is the world's most complex board game and significantly more challenging than chess. Having spent months, if not years, "teaching" the programme the game and then loading in thousands of game histories the programme finally won its first official game in October 2015. Just five months later AlphaGo defeated the reigning world-champion of Go 4-1 in a five-game tournament. With this achievement AI took a major leap forward. Google programmers then decided to develop another programme, which they called AlphaGo Zero. The difference here was that the programme was given just the basic rules and no game histories. Within three days of the programming being completed, AlphaGo Zero was playing at the level of the original AlphaGo. By day 21 it was beating AlphaGo master, a version that had beaten 60 of the world's foremost Go players online. By day 45 AlphaGo Zero was essentially the undisputed world champion. All of this was done by the programme playing games against itself to learn, having no prior knowledge of any game-history.

Whilst initially AI will tend to be used in areas such as content capture and potentially competitive intelligence, it is only a matter of time until it is used in strategic planning. When AI is harnessed to massive data sets and cloud computing it should be capable of discovering patterns and possibilities as set unseen by human managers.

7. Predictive intelligence at your fingertips

Corporate intelligence can be used in a relatively simple way, or a highly complex manner: it is a matter of money. However, more expensive solutions do not necessarily deliver better results. Like all intelligence products it can be used in offensive or defensive. At its most useful it can be used predictively and to monitor for unexpected risks, the so-called "unknown unknowns".

Case study: accurately predicting market share growth of a (very) private company

The following case involved the use of deep-web search and scraping techniques, media monitoring, geo-location analytics and mobile app data.

In 2014 the UK press carried several articles regarding the "onslaught" that German deep-discount food retailers were making on the UK grocery market. At this time the four largest supermarket chains (Tesco, Sainsbury, Asda and Morrisons) controlled 74.4% of the market, and the two German deep-discount players (Aldi and Lidl) controlled just 4.3% and 3.1% respectively. Small fry compared to their giant peers. Both companies had been in the UK for over a decade but during 2014 their combined market share had risen from 7.4% to 8.5%. With a price differential against their senior UK peers of anywhere between 20-50%, the cost-conscious UK shopper was clearly beginning to alter their habits. The question posed was as to how much market share Aldi might take in the UK and from who? Aldi is a (very) private company that publishes very little information relevant to the matter at hand.

Yet by bringing together various data sources that were publicly available (either freely or by subscription) it was possible to predict Aldi's market share eighteen months ahead with considerable accuracy. The company was growing its network quickly and invariably built its new stores from scratch. This meant that planning permission data, which is publicly available in the UK, could be scraped and analysed. Historical analysis of prior years revealed how many months the company took between the initial pre-planning application and the start of construction and how long the physical build and set up took. The mix of media monitoring and planning permission screening meant that a clear timeline and map could be created for the future opening of new stores.

Another critical source of information came from a mobile application used by almost forty thousand families across the UK to consolidate and monitor their monthly spending habits. In downloading the app, the users had agreed to let all their transaction data be consolidated with that of other users and sold on an anonymised basis. The dataset was highly detailed and granular. All spending was detailed to the merchant level and tracked daily. Consequently, one could track spending at Aldi stores by post-code. Furthermore, time-series analysis enabled one to see at a granular level how families had reacted to the opening of a new Aldi store in their neighbourhood.

Hence a mix of media monitoring (local press articles), of deep-web data searching (planning permissions), of freely available market research data (Kantar and Nielsen), and paid-for data from a mobile app enabled analysts to accurately predict Aldi's market share eighteen months forward. In the final analysis the market share prediction was 10 basis points too conservative, but the report had accurately located every new store. Today Aldi has a market share of 8.0% and it is only 2.3% away from being the UK's fourth largest food retailer.

Case study: Predictive intelligence to monitor for financial crime

The following case used multi-lingual media monitoring and structured search to accurately predict a bank collapse.

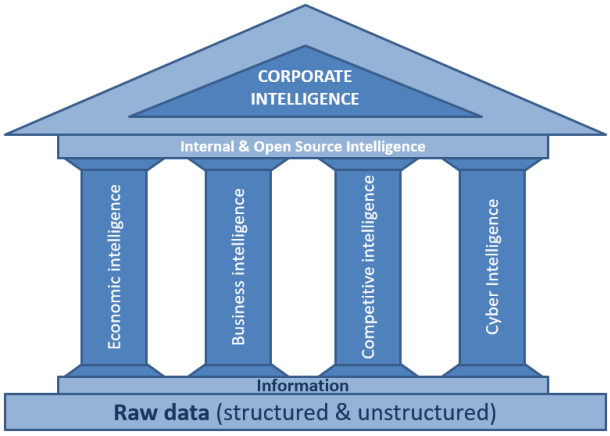
In August 2014 Portugal's second largest bank, Banco Espirito Santo, had to be rescued and nationalised. Shareholders and many of its bondholders lost everything despite earlier assurances by leading investment banks and the local regulator that the bank was in good health. Yet had these investors been monitoring foreign media and had they known how to make structured searches of the deep web they would have uncovered over a dozen news items that when read in series showed clearly that there were series problems hidden inside the bank.

It is relatively straight-forward for anyone to set up what is called a "listening station" to monitor for negative media across a given sector or focusing on a specific target especially when having access to a tool such as the Moreover Technologies suite mentioned earlier. In March 2014 the bank made couple of statements that should have immediately raised questions: it made a provision for €700 million for possible responsibility regarding loan notes bought by the bank's retail customer and issued by the bank's direct parent. There was little explanation as to the issue but given that the valuation of the bank in the market was €5 billion the scale of the provision was meaningful. At the same time the bank postponed its annual general meeting for a second time. The reasons behind such a move would have had to have been made clear to the regulator, but again, the bank gave no reasons for the move.

On April 30th the listening station captured an Angolan blogpost in Portuguese that alleged that the bank's Angolan subsidiary had a hole in its balance sheet of US$6.5 billion, i.e. an amount greater than the stock market valuation of the bank. Either no-one was listening, or no-one wanted to

listen. The post was written by a well-respected (if little known) Angolan human-rights activist, who was regularly arrested by Angolan authorities whilst at the same time being the recipient of prestigious international awards for his work. Deep-web search soon revealed that the Angolan bank had just $2 billion in deposits at best and that the parent bank on Portugal had made interbank loans to the Angolan subsidiary for over $3 billion. If that money had been "lost" then the parent bank in Portugal was bankrupt.

Despite this information, the parent bank launched a €1 billion rights issue without making any mention of the Angolan issues, with various leading investment banks apparently carrying out due diligence investigations ahead of underwriting the capital increase. Three months later the bank failed. The listening station "discovered" thirteen distinct pieces of published information that pointed clearly towards bank-failure; but no-one believed the story. Herein lies a moral: often the information captured by intelligence units is "too" early and deemed unbelievable.



Source: the author

That said, like all change management projects, such initiatives need to win the buy-in of all users across the enterprise. Humility is a key ingredient to success: start small with initiatives that have a high probability of success, and then build from there.

8. Conclusion

Intelligence within the corporate world used to be divided across distinct siloes; economic and business intelligence within the finance department, and competitive intelligence typically residing in either the R&D department or in marketing. Those days have gone, and hopefully senior management now view intelligence holistically across the enterprise. Just as it is impossible to initiate the digital transformation of a company without cyber-security at the core of the strategy; it is impossible to develop strategic planning initiatives in the digital era without corporate intelligence being firmly embedded in the vanguard.

If a company cannot defend its attack-surface without forward-looking cyber intelligence being delivered to its blue team, then how can it expect its business to thrive in an increasingly digital world without the teams and the tools to deliver meaningful real-time intelligence to senior management as well as to the front line? The corporate intelligence team needs to report into the most senior level of management (CEO or Chief Risk Officer), not into a corporate silo (finance, marketing, R&D); it needs to have a holistic view of its own business and be given the training and technology needs to deliver the tactical and strategic advantages that are now available; and it needs to be ordained and empowered by the senior management board.

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