

Nowadays it can be overwhelmingly breathtaking to read the newspaper, listen to the radio or watch the television. With the contemporary days' complex, complicated and apparent disorganized happenings, finding the common thread that goes through the patchwork of today's events can be a tricky business. One which is not fairly easy to do.

Ultimately, what else could focus Facebook advertisements used to sway a referendum in the United Kingdom, the Arab Spring and the plans of international terrorist groups such as ISIS and al-Qaeda share in similarity? The answer is obvious but may seem unlikely at first sight.

Networks, to simply put in one word. Whether one is a regular user of social media apps, such as Twitter, Facebook among or a financial investor utilizing global trade there's a high chance you're connected to a network that uses technology to share information and ideas.

This networks may appear completely modern in regards to the age of Brexit and Trump. However as shown in Niall Ferguson's study of networks that what we're experiencing at the moment is only the latest, and disruptive, action in a play as old as Gutenberg and the creation of the printing press.

Networks have long fuelled historical developments, From the reformations attack on Catholic dogma to the Enlightenment and dissident groups of communist Poland. they have since been given power by technological developments and have always acted as directions for radical new notions.

The push and pull of hierarchy and networks mold history, both of which are phenomena that have some basic traits in common.

Some see history as a pyramid where at the top are great monarchs and aristocrats with the vast hierarchy of cavalry, religious leaders, successful merchants and peasants below them. Well, some choose to exaggerate the role of bizarre networks such as the Illuminati or the Freemasons - those who pull the strings behind the scenes without normal society's knowledge.

However, can both of these models really give an accurate explanation of the historical process? Is there a direct and outstanding explanation for this question?

For very long time networks have been playing an important role in fueling historical change and bringing change in societies even though hierarchies often have the last input. As much as there is the existence of hierarchies in nations and states, it is impossible to get rid of the place of networks within the world.

For example, the coming of steamships and railways brought up global economic networks. Or even more recently the advent of communication networks brought by telephones and the internet have contributed to the development of global economic networks. Just like the French Revolution which was facilitated by different groups of people who could meet to discuss the ideas in salons, social networks have played a key role to change.

You can see that networks and hierarchies share a number of traits. If you think of what a network simply put it is interconnected nodes which can be humans, trading places, communities or simply family members. These nodes tend to grow and get connected by things which we have in common due to our habits to develop networks with people who have similar traits to us.

Shared statuses such as race, class, age, sex or a group of shared values derived from religion, education or jobs are some of the basic things which join us.

Take for example the 20th century Bloomsbury group which consisted of authors and artists who were molded by a sequence of shared ideas concerning art, life, sexuality, and politics.

Marriages between group members also made these connections formal. As you can see, these singular nodes connected in various ways draw a line showing a connection with a pattern similar to a spider-web.

Hierarchy functions like this, however, the connections are unlike the spider's web rather they run down from the top, where the central node is and forms a pyramid where the central node is at the apex.

While everyone is connected to the apex, with different degrees of separation, the separations further along horizontal connections between individual nodes. Imagine a pyramid as a good illustration of this example. The pyramid widens from the peak as it goes down. Towards the top, there is virtually no separation but as one approaches the bottom the separation, horizontally, keeps widening.

Therefore, even though hierarchies and networks do have some similarities, networks prove to be more interconnected as explained above.

Centrality, weak ties, and brokers are the key traits that define networks.

Although networks are a series of nodes, there are those which are more effective than others. Simply put, a network functions better if the nodes are better and closely connected.

By analyzing and studying the relative centrality of nodes in a network, we can comprehend the importance of different nodes.

Degree centrality is an example of the measure of the number of connections or relationships one person has with others.

Betweenness, on the other hand, is a measure of how much data goes through an isolated node. If you think of a train station as a kind of node, you can see that some stations have more passing through them as compared to others.

Just like this, some individuals pass more information within a network. However, this doesn't mean that a person with higher betweenness centrality necessarily has more connections. They just have the most important connections.

Finally, there's a closeness centrality which is a way of determining how many steps are in between different nodes from one another. The best access to data especially when it's widely spread through the network is often owned by individuals with high closeness centrality.

The nodes which have the benefits of a high level of centrality - that is the ones which are better connected than others - can be idealized as hubs.

However weak ties are also vital, not just the strong and direct connections matter. This is well demonstrated by the traditional idea of there existing six degrees of separation between different individuals.

An experiment conducted by the Stanford Professor Stanley Milgram, in the late 1960s, is a demonstration of how this works.

Milgram sent letters to randomly chosen people and requested them to forward these letters to a specific group of people which represents other nodes.

The recipients recognized the individual they were meant to forward the letter to in special cases. This made it simpler and they were able to send the letters directly because the degree of separation is only one.

However, others didn't know the deliberated final recipient and had to utilize intermediaries - people who recognized them. In this case, the degree of separation was raised by one with each intermediary.

The mean degree of separation tended to be six, between individuals, two nodes had to be connected by five intermediaries.

This is an illustration of the key value of weak ties in joining different networks. Because of weak ties, people are able to interact with different groups as compared to if the connections were limited to strictly doors whom we shared very similar connections. They act as links between various social walls.

Brokers are another way of connecting different networks. They also play the role of intermediaries.

Some of the conditions that led to the French Revolution was by women who ran literary salons in Paris. They hosted enlightenment thinkers and revolutionaries which brought up the possibility of conversation between groups who normally would have never interacted.

The invention of the printing press and Global exploration made possible the creation of new networks.

The globe was separated into about 30 various empires and kingdoms at the beginning of the 16th century. They were ruled over by powerful individuals and had a top-down structural hierarchy. Nonetheless, the two upcoming networks that would alter the base of this old system. As a result of Spain and Portugal exploration of the world, one of these networks was discovered.

These two countries developed significant global trading networks that spawned the globe from East Africa, South East India and spanned all the way to China. This expansion was fueled by new technologies such as better ships and more accurate maps as well as social networks which were developed as sailors shed light on their information of Maritime navigation. These trading networks opposed classical hierarchies and diminished the norm which was a structural hierarchy.

At the same time in Central Europe, Johannes Gutenberg's printing press was showing glimpses of the emergence of yet another network. Before the printing press was invented, books and text were restricted to those who held high positions in society. Those of high societal hierarchy and the aristocratic individuals had free access to information unlike the normal individuals of society.

Due to this churches and courts were the central nodes of the provision of literature. They had control of knowledge and information. They were entrusted with this and intentionally limited access of these books and texts to the normal citizens.

The invention of the printing press enabled new information networks to emerge all across Europe. Now, individuals gathered around printing houses and they were the central nodes of information and knowledge. Literature was not only expansively available, but there were also cheaper and affordable than before.

The decline in prices led to a revolution of that normal hierarchical structure. Now ordinary citizens could access literature which made a huge impact at the time.

A good example is in 15th-Century England where the price of books fell by sixty-six percent between 1450 and 1500. Moreover, the overall falling in prices was more outstanding between the late fifteenth century and late sixteenth century where it dropped by a massive ninety percent.

The bases of the hierarchy were disrupted and a new age of networks sprouted due to the Reformation.

The Reformation, which is the provision and circulation of written literature, created an environment that heavily opposed hierarchy. Much cheaper access to knowledge for society enabled them to challenge the beliefs of the current hierarchical system.

In Europe the central node of hierarchy was the Catholic Church, therefore when a German priest by the name of Martin Luther published theses attacking the church in 1517, he suggested a revolution more than a reformation.

Due to the printing press, the information spread out rapidly. To further help this cause, the German printing houses published around 5,000 additions and 80% of them were in German rather than Latin which meant ordinary people could also access the message contained in these theses.

Protestantism spread like wildfire and went viral, fueled by the printing press. Where multiple printing presses were present, the people there were most likely to convert to Protestantism unlike the areas where the books remain scarce the old faith, Catholics, continued being prevalent.

Networks are more evenly spread out which makes eliminating them not so easy. In the case of the English Protestants, the Catholic Queen Mary I persecuted Protestants and managed to eliminate 14 of the faith's 20 key nodes. However, the creed's members were rapidly replaced by others.

The network, which had its centrality more evenly dispersed across its members, was more durable. Another great movement sprouted due to the success of the Reformation. The new religious creed allowed people to think outside the box. This was the foundation of the Scientific Revolution of the 17th century.

Both the American and French revolutions and the Enlightenment were network-based.

The printing press, the Reformation and the growth of the Scientific Revolution opposed the established order and soon enough hierarchies were being challenged on both sides of the Atlantic.

The American Revolution was fueled by a vast number of associational Networks and inspired the country to gain independence. For example, the Boston Tea Party in Massachusetts. Boston as a city is very much relatable to the revolt against the great British empire. In 1773, the Boston Tea Party was a protest against the harsh tax laws that were in favor of the British tea

There are various individuals who functioned as weak ties between different networks. Their role was to assist in sharing and spreading revolutionary ideas between different networks. This is in spite of the fact that the colony was hierarchical.

The Freemasons, including the other four associations, were cornerstones of the movement of independence. 86% of the 137 members of these association belonged to only one organization. However, there were several others such as Joseph Warren, Paul Revere, Samuel Adams and Benjamin Church who were members of many more.

Warren and Revere, for example, had the highest levels of betweenness centrality and functioned as brokers between networks. They were vital for the strength of these networks.

Therefore, the now interconnected networks sprouted and assisted in spreading the idea of revolution throughout the 13 colonies. As a result of these brokers, there were massive connections that spread throughout the thirteen colonies.

In the French Revolution and the Enlightenment, networks played a key role at the end of the 18th century. Philosophers such as Voltaire and Rousseau were the two key central nodes in the dissemination of great revolutionary Enlightenment ideas.

Letter writing was also important in these networks. Just as the literary salons discussed previously, these letters connected different free thinkers and assisted in spreading the notions of republicanism and people's rule.

Voltaire alone had over 1,400 recipients. Similar to the literary salons discussed earlier, this network of letters allowed the connection of thinkers, philosophers and it heavily assisted in spreading the nationalistic ideas of republicanism and people's self-rule.

However, whereas America had a strong association of culture, France was a more hierarchical society. This difference was made imminent in the revolution. The French Revolution was a gory affair which witnessed a massive amount of terror which led to the dawn of the Republic. In the end, one hierarchy supplanted another.

The King was replaced by a revolutionary dictatorship that would open the path for the Napoleonic Empire and a neo-European hierarchy.

The birth of reformed and networked hierarchy in the 19th century.

By conquering most of Europe Napoleon Bonaparte stamped his name in the history books. Not only did he just reemerge the strict hierarchy on France, but he also did so across all of Europe. Napoleon's enemies made alliances in order to defeat their common French enemy.

Once they won, they rapidly put up a hierarchical settlement all over the continent that would stand firm until only a century later. The Nations which were key to the new order were Britain, Prussia, Austria, Russia (these four countries had put an end to Napoleon's rule) and

France who joined in 1818 creating a pentarchy which imposed dominance in Europe for the next century.

These superpowers created an agreement and a blueprint to maintain peace and assure their dominance over Europe. Their vision was formalized at the 1815 Congress of Vienna. As a result, fewer wars occurred between 1815 and the outbreak of World War I in 1914, as compared to the century between 1715 and 1815 where a larger number of wars broke out. The order they had constructed was efficient.

Networks were the key ingredient in the longevity of this new order. The network created by the 1815 agreement between the hierarchies allowed this to be possible. Even though many individual states argued and cried about various issues, they all accepted the pentarchy had the final say of an issue. This helped in preventing conflicts and major wars from occurring.

For example, there is the royal of Saxe-Coburg-Gotha. Queen Victoria of Britain and her husband Albert, as well as the Belgian King Leopold, belonged to this royal network. Furthermore, this network was linked formally and ceremoniously by marriage to the French royal house of Orleans, the Austrian Hapsburgs, and the Romanov family in Russia.

The countries which were ruled by monarchies borrowed a leaf from the pentarchy networked hierarchies. Therefore, they ruled with a combination of networks and hierarchy. Therefore, networks continued playing a vital role in global affairs.

To build an empire and spearhead globalization, the British Empire made use of existing hierarchies.

During the 19th century, Britain would build a massive empire and started to outdo both its allies and enemies and soon became the most powerful nation in the world.

A major reason for its success is due to the fact that it made use of existing hierarchies for its imperial network. For example, Frederick Lugard, a colonial administrator for Britain, introduced the "indirect rule", which is a system that incorporated the local hierarchical governments into Britain's structure. Another factor enabled the British Empire to establish its dominance was the emergence of strong capitalist networks of banks and the Industrial Revolution.

Now they had both the technological infrastructure and financial backing to develop further networks across the world and the corners of their empire. For instance, they developed

thousands of miles of railroads, telegram networks and improved shipping all over their colonies.

The foundations of the globalization were revolutionized by the advancement of communication networks and the unmatched mass movement of people. Travel was way faster and less expensive. As a result, suitable conditions for the mass migrations of the modern era were established. Millions of Europeans set sail for the Americas whereas the Indians and Chinese looked for fortunes across the Southeast of Asia as well as along the shores of Africa and Australia. Socialist repercussions in both Europe and America were the results of the coming of immigrants and led to the rise of racism and nationalism.

The two most lethal ideologies of the 20th century started out as Networks.

For about 100 years, the pentarchy overlooked a period of relative peace in Europe.

This relative peace established in Europe broke down in 1914 with the emergence of World War I and yet again hierarchies were diminished and the world came under the opposition of emerging networks.

Socialism is a network that rapidly grew in the late nineteenth and early twentieth centuries. Lenin was a key figure in the socialist movement in Europe and managed to take up the reins of government. In 1917, he defeated the more liberal opposition of the Russian Tsar who had just achieved power in February of the same year. The socialist emergence was completed by the Bolshevik Revolution in October.

Their success was due to the fact that they were tied to a network, unlike their liberal opposition. Due to their better connectivity, their notion spread like a "disease". After Lenin's death there was a period of Civil War among the Bolsheviks, however, eventually, Josef Stalin came up victorious and was the new leader of the Soviet Union. His rule imposed an intensive hierarchy over the citizens.

In an environment of terror which was curtailed by Stalin's reign, individuals isolated themselves due to the fear of being denounced or framed by neighbors.

Simultaneously as Stalin was unleashing the first waves of terror in the Soviet Union, another little ideology was rising in Germany. The Nazis were setting up a network which was significantly different as it rose to power through voting and democracy. This is what

made them extremely unique. As a matter of fact, all of the votes submitted for fascist parties in Europe between 1930 and 1935, ninety-six percent were registered by Germans. The Nazi vote was growing at an extremely rapid rate. The Nazi vote was growing by a factor of three every two years after 1928, especially in places where large networks existed.

The results of the rise of this network were widespread dissociation as the party induced fear among the population and soon Germans were also terrified of the neighbors. However, after the Second World War, the Nazis' "Third Reich" crumbled, unlike the Communist Soviet Union which in contrast lived on. It would, later on, compete for World dominance with the new superpower United States and its NATO allies.

The years after the war were defined by hierarchy but the end of the 20th century saw the emergence of networks.

Defined by the Cold War, the post-war period witnessed a conflict between two large hierarchical structures. The United States of America led the NATO alliance and the Soviet-led Warsaw Pact. Both these sides could be defined as networks however they were largely shaped around a central hub, being the United States of America on one hand and the Soviet Union on the other. Decisions and information flowed out from the hub/core and then outwards.

In the years succeeding the Second World War, the hierarchy was not only restricted to simply military matters but also included a top-down economical organization.

Take for example Alfred Sloan's pioneered "M-form" corporation General Motors. General Motors was an American car manufacturing giant.

As the CEO of the company, he had the notion that corporations ought to be built around a pyramidal hierarchical structure with stockholders at the apex, below them being directors and the president of the company then various multi-legged departments at the base that didn't have much communication between each other but all they did was refer back to the central node. It became the new standard of business organization.

However, this being mentioned, networks did not disappear entirely. As a matter of fact, they were revived by Communist countries at the end of the 20th Century. After being dormant in the tough times of the Stalinist period, association sprouted in the 1970s.

As the worry of being related to non-Communist institutions began to decline in the 1970s, the first shoots of associations began to come up again.

In Poland, these developments were most profound. The working-class dissidents, educated liberals and academics and Catholics began connecting with each other. These elements that molded the network started to rapidly take shape and grow, increasing by around 40% between 1969 and 1977. By the 1980s it had found a central node in the Solidarity trade union.

The government's attempts to crack down on these networks were not so effective as the effectiveness of the network kept expanding and in June 1989 the Solidarity made a breakthrough in applying pressure on the Communist party into accepting free elections which saw the election results go in favor of the Union, significantly.

There was a chain reaction though-out Eastern Europe and by September 1989 Hungary had also taken in free elections and by November the Berlin Wall came down.

The Soviet Communist Party's had hardliners who tried a mutiny in August 1991 only to see it fail and to see the Soviet Union crumbled. This saw the fall of one of the two dominant hierarchical structures of the 20th century.

The decentralized networks of the day emerged as hierarchies and were put under pressure in the 1970s.

The networked civil-rights movement that had emerged in the previous decade, prior to the 1970s, diminished the hierarchical structures in the United States of America. Along with the institutions of racial segregation, other hierarchies began to look weak and started waning.

The world was opening up and becoming more flexible. Much less rigid than the previous times. An age of "interdependence" as defined by Henry Kissinger. Henry Kissinger was President Nixon's secretary of state. Different nodes, be it countries or institutions could no longer exist in solitary isolation. They were interdependent and each element relied on the next. This defined that period and it also led to the world developing a more complex worldwide system.

Central planning diminished in importance and became futile as this awareness spread through society.

Commercial structures and businesses realized they had become too hierarchical with its directors as central nodes. The directors were over flooded with information. On the other hand, the workers were too specialized in their line of work such that they couldn't adapt to changes in models even the simple changes led them to encounter difficulties. This disrupted the entire production process and was not an efficient model to utilize.

The internet began to be molded as the old hierarchical structures began fumbling. It grew organically unlike hierarchies, far from the central planning portrayed by hierarchical structures. The internet is a reflection of a network that embodies our modern understanding of networking.

As a matter of fact, it started simply with the need for a few computers establishing communication. It simply commenced in 1983 with a few computers communicating and led to the development of the TCP/IP which allowed any computer, irrespective of its own personal internal structure, to use this network for communication.

The internet grew exponentially faster once open-source tools such as HTML, HTTP, and URL were developed and added to the equation. The internet literally blew up and soon enough it then grew into a large spider-web of personal user-created content connected worldwide by hyperlinks.

The spirit of the internet's early days have been consistently held up in its advancement and development and to this day there is no single central authority managing or singularly individual nodes. Even now the internet is not controlled by a single central authority.

Users are free to add and remove links as they please, therefore, the networks are dictated and controlled by its users. This makes the web of connections very complex and impossible to trace. As a matter of fact, it is impractical to make a map of the internet. The web of connections is controlled by its users.

The internet has become the 'new' printing press. Both have the ability to share and convey information and just as the prices of books fell, so did the prices of computers.

Anarchic networks could have a major impact on society as proved by the early 21st Century.

On September 11, 2001, the terrorist attacks on the 'Twin Towers targeted the central nodes of America's economic and political system. This was defining moment just at the beginning of the century.

The terrorist claimed themselves to be the notorious group al-Qaeda. However, network analytics showed that the perpetrators of the attack had weak ties apart from one Mohammed Atta who served as the crucial node in the group. Atta had the highest betweenness centrality within the group with 16 connections of the 19 hijackers and to other 15 key people outside the group.

America responded by targeting al-Qaeda in Afghanistan as well as toppling Saddam Hussein's dictatorship in Iraq. As a result of this, various Islamic networks filled the country as a vacuum was left, operating more freely.

Other networks have also employed technology to alter the face of the Middle East. The Arab Spring, which commenced in North Africa, spread all the way to Syria with social media platforms such as Facebook and Twitter driving the spread of information during the struggles against these regions respective hierarchical dictatorships.

These vacuums left behind led to the development of new networks such as the Islamic State or ISIS which utilized the use of an open network and sites such as Facebook, Twitter, and YouTube. They used these sites to spread their messages and go viral.

By using countless social media networks at the same time, they avoided being shut down. And this applied in the real physical world too as the Obama regime tried to bring an end to the Islamic State only for them to keep increasing in number. Like the Hydra in Greek mythology.

Networks have the potential to challenge hierarchies in the West as recent events have displayed.

It's not only in the Middle East where hierarchies have come under intense pressure. There has been an influx of turbulence, since 2016, which has caused unrest in pyramidal institutions in the West with social media driving the disturbance.

This is due to the fact that social media is such a good tool for polarizing opinions. In the case of political issues, most social media users are situated in closed networks. They take up a space in which they are accustomed to receiving news that echoes their beliefs.

However if a person can find a way into these private networks and start spreading their own propaganda, it could get chaotic.

The recent “Brexit” referendum is a good example of this case. When the Prime Minister at the time, David Cameron, summoned for the referendum, the pro-Brexit Leave group (voting to leave the European Union) recognized their major disadvantage as most of the major and established hierarchical institutions in the United Kingdom were in favor of staying in the European Union.

Nonetheless, Dominic Cummings, the Campaign Director of Vote Leave, saw the opportunity to benefit his cause. He claims that Vote Leave was successful because of the focused advertisements utilized to lobby important messages on social media platforms. An example of these messages includes the assurance that leaving would liberate £350 million a week for the National Health Service among others.

Before the referendum, a great multitude of similar messages, which favored the idea of Vote Leave, were sent out across vast channels reaching various voters and their channels.

On the other hand, Vote Remain shapes their campaign on traditional campaigning tactics. When the country decided to leave the European Union, it was apparent which strategy was more efficient.

In the United States, Donald Trump (who was considered an outsider) was very much utilizing the capabilities of social media to put his foot into political power.

His success mirrored that of Vote Leave, which shows that most people are dependent on social media platforms for their news. About 50% of the population in the United States alone receive their news from Facebook alone.

Donald had a larger social media following than Hillary Clinton. With 87% more followers on Facebook and 32% more followers on Twitter, he was the more likely one to send his message to the individuals/nodes. Even though it seemed that Hillary Clinton would have a larger social media following considering that she had a larger share of urban and younger voters, the demographics on the internet weren't reflective of this.

Trump had a bigger advantage as well due to the fact that social media campaigns become more productive when discussed in the real world (offline), in social gatherings. Especially with individuals outside their social networks. More-so, it is more effective if the messages on

social media are shocking enough to go viral. This is where Trump leap-frogged over Hillary as he was more controversial and stirred people up more than Hillary.

The future has a probability of turning more chaotic and more networked unless the regulation is set up.

Networks and revolutions go hand in hand as we have seen and what does this symbolize for us as individuals who live in the most networked age in human history?

We are at the peak of a time that is just as much revolutionary as those that succeeded in the invention of the printing press, all due to the growth and development of the internet.

However, there exists a number of differences. Firstly, the internet has developed at a pace that is way more faster than which the printed books and literature did in the 15th and 16th centuries. Only about 2% of the world's population had an online connection back in 1998 while in 2018 the number has tremendously grown to about 40%.

The growth of the internet initially provided the idea of information sharing and knowledge democratization, however, things panned out differently. Technology has become a fruit enjoyed and exploited by huge American firms which restrict the benefits of complete dominance to themselves.

Even though these big firms such as Amazon and Google claim they are committed to an open internet they have done quite the contrary in ensuring their positions are unattainable.

New networks are therefore less open as they could optimally be and can be exploited to spread fake news and as channels to spread propaganda - as portrayed by a terrorist like ISIS and Russian trolls.

Some solutions to this could be reconciling hierarchies and networks. For instance globalization. The individual nation-state is still the fundamental of political power. There's a danger of a possible upheaval in the case where these two aspects are not reconciled in the modern world. And this could eventually lead to democratic repercussions and turn towards authoritarianism.

Another solution could be moderating cyberspace. Cyberspace is an unregulated area which is a reflection of the physical world before the establishment of rules, laws, regulations and the state.

There is no definitive answer, however, we can draw inspiration from the relative peace of the 19th century which could act as a guideline.

The Square and the Tower: Networks and Power, from the Freemasons to Facebook by Niall Ferguson Book Review.

Living in an age of networks and networking is nothing new to us people living in the twenty-first century, from the invention of the printing press, through the industrial revolution and the World Wars to the development of ideas of capitalism and socialism in the Cold War, establishment of the internet and now the more recent Brexit referendum and American election of Donald Trump.

These technologically-fuelled networks have quickly and radically spread new ideas and notions, molded world history and even diminished existing hierarchies.

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