Giulio Jan Valentini

Patricia Pisters

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An Ecosophy of Google

Why it makes sense to see Google as en ecosystem and what can we learn from this framing

Surveillance, Three Ecologies, Google Ecosystem, Monopoly, Privacy

The worldwide web was received with enthusiasm and optimism, it opened the doors for an utopia of democracy, freedom and inter-connectivity. This, until few companies grew into ecosystems big enough to arguably be the gatekeepers of the mainstream internet and thus, to shut that door. Their business model is fueled by the extraction of user-generated data and their influence over non regulated territories has shaped the landscape of the internet and beyond. By means of artificial serendipity, filter bubbles, echo chambers and recommender algorithms, users are retained and their attention is continuously harvested - but not without consequence.

Under the exploitative pressures of the GAFAM[1], the internet came about to be a heavily polarized environment and users are influenced by this. This paper focuses on Google and analyzes it by means of Guattarì's *Three Ecologies*. Through the use of this methodology, Google policies and design choices are scrutinised to highlight the robustness of its ecosystem and the power emerging from the massive orchestration of information it enacts through the multitude of its interconnected modules. This assemblage of services and practices shows proprieties that go beyond those of the single modules. Complexity emerges as the Google-Ecosystem is not just the sum of its part, its dynamic architecture reveals more than meets the eye. In a landscape where network-effects and winner-takes-all paradigms are shaping forces, emergency over-scale and self-organization over time are close to unbeatable.

One of the specific tasks of this essay is to deal with an object where every point is extremely interlinked. To analyze this I am going to thread the standard academic path of going step by step, while being conscious of the limitation of said approach. Only in the very end all the necessary connections - which maybe during the discussion are partially implicit - are clear enough to draw conclusions. Google is first framed as a cybernetic-ecosystem and its goal is identified through its business model. Following, the three layers provided by Guattarì are applied in an effort to understand Google's impact on them. Finally, conclusion are drawn on the Google-ecosystem as a structure prone to monopolize and shape the digital landscape, and consequently the real world. Throughout the paper, concepts and spatial abstractions by Vladan Joeler are built upon to assist the argument and provide visualization of the issues.

1. Understanding the Google's Ecosystem

1.1 Google as a cybernetic ecosystem

An ecosystem is the context where organisms interact with the environment. Ecosystems exists in the broader spatial context of the *landscape*. The *eco–* part of the word relates to the environment, the *– system* part implies that the ecosystem behaves as a collection of related parts that function as a unit. The related parts can either be biotic or abiotic and they exchange matter and energy (Smith and Smith, 2012, 4). McNaughton and Coughenour argue that ecosystems are cybernetic in nature. What makes them a system are the specific dynamic relationships between the constituent components. What makes it cybernetic is the existence of coordination, regulation, communication, and control in these relationships. (McNaughton and Coughenour, 1981, 3). They go on explaining that the flows of matter and energy are a manifestation of the information flows and thus, ecosystems are cybernetic systems as long as information pathways and control mechanisms remain within the system. (McNaughton and Coughenour, 1981, 5). Cybernetics scholars have discussed if ecosystems are cybernetic systems or not[2]. One of the main argument for ecosystems not being cybernetic is that the flows of energy and matter cannot be understood as a network of circulating information. Diving into that discussion here is not useful since Google-ecosystem

is structured upon information flows and feedback loops at different scales. Thus, if the reader agrees that Google's mechanisms resemble an ecosystem, it cannot be of any other type than the one understood in a cybernetic sense.

Furthermore, according to Smith and Smith, the biotic component is the one that responds and influences the abiotic, not the opposite. The abiotic component acts mechanically, without intention, while the biotic component is actively pursuing a goal. Distinguishing the two components based on how they relate to *bios*, is not useful in the digital landscape. While life-like systems with non-deterministic behaviour can here exist[3], only quantifiable images of what pertains to life can enter the digital landscape. Thus, detecting the biotic and abiotic components is not relevant, the *bios* has to be detached by associating the components to the way they operate. The intentionality of the biotic component is crucial also in the ecosystem defined in a cybernetic sense. All of its parts act towards a common goal which is mediated by a common information network. This goal is not merely the coordination of its activities but rather to preserve and perpetuate the intentional component. Thus, the goal makes only sense in relation to an environment and consequent adaptations. (McNaughton and Coughenour, 1981, 5)

The Three Ecologies outlined by Guattarì serve here as a tool to draw a picture of the various entangled layers from which Google as an ecosystem emerges. This approach allows to understand the complexity emerging from assemblages such as Google, while also highlights the relations it has with the environment which parallels the relation between culture and nature. "Now more than ever, nature cannot be separated from culture; in order to comprehend the interactions between ecosystems, the mechanosphere and the social and individual Universes of reference, we must learn to think 'transversally' (Guattarì, 1989, 43).

In an effort to think *trasversally*, this papers investigate how Google can be understood as an ecosystem in the context of the digital landscape, where its modules engage with the three layers outlined by Guattarì. Moreover, Google efficiency increases as it grows - thanks to *Network-Effects* and *winner-take-all* mechanisms that emerge in the context of digital networks. This context is defined by Stiegler, who builds on Simondon's idea of culture as an "Associated technical milieu",

as an ”Environment totally mediated by telecommunications, by modes of transportation of Communication and by the Public as well as by television and radio, computer networks and so on, whereby distances and delays are annulled ” (Stiegler, 1998, 60). This process mainly breaks down to Google's astounding ability to orchestrate information efficiently and thus, making users dependant to *free services* that enshrine a narrow definition of productivity (Odell, 2019, 10).

1.2 Google's Goal: its business model

The aim of this section is not to thoroughly explain Google's intricate business model, something to which I redirect the reader to the vast literature available on the topic. The aim here is to highlights the main points of it so that, following the step by step procedure stated above, the necessary tools to understand the logic behind its design choices that culminate into the ecosystem-infrastructure are provided.

Google is growing steadily and without showing any signs of slowing down. Since 2012, year in which Vaidhyanathan raised concerns about the Googlization of everything, the company's revenue has increased by roughly 20% every year[4]up to the astonishing amount of 160 billions in 2019. Roughly 70% of this revenue is gained from advertisement - Google sells targeted ad-spaces by auctioning slices of its audience to the highest bidder.

Google is a Multi-Sided Platform as it ”enables direct interactions between two or more distinct sides” (Hagiu, Wright, 2011, 5). On one side there are users, who are attracted by a plethora of services accessible without monetary fees. On the other side there are companies, who want to effectively reach their target audience. Google mediates the relation by connecting companies, who pay for the service dearly, with their desired customers. What makes Google lucrative, is the ability to target a specific portions of its audience with extreme accuracy.While Google rarely reaches directly for users' wallets, it does not lose a chance to peak into their lives and to take notes about their behaviour.

In this type of systems, where information is excessive and attention is sparse, attention becomes a currency (Pedrycz and Chen, 2014, 226). The enormous quantity of data harvested about

the behaviour of each user is analysed through sophisticated algorithms that are protected trade secrets hidden behind inaccessible black-boxes. The more attention users are spending within Google's reach, the more ads users are exposed to and the more granularly Google is able to profile them, which increases the likelihood of users responding to ads and thus, increase the value of the advertisement offered by Google.

In this sense, attention is the main commodity Google profits from. Moreover, Network-effects[5]exacerbate this mechanism and creates feedback loops, so that the more users a Multi-Sided Platform attracts, the more valuable it becomes for every side involved (Nieborg and Poell, 2018, 8). As a wide range of digital communicative activities, including web search, email, online video posting and viewing, and numerous other activities are being 'Googlized' (Vaidhyanathan, 2012, 13), winner-take-all effects come into play, allowing a platform to aggregate a disproportionate amount of users, revenue, and/or profit (Brynjolfsson and McAfee, 2014, 10). The Google-ecosystem implements this model on various scales to the point that it arguably works as an ecosystem for hosting modular Multi-Sided Platform, All these modules apply the same logic, adapted to their own specificities and combined with peculiar design choices that result in Google's business model, which is here generalized, but exhaustively explained by many scholars[6]in many of its shapes.

1.3 Google is an Ecosystem

The Google infrastructure and its users can be understood as en ecosystem in the digital landscape. Who is here pursuing a goal is Google, while users are understood as a mechanical source of data. Google aims to maximize profits, which is to maximize the attention harvested. On the other hand users are not unified by a common goal: everybody seeks efficiency for independent reasons and their behaviour can statistically be understood as the environmental component. In fact, Google intervene on the environment with design choices that polarizes users behaviour so to maximize the attention it can harvest.

This practice is eloquently formulated in one of the slogans from the Design Manifest by

Gerritzen and Lovink: ”PROPERLY DISTRACTED = TOTALLY EXTRACTED”(Gerritzen and Lovink, 2020, 54). The more resources it is able to extract the better it can thrive, grow and thus, extract more resources. As ecosystems thrive in presence of water, rivers can be steered by the biotic component towards a destination that is more efficient for an ecosystem to thrive, in the same way as human behaviour can be polarized for attention extraction.

To achieve this, Google juggles with its data-processing capacities by interacting with the complexity of 'The Stack' on several layers. While looking at one of Google's practice or service at a time offers exhaustive explanations of their functioning - complexity arises when all of these modules are connected and centralized. The ways it works are actively mystified and shielded from prying eyes. While this black-box ensures Google's trade secrets, at the same time is used to cover unethical practices that do not share anything with trade secrets other than the necessity of secrecy - but for different reasons. Just to exemplify what I mean: when creating a Google account, Google asks for permission to access users' emails. Why Google needs to read its users emails? Apparently, *to better their services*. At least this is how they answered when faced with the question but promised that it would never ever read users emails. Yet in 2018 it sold billions of private emails regarding transaction to Mastercard, Google was caught and had to pay sanctions. Nonetheless, the user agreement has not changed[7].

2. Material Ecology

2.1 Digital and Physical Landscape, infrastructure ownership

To build on the idea of Google as an ecosystem a clarification needs to be made between what the physical-landscape and digital-landscape are. The first is the physical world we live in and where the titanic infrastructure of servers, cables, satellites and personal devices that allow the second one to exist, is hosted. The digital landscape is sustained in the same way as Atlas sustains the Earth in the ancient myth. Earthlings did not experience Atlas, in the same way as users do not experience the computational Stack beyond its interfaces. I do not argue here for a separation of these two spaces as early cyberspace enthusiasts would[8]. These two environments are overlapping

and entangled in a complex environmental, social, economic and political system. What I argue for is that the infrastructure is a mean to shape the digital landscape - which then reflects and pervades physical objects in order to project images of them back to the digital. Interfaces for data surveillance are getting embedded in houses, cars and cloths so that images of these suddenly exist in the digital environment, with all the consequences of having a presence in the digital environment - in Bratton's words, interfaces are point of contact between complex systems that govern the conditions of exchange between those systems. (Bratton, 2016, 2020)

What pertains to the digital landscape is anything that can be computed: if something is not *translatable in information* it cannot enter the digital landscape, only images of it can. We cannot download a meal, but we can get it delivered; we can look up the recipe and where to find the ingredients, but we cannot download them. While many industries are pushing their possibilities as far as they can, computation still is the hard and non negotiable limit for all the players involved and this cannot be overdone without a radical re-design of computation as we know it. Within these borders, the infrastructure imposes design choices that determine how users experience the digital landscape. Is important to note that the infrastructure is shared among all the users, but not equally - its distribution is polarized towards few main actors.

For as much as the computation allows, the available technology poses a limit on its possibilities. More developed technology translates into the flow-capacity of the information network over-scale and the speed of data processing over-time. The dimension of the files that can be shared has been exponentially growing, while the time and energy required is exponentially decreasing - To the point in which executing a certain task might take longer than waiting for a better technology to be available and let it process it[9].

In the case of digital-ecosystems, this creates a dis-equilibrium between the two components. While both of them influence each others with feedback loops of information flows, one has access to the entire data-set about each user. Thus, one side has the full map of the information-flows that determines the cybernetic-ecosystem; the other only sees the manifestations of the information flows allowed by who owns the infrastructure. Google is able to read and interpret the growing

scale and complexity of these flows of information through AI and machine learning algorithms - the quantity and quality of data and the processing power they own is unprecedented by any organization, private or governmental. In this unbalanced relationship lies the power Google has on its users, developers and competitors.

Software are increasingly becoming online-only and often provide no purchasing-alternative to the monthly-subscription model. Hardware is going in the same direction, thanks to cloud-computation and faster internet connections, computational power is more and more centralized and provided through clouds. Most of the data is stored in servers owned by few companies, one of them being Google. Users are losing ownership, or have already lost, of software, hardware and personal data. This disadvantage does not only lock users and their data to the Google ecosystem it also makes Google more efficient and hence, actively grows the disadvantage. Owning such a huge and capillary infrastructure allows to shape the digital-landscape by means of affordances and thus, making an ecosystem more or less attractive to users. Google infrastructure is so wide and thus efficient, that every competitor is less attractive.

2.2 GOOGLE ECOSYSTEM IS DIGITALLY NATIVE

The Google infrastructure locks users in by design - this is what Vladan Joeler calls *gravity* (fig. 1). Gravity is a propriety that emerges from the design choices of infrastructure such as Google. These conglomerates concentrate services, content and users in the same way as gigantic concentration of masses curve the space and time into black holes - both of them keep attracting and swallowing more. The lubricant proprieties of the digital structure, in some sense, curves the time and space by speeding and optimizing flows of information.

The very core of the concept of gravity is the Google-Account. Introduced in testing phase on the 1st of April 2004, it was publicly released on 7th july 2009. It supposedly started as a web mail service and quickly developed into an identity badge and the main tool for Google's optimization. It works both as a passpartout-key for many services and as a digital-id to which all users data is associated, stored and centralized. With the G-Account users can use around 850[10]software

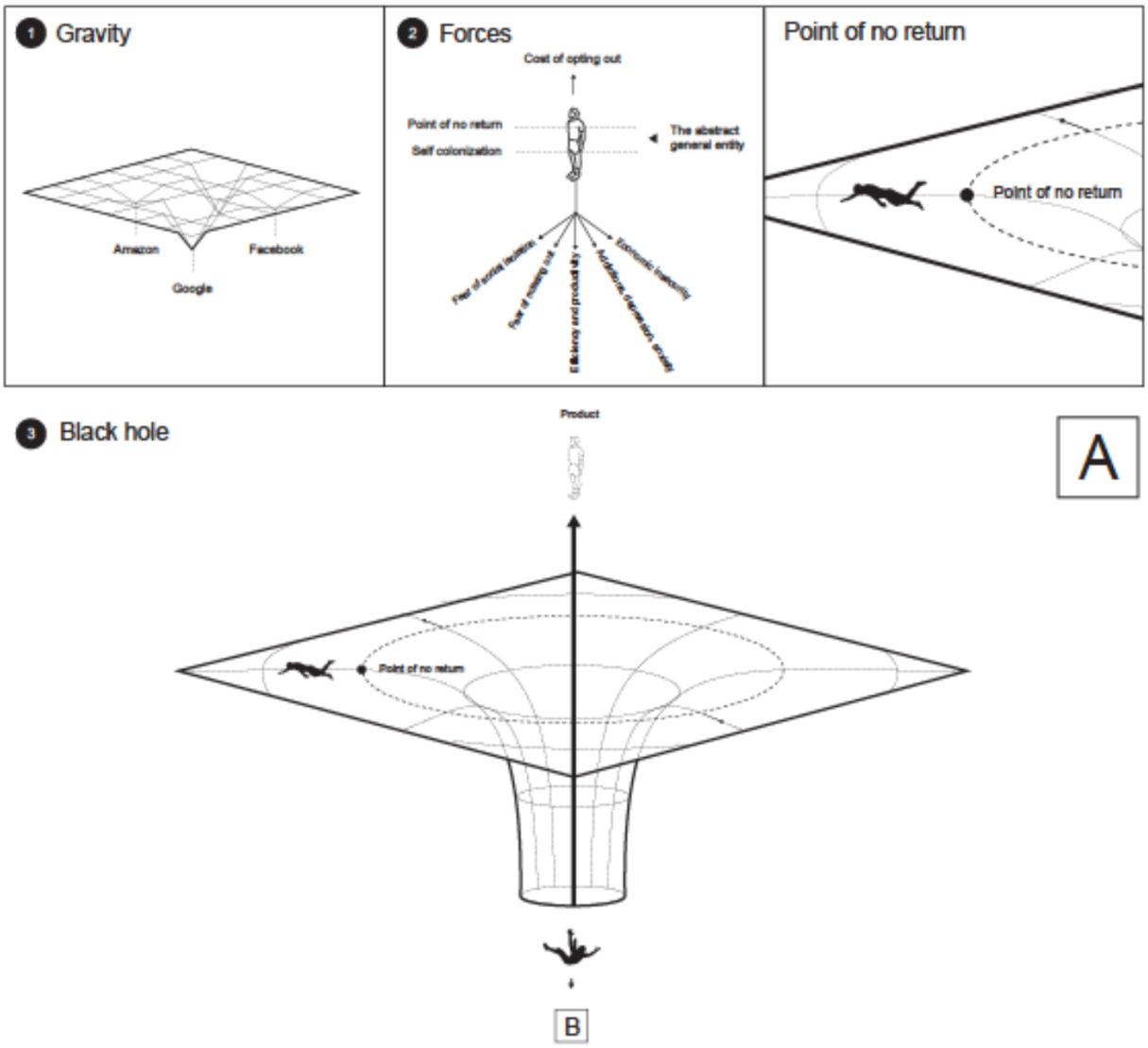

Figure 1: Visualization of *Gravity* by Joeler. Users are being swallowed by Google

by Google of which around 600 aimed to developers. Services such as the G-suite package, G-mail, Google-maps, Youtube, the Play-Store... the list goes on. It also allows the users to log in to millions of third party services such as websites and application[11]. The G-Account is also a requirement to use some hardware running on Google's OS such as android phones, which are 87.5% of the smartphone market share[12]or Chromebooks, Google's laptop that work only through cloud computing and thus, requires to be online and logged to Google to do almost any task. Partner companies that rely on Google services such as Uber are forced to use Google service for their infrastructure[13]. Meanwhile the G-Account has taken over schools and workplaces, offering

G-suite for an unbelievably competitive price. What makes the price believable is that students and workers are paying for it with by giving up their privacy.

The G-account removes plenty of friction for users by centralizing their data, users can login to a plethora of services without creating new credential or inputting more data. Users might even be misled into thinking they are giving out less data, while they are actually giving out more and making it more valuable as their digital profile is increasingly becoming multi-faced. Using any other service that asks for credentials to be inputted is an extra effort for the user, who starts to get *attracted* by the optimizing gravity of Google. Millions of students are forced to use Google services at school starting from first grade on, many of which found themselves with Google-accounts with their names and details without ever providing consent from them or from parents when minors. Furthermore, workplaces force employees to use Google in order to save money on licences for the software needed to run the company. It is clear how the effects of this kind of politics do not end in the workplace and users get accustomed to Google's interface, which is consistent throughout its services. Using alternative services for leisure, productivity and entertainment requires them to keep up with doubles of the services they already use and to learn to use them.

Moreover, Google's interface design is not simple but deceptive: it hides complexity it does not simplify it. Interfaces aim to be deeply integrated so that the user *is not aware of him/herself as being a user of a specific program, but experiences him/herself as the one performing a task without noticing the mediation* (Hadler, 2018, 5). The interface will never disappear but users internalize design choices and procedures. When trying to perform a task through a different kind of mediation from what the user is used to, the interface emerges. If a user is accustomed to the interface design of a certain provider, and the design choices are coherent throughout all the interfaces from the same provider, the interface will be less noticeable and more submerged and embedded in the service itself. If the users choose a service from a provider that mediates the performance with a different kind of interface design, it will emerge more evidently and thus increasing the perceived cost of learning to use a new software. Considering that Google interfaces hides complexity, any other interface seems complicated by comparison. (Valentini, 2020, 5) The

consistency of the interface, its user-friendliness and deceptive simplicity add more gravity to the Google conglomerate.

The gravity retains and lock-in users within the ecosystem, accomplishing Google's goal to harvest as much data as possible. This is enabled by the ownership of the physical infrastructure which determines the affordances of the digital environment. Their design is specifically structured to maximize Google's goal and thus, shapes the digital-landscape in the same way an open-pit mine shapes the physical landscape. Google's ecosystem shapes the digital environment by embedding the logic of surveillance capitalism, which is mediating every action in the digital environment and is invading the physical one by building surveillance structure on top of objects that are not natively predisposed to that logic, such as jackets and cars. This has consequences on how users can move around, or better, how the digital-landscape moves around users, shapes the shared abstract space and mediates how users relate in it and to it. The polarization of the digital landscape then, comes with no surprise: as the infrastructure is tweaked to promote and reward a certain behaviour, the landscape is affected accordingly.

3 Social Ecology

3.1 Landscape shape as a consequence of intensive data extraction

The Google Search engine has established itself as the main gate of the internet, being the access point for most users and holding almost 99% of the searches in western countries and 88% worldwide [14]. What lays beyond the gates is based on what the user is querying but mediated by Google who determines what is best for us to see - which does not fall far from what is in Google interest for us to see. Which is, again, what retains users within its ecosystems. Moreover, the results are specific for each user so that the editorial power Google is holding is individually tailored by its algorithm. Some results are ranked higher and some others lower. Google determines what is closer, further or hidden from us - being advertisement the top result. The same idea is applied

to each of Google's services that is equipped with a search engine - it chooses what deserves to be closer, further or hidden from us.

What allows Google to specifically tailor its services and sell ads targeted on specific users is the surveilling infrastructure that is pervading its ecosystem and beyond. The two main component that make this work are the G-Account and Doubleclick. The first one accumulates users' data by tracking every device, software, or services they log in with using the G-Account. It centralizes behavioural data from a multitude of sources with the complicity of the users who sees the advantages of G-Account lubricant proprieties. Doubleclick is a tracker: trackers are embedded into webpages and collect data about the visitor, such as the device in use, the location, the ip address and more. DoubleClick is capturing users behaviour in the background of webpages and follows users beyond Google's domains. The combination of these two technologies results in a powerful surveillance infrastructure that collects, combines and centralizes all of the users data into their digital profile. The core of computation is information flows, everything in the digital landscape exists first and foremost as a flux of information. Thus, the digital landscape is naturally predisposed to host the logic of surveillance - protecting data from being captured require the user extra steps, which often are not allowed by the user's agreement. Moreover, companies such as Google do not have any interest in changing the paradigm, they are rather concerned on expanding the quantity and quality of user information they can access. This results in what Joeler calls the rhizomatic surveillance[15], which allows to collect information and centralize it. Through the invisible network of data dealers, public and not public partnerships, those pieces of information are in a constant flow forming one functional entity. Surveillant assemblage can be seen as a rhizomatic structure described by Deleuze and Guattari. (Joeler, 2020, 11)

The complex data sets produced by this type of surveillance, is worked and analyzed by AIs and machine learning algorithms. Algorithms offer us solutions that are tailored for us but not aimed to our interests - they are first and foremost oriented to the companies' ones. Google's search engines such as Google.com,Youtube.com and G-maps, determine what content users see based on that principle. This leads to an algorithmic landscape that moves around us, while users

find themselves in filter-bubbles actively trying to keep them attentive (fig 2). The results is that users interactions are mediated, as much as the content users can access. Google's ecosystem is shaping the digital environment so that users data yield is maximized and the algorithms determine what reality suits each user best to accomplish Google's aim.

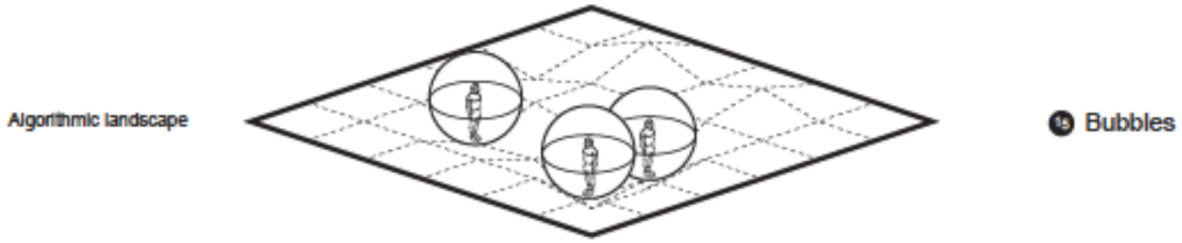

Figure 2: Visualization of *Filter Bubble* and the resulting *Algorithmic Landscape* by Joeler

The environment is designed to trap users by offering content that keeps them consuming more by means of echo-chambers and polarizing feedback loops of content. This happens without concerns about consequences on users and the representation of reality they are provided. *The increasing deterioration of human relations with the socius, the psyche and 'nature', is due not only to environmental and objective pollution but is also the result of a certain incomprehension and fatalistic passivity towards these issues as a whole, among both individuals and governments.* (Guattarì, 1989, 41)

Arguably, Google is also absorbing the physical landscape by duplicating it in the digital landscape and thus, creating new digital services on top of the physical ones so to impose capturing models. Google Maps orients us in the physical landscape, promotes brick-and-mortar businesses and hosts third party services such as Uber and PokemonGo; the Google-Lewis collaboration produced Lewis jackets embedded with Google interfaces. These practices are creating a digital corresponding image of the physical landscape, so that everything is translated into information and can be subjected to the logic of surveillance capitalism. In other words, is not the digital environment simply leaking into the physical one, but rather the latter being reproduced and simulated in the

first one, so that surveillance models can be applied.

3.2 Consequences on the Digital Landscape

Filter Bubbles are amongst the most evident and discussed consequences of Google business practices on the digital landscape. Google rules the web through its power to determine what gets noticed (Vaidhyanathan. 2007, 2) and in 2009 it already used 75 different signals about users behaviour to determine what kind of advertisement should be promoted to them(Pariser, 2012, 6). While revenue from tailored ads is one side of the coin, keeping users engaged is the other - the same logic used by the algorithms that orchestrate tailored ads is transposed to all the content that users are shown (Pariser, 2012, 10). Filter Bubbles are the result of algorithmic prediction that determine what kind of content keeps users attentive, so to shape the digital landscape. As Eli Pariser well formulated, people have always be prone to consume media that appealed to their interests and ignored much of the rest. Nonetheless, he points out how Filter Bubbles are more than that because of three specific reasons.

First, the Filter Bubble is specifically tailored around users, who find themselves alone in the specificity of the media that is offered to them. Previously people could lean towards a certain type of media, such as tv-channels that would approximately target a cluster of (not single) viewers. Users would know that the media they consume are serving a particular point of view - which leads to the second point: Filter Bubbles are invisible and Google's agenda is opaque. Users do not know the assumptions Google is making, they have not chosen the criteria of the filters and users could easily think that the content they are provided is unbiased, objective and true. The bubble is personalized and unique, is not easy to compare its content because we are in it alone. Users loneliness, combined with Google opaque policies, makes it impossible to know how biased a bubble is. Third, users do not choose to enter the bubble. The bubble is around them from the very first search and it gets narrow all the time. Google's algorithm keeps collecting data on users who do not have power over the filter used by Google, they cannot chose what kind of bias they are facing.

The concept of Filter Bubble is similar to that of echo chambers, the latter being usually referred to news. Users end up consuming content that confirms and reinforces their pre-existing positions and creates a feedback loop that radicalizes (and retains) users. While these types of phenomenon are consequences of the algorithmic editorial power, they are not to be considered just a mere consequence of the customization of services: algorithms are not optimized to provide the best user-experience nor to polarize them - the aim is rather to keep them online as much as possible.

Vladimir Youler introduces the idea of *Planopticon* (fig.3) to describe such systems. The Planopticon is a combination of Plato's Cave and Foucault's Panopticon. While surveillance is centralized and users are around it, they are lonely consuming the media offered to them. Moreover, the way media is consumed is reminiscent of the way in which people, chained to the walls of Plato's cave, watch shadows - contextualized projection of objects - and give them names and meanings. In the Planopticon the *performance of shadows* is directed by human-algorithmic machines that regulate, filter, censor and moderate content. what Guy Debord describe as: "an immense accumulation of spectacles consisting of images, sounds, text, emotions and meanings. All that once was directly lived has become a mere representation"

"However, this is not a single play, but a multitude of simultaneous and different performances. The gravity of these techno giants hold billions of users/workers/products at the bottom of those caves. Each user detained in their own cave is exposed to a designed play adapted only to them. This self-centered personal space is filled with images and meanings selected by algorithms partly with respect to its affective and cognitive reactions. The user is in a specific closed circle, communicating with oneself in a particular form of self-stimulation and exposed to a constant flow of spectacle. Therefore, this cave or prison cell is a place of pleasure from which, as in Plato's cave, the prisoner does not even have the will to come out. In this assemblage of allegories, millions of caves or prison cells form the unique and invisible panopticon structure. The central tower of this structure has two main functions: (1) to project the content on the walls of the caves and (2) to surveil and capture the digital shadows of the prisoners reflected on the opposite wall." (Youler,

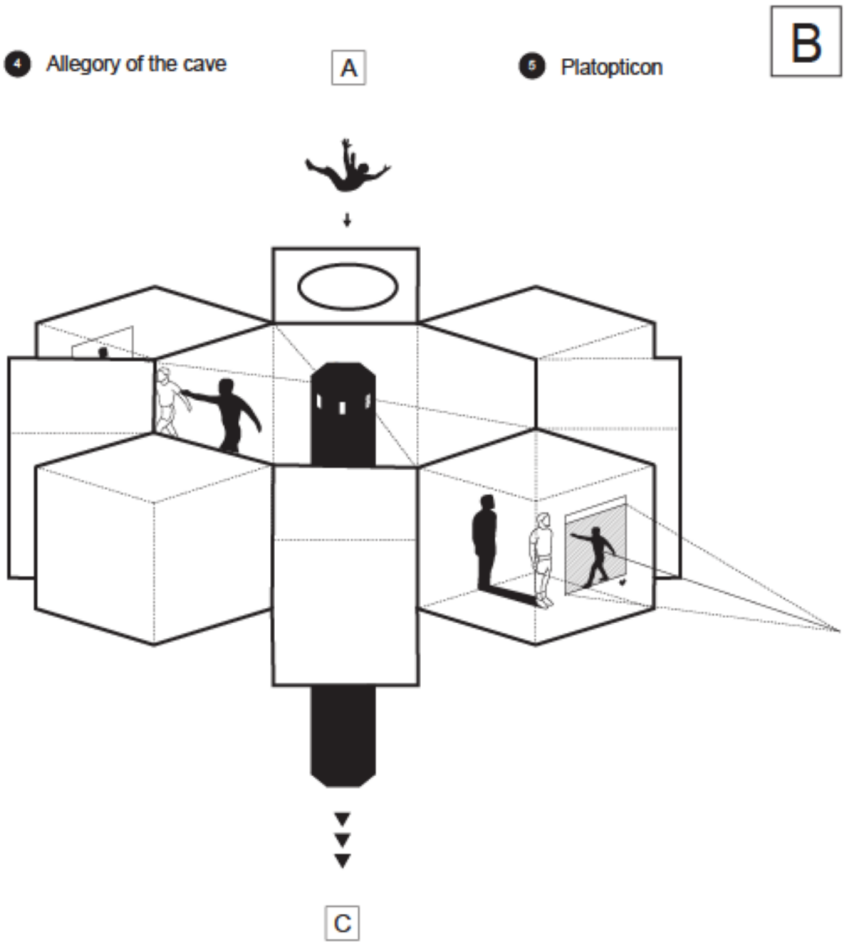

Figure 3: Visualization of *Platopticon* by Joeler. Users are isolated and surveilled, while the landscape around them transforms

2020, 4)

3.3 Consequences on the physical Landscape

G-maps is the most used Google service after its search engine and overall, one of the most used app of all times. G-Maps encapsulate Google business' politics such as the absorption of competitors, exploitation of user-labour both direct and indirect, infrastructuralization of its services by integrating Multi-Sided Platforms. This is conceptualized as the Googlization, "An important political economy style critique of Google's taking over of one service after another"(Rogers, 2009, 1)

This service started in 2004 with the acquisition of two start-ups, *Where 2 Technologies* and *Keyhole Technologies*. The first being a browser-based digital map service and the second a geospatial data visualization company - its "Earth-Viewer" software became what is today know as Google Earth. In 2005 another start up gets absorbed, *Zipdash*, a real-time traffic congestion application. In 2005 G-Maps opens access to its API, leading to massive contributions from users and third-parties who were able to add features to G-Maps and embed it with other services.

The participatory culture has since been a key of G-maps development even though today it is employed in new ways. Indeed, in 2008 Google acquired the bot detecting software *reCaptcha* and rapidly used it as a new way to crowd-source the process of cleaning and curating data, by making users scan various pictures taken from Street View. Moreover, Google has been capturing hundreds of billions of pictures of earth by employing humans and cars equipped with 360 degree cameras travelling the world. G-Map is a *technology in motion*: it should not be seen a single entity but as the result of integration of different parts that continue to develop even as they mesh into the Mapping-platform. (Mc Quire, 2019, 4).

In 2008, G-maps mobile app is officially released coincidentally with the announcement of commercial Android mobile devices. This step is crucial as hundreds of millions of users started carrying phones in their pocket and providing, once again, crowd-sourced data about mobility alongside establishing the *always-online-state* in which users keep gravitating within Google's reach, and providing it with lucrative data, even while not using their phone. After a decade of investing, collecting and curating data, G-map became an essential tool for everyday life. It does not only provides all the alternatives to get from point A to point B, it promotes and rank shops around us and highlights points of interest. This mastodontic project was achieved combining its own data, user-generated data and licensed data.

In 2013 Google bought its main competitor, *Waze*, for $1.3 Billions which was not absorbed and still exists independently, G-maps uses Waze's crowd-source generated data, provided by the social-mapping features of the software, to enrich itself. This digital mapping-infrastructure is growing steadily and setting the ground for Google's self-driving car company.

G-Map enriches the environment to the point of being a crucial service for people's every day life. It is growing to be a private infrastructure offering a universal service but there are major limitations of public oversight over the companies choices, decisions and operations(Mc Quire, 2019, 10). In October 2010 Nicaragua troops invaded Costa Rica and moved its borders by 2.7km into Costarican territories. Nicaraguan officials did so on the basis of the borders shown on G-Maps, which were providing more territory to Nicaragua than it actually controlled. While Google soon admitted its mistake in signaling that border, Nicaraguans where already installed in the territory without intention to leave.[16]

Apparatuses such as G-Map are the main vectors for what Stiegler calls *hyper-capitalism* - a system in which production, logistics, entertainment, marketing and finance become increasingly integrated and synchronized across the globe (Mc Quire, 2019, 13). Moreover, Mc Quire argues that this has immense psycho-social and political consequences. One's position is today fundamental to commercial logistics and governmental security agendas - the corporate ownership of such infrastructure will only further exacerbate current issues, without leaving space for other possible futures. (Mc Quire, 2019, 13)

"However, today the huge subjective void produced by the proliferating production of material and immaterial goods is becoming ever more absurd and increasingly irreparable and threatens the consistency of both individual and group existential Territories. While there no longer appears to be a cause-and-effect relationship between the growth in techno-scientific resources and the development of social and cultural progress, it seems clear that we are witnessing an irreversible erosion of the traditional mechanisms of social regulation." (Guattarì, 1989, 46-47)

4 Mental Ecology

4.1 Computer Aided Subjectivity

As stated at the beginning of this essay, all these layers are entangled. Following a step by step procedure in the analysis of Google's ecosystem has required that certain aspects have been anticipated yet left partially implicit in this text. The many premises that have been outlined and

anticipated in previous sections, in this section will come together and conclusions are soon to be drawn. Analysing Google as an ecosystem shows how its multiple modules are interlaced on all layers working for the common goal of retaining users. The environment is designed to lock users within Google's gravitational field. Users are isolated, recombined and relocated in the digital landscape, based on their algorithmic profile - which consequently reflects on their perception of reality.

Now the attention is given to what type of individual emerges from this attention-harvesting mechanism and how users behaviour is being colonized by means of grammatization. Google is today an unavoidable extension of our cognition as it raises the bar for user productivity. A human with Google is like a 'superhuman' by information flows that are accelerated through the affordances of Google. Google makes easily available all kind of services necessary for daily tasks, work and school related efforts and even our entertainment. People who refuse to be users are left with less possibilities, less service and less efficiency to the point of making them less-competitive compared to Google users.

Zuboff argues that being a user is the class identity of the exploited lower class of Western society[17]. Users lose their individuality as their dependency on digital services becomes deeper. This has also been outlined by Guattarì who saw the working-class/middle-class oppositions being projected into new imaginary conflict (Guattarì, 1989, 29). Guattarì continues: "After the data-processing and robotics revolutions, the rapid development of genetic engineering and the globalization of markets, neither human labour nor the natural habitat will ever be what they once were, even just a few decades ago. [...] it requires a reconstruction of the objectives and the methods of the whole of the social movement under today' s conditions" (Guattarì, 1989, 43). Furthermore, as subjectivity requires a new paradigm - one that does not limit an individuality to its human parts, it calls for hybrid individuals whose subjectivity is computer-aided, as they are remotely controlled and governed by institutional and social class dimensions (Guattarì, 1989, 39). Augmenting the quantity, the quality and the structure of information collected on users is Google's main drive. This is achieved by maximizing the capture in terms of quantity of data, multiplicity of sources

and finally structuring it into meaningful architectures.

The last step is what concerns the Mental ecology and is well argued by Tony D. Sampson in his book The Assemblage Brain. The second chapter, Neurolabor: Digital Work and Consumption, begins by asking the question, what can be done to a brain by mapping the brain's relation to recent trends in the management of efficiency in the workplace and sites of consumption? He argues that changes in technological and scientific approaches to the relation between brain and body is shifting the ground toward the goal of consistent efficiency management of work and consumption. (Sampson, 2017, 45). The way in which - what he calls neurocapitalism - is manifesting, is the understanding of how neural interactions relate to motions, affect, feelings and decision-making processes.

This results in a regime of control that neurologically models and imitates experiences to condition workers' (which is to also say users') motivation and consuming engagement. These are combined into the same circuit of control. "On one hand, there are numerous popular notions of the smart advantages achieved through sharing knowledge on a network. These serve as indicators of the emergence of an assumed neo-liberal economic model that taps in to the self-organizing hive mind. On the other, the detriments of immaterial labor have been grasped as part of a cybernetic control system that transforms activities not normally associated with work (play, chat, fashion, tastes, opinion) into products of often low-paid or even free labor."(Sampson, 2017, 47)

The immaterial and free labor that users perform does not only expose them to profiling practices, but as well increases their vulnerability to new cognitive subjectifications, by which new quantifiable models of user behavior are generated. This is done by way of 'cognitive routinizing' that is perfected by conforming the processes of mind to software. Thus, a user's mental functions are read as if they are functions of computer software. This includes a user's perceptive and attentive functions, and also inputs that are consigned to memory storage or hardware system primed for future action.

For Sampson, this, is reminiscent of the effects of the post-Fordist cognitive circuits of control that have partially mummified non-conformist thinking.(Sampson, 2017, 51). Stiegler has in this

sense defined neuropower as the shift from the biopower of the factory to the psycho-power of marketing control (Stiegler, 2013), what Sampson calls transcendental-Fordism.

In ”Postscript on the Societies of Control”, Deleuze outlines a form of power that transforms individuals into dividuals who are deconstructed into numeric footprints and administered through data-banks. The rhizomatic surveillance assemblage that served as the basis for algorithmic profiling of users broke them down into an atomized subjectivity who lost its unique identity for the sake of being combined with other dividuals. Hereby, their unique individuality, or say, 'human identity' is foregone by the way that Google 'reads' them, for the sake of categorizing users as dividuals. Dividuals are understood as data-bodies, defined by the continuous yet specific information-flow that moves through them. The more user behaviour is rendered as information-flows, the more their individual identity is broken down into the modules that require computer-aid to affirm as a subjectivity.

Moreover, as Vladan Joeler points out ”every segment of our existence can be seen as a form of direct or indirect labor producing data as a behavioral surplus. When we breathe, walk, or sleep, every single emotion that we feel, our attention, our body temperature, or diseases that we have—everything can produce a behavioral surplus if being captured by this giant surveillance apparatus. In that sense, even our bare existence can be seen as labor.” (Joeler, 2020, 13) Important to emphasize is that the ecosophy of Google has managed to develop a system that is able to extract the surplus value from the bare existence of its user. It is the function of Google's infrastructure whereby user's bare existence becomes their surplus value. The fact is that users themselves are not able to turn their bare existence into surplus value; they do not have access to the means of production for the value transformation. Google holds the means of production for the extraction of value.

5 Conclusions

In what follows, our finding so far will be summarized and multiple threads will be pulled together. The analysis of the ecosophy of Google has allowed us to frame Google as a cybernetic-

ecosystem in the digital landscape, where biotic and abiotic components are defined by their functioning, rather than on their liveliness. Thus, the relationship between biotic and abioticas that would be intuitive for such an ecosystem, in the case of Google, are in fact inverted. Google is the intentional component (though not lively) and users the environmental one and thus, understood as a mechanical source of resource. The three layers as conceptualized by Guattarì serve to analyse Google as a multi-sided infrastructure that centralizes several modules, or services. It's aim is to maximize the attention of users, that is harvested for Google's profit.

The inherent complexity of Google's ecosophy is the result of emergence over-scale, supported by Network-Effects and Winner-Takes-All mechanisms. As well self-organization over time as the result of tension between users seeking more efficiency and Google's optimization in surveillance practices. The effects of emergence and self-organization provide Google with an ultimately totalizing power, that is imposed over each of the three layers and is hardly detectable by looking at abstracted portions of it.

The digital landscape is continually shaped so that the commodities, which is to say users, are best suited for Google's extraction. The physical landscape is reproduced in the digital one in order to bend it to the practices of surveillance capitalism. Moreover, the space shared by users is tailored on an individual basis through Filter Bubbles and algorithmic landscapes. This is turn leaves users in a planopticon-like structure that mediates and curates their reality and interactions. Here, individuals are profiled and thus torn apart into modular dividuals for the sake of being defines as data-bodies to Google.

The more users' minds, emotions and consciousness are read as quantified information, the more users are stripped of their unique subjectivity and conformed into the multiple modules that define their identity. This new form of dividual data-body as subjectivity exists only as a computer-aided subjectivity. Thus, users need to gravitate around Google to accomplish this supposed subjectivity: users become dependant. Being a competitive corporation in merciless capitalist form - Google enforces itself with unethical practices, that often finds the help and collaboration of schools, workplaces and other institutions; leaving users with little to no choice. Furthermore,

Google's infrastructure is unbeatable at its degree of entanglement it has achieved in the majority of its users' lives. Currently it thrives as an ecosystem in the digital landscape where the environment is not consumed by the extraction of its resources but rather enriched with more resources and extraction capacity – the question is: for how long is it sustainable?

This feedback loop, which is allowing Google to collect more power without signs of declining, is unprecedented by any organization - private or governmental. This trajectory can only be subverted with external interference aimed to regulate the extent to which a business model as such can be considered ethical and psychologically sustainable. Users' sensibility about the value of their data and their free-labour is undermined by Google by way of mystifying its functioning and shielding unethical practices by labeling them as trade-secret. Thus, the way Google is able to monetize user's behavior is contained in a black-box. Institutions should regulate the extent to which individual user data can be gathered and processed, regulate the transparency of said black-boxes, give right to ownership to users and, above all, educate users about the impact Google has on their reality.

NOTES

1. Google, Apple, Facebook, Amazon, Microsoft

2. *The noncybernetic nature of ecosystems.* - Engelberg, J., and L. L. Boyarsky. (1979)
   Do Ecosystems Exist? - by Carl F. Jordan (1981).

3. *A New Kind of Science* - Wolfram S. (2002). Artifical life and Cellular Automata are here thoroughly analyzed

4. (https://www.statista.com/statistics/266206/Googles-annual-global-revenue/ accessed on 21 December 2020

5. *Information rules : a strategic guide to the network economy* - Shapiro Carl (1999)

6. *Google as a Fortune Teller: The Secrets of Surveillance Capitalism* - Shoshana Zuboff (2016)
   The Stack: on Software and Sovereignty - Benjamin Bratton (2016).
   For fun and profit: the limits and possibilities of Google-Maps-based geoweb apps - Dalton M. Craig (2013)

7. https://www.fastcompany.com/90349518/google-keeps-an-eye-on-what-you-buy-and-its-not-alone accessed on 21 December 2020

8. *Escape Velocity: Cyberculture at the End of the Century.* - Mark Dery, 1996.
   A Declaration of the Independence of Cyberspace - John Perry Barlow, 1996.
   Escape Velocity: Free Your Company's Future from the Pull of the Past - Goeffry Moore, 2011

9. Consequence of Moore's law - the number of transistors in a dense integrated circuit (IC) doubles about every two years.

10. https://about.google/intl/ALL_us/products/ accessed on 21 December 2020

11. https://www.statista.com/statistics/266210/number-of-available-applications-in-the-google-play-store/ accessed on 21 December 2020

12. https://www.statista.com/statistics/309448/global-smartphone-shipments-forecast-operatinG-system/ accessed on 21 December 2020

13. ”Thousands of corporate and government actors are independent of each other, collecting information about us. Through the invisible network of data dealers, public and not public partnerships, those pieces of informa- tion are in a constant flow forming one functional entity.” (Vladan Jouler, 2020, 11)

14. https://www.sherweb.com/blog/G-suite/resellinG-G-suite-everythinG-you-need-to-know/ accessed on 21 December 2020

15. https://www.statista.com/statistics/216573/worldwide-market-share-of-search-engines/ accessed on 21 December 2020

16. https://www.npr.org/templates/story/story.php?storyId=131183082 accessed on 21 December 2020

17. https://www.youtube.com/watch?v=8HzW5rzPUy8 accessed on 21 December 2020

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