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RESEARCH ARTICLE

Internet Neutrality: Ethical Issues in the Internet Environment

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Abstract This paper investigates the ethical issues surrounding the concept of Internet neutrality focusing specifically on the correlation between neutrality and fairness. Moving from an analysis of the many available definitions of Internet neutrality and the heterogeneity of the Internet infrastructure, the common assumption that a neutral Internet is also a fair Internet is challenged. It is argued that a properly neutral Internet supports undesirable situations in which few users can exhaust the majority of the available resources or in which specific types of applications and services cannot be developed or properly deployed. The solution offered to these shortcomings is based on (1) an environmental approach to the Internet, (2) the four guiding principles of Floridi's Information Ethics and (3) a principle called 'Information Diversity'. The paper is divided into six sections. Section 1 briefly presents the debate concerning the concepts of network and Internet neutrality. Section 2 poses a general and unifying definition of Internet neutrality based on the critical assessment of several domain-specific approaches to the problem of neutrality. Section 3 is dedicated to the analysis of the relationship between Internet neutrality and the ethical principle of fairness. Section 4 introduces Floridi's Information Ethics, the definition of Information Diversity and an analysis

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of how they can be used to address the limitations of Internet neutrality. Section 5 summarises the ethics of Internet neutrality and Information Diversity defining their relationship. Section 6 reviews the arguments presented in the paper clarifying the foundational role played by Information Diversity and Information Ethics in Internet policy-making activity.

Keywords Network neutrality · Internet neutrality · Computer ethics

1 Introduction

The debate on network and especially Internet neutrality has uncovered new and largely unanticipated issues that are outpacing established ethical, legal and economical frameworks. The analyses of network and Internet neutrality have revealed a policy vacuum where institutions, companies and users struggle to make informed and effective decisions concerning the development, deployment, provision, management and utilisation of network-based services. Theoretical and applied research is needed in order to fill this vacuum and to strike a balance among competing interests.

The Internet is at the centre of the network neutrality debate because of the fundamental role that this communication infrastructure has come to play into society. The Internet is rapidly becoming the elective tool for information management and worldwide communication of unprecedented richness. As such, every alteration of its infrastructure and of the way in which it can be accessed and used may affect billions of individuals. Many examples already exist of how critical Internet neutrality can be for social, ethical and economic dynamics. Internet Service Provider (ISP) and telecommunication companies have exercised forms of censorship by blocking Web sites or e-mails that contained inconvenient but perfectly legal information, have hijacked Internet traffic for their own economic gain, and have shaped Internet traffic to limit or de-prioritise some types of usages of their resources (CBC 2005; Liptak 2007). In all these cases, the flow of information is shaped by unilateral decisions and for personal or corporate interest. As such, network neutrality has become a label to indicate a problem of conflicting interests among users and service providers.

The position of national legislators about whether and how to regulate network neutrality appears still ambiguous and uncertain. Since 2006, a plethora of legislative initiatives has been proposed but not approved in the USA.[1] Recently, the Federal Communications Commission (FCC), under the direction of Chairman Genachowski, has moved a first and controversial step towards enforcing network neutrality by adopting new rules to preserve 'the free and open Internet' (FCC 2010). The European Union seems instead to avoid a fully

[1] Internet Non Discrimination Act S. 2360 (2006), Communications Opportunity, Promotion and Enhancement Act H.R. 5252 (2006), Network Neutrality Act of 2006 (H.R. 5273), Communications, Consumer's Choice and Broadband Deployment Act of 2006 (S. 2686), Internet Freedom and Nondiscrimination Act of 2006 (H.R. 5417), Internet Freedom Preservation Act (S. 215 in the 110th Congress, formerly S. 2917 (109th Congress), Internet Freedom Preservation Act of 2008 (H.R.5353) and The Internet Freedom Preservation Act of 2009 (H.R. 3458).

committed direct action concerning the issue of network neutrality by relying on the choices offered by competitive markets. Following this approach, the revision of Europe's telecommunication rules approved in December 2009[2] focused mainly on granting information transparency to the users and to preserving privacy.

The research developed so far has provided mainly partial analyses of Internet neutrality because it has concentrated on specific issues related to its technological (e.g. Clark et al. 2005), economic (e.g. Speta 2000; Farrell and Weiser 2003; Schewick 2007) or legislative (e.g. Yoo 2005) implications or on a combination of the three (e.g. Lehr et al. 2007; Peha 2007). All this research overlooked or considered only marginally or implicitly the ethical issues associated with network neutrality.[3] Nonetheless, network neutrality is often considered as a means to guarantee fairness or analogous egalitarian ethical principles. For example, the Savetheinternet.com coalition considers network neutrality the "guiding principle that preserves the free and open Internet" and claims to give voice to "two million everyday people" and "thousands of non-profit organizations".[4]

The goal of this paper is to investigate the ethical foundations of network neutrality by focusing on the advocated connection between network neutrality and fairness. In so doing, a principle called Information Diversity is offered as a better alternative to that of network neutrality. The overall argument is that, while Internet neutrality is a principle that can guarantee fairness in some circumstances, it is not general enough to qualify as a necessary requirement that should always be preserved during Internet policy-making activity. Internet Diversity is a better principle because, alongside the ethical framework of Information Ethics, it can be adopted by policy makers as a guiding ethical foundation for understanding how to maintain and promote fairness in the Internet.

The paper is divided into six sections. Following this introduction, Section 2 provides a conceptual analysis of the nature and scope of network neutrality based on the available definitions and current research. The conclusion is that network neutrality, in its more abstract form, can be defined as a partial or complete localised absence of differences finalised to preserve and promote fairness in the Internet. Moving from this definition, Section 3 is dedicated to understanding whether network neutrality can fulfil the goal of preserving and promoting fairness. In Section 4, the principle of Information Diversity is defined in the context of Floridi's Information Ethics framework, in order to overcome the limitations of network neutrality. Section 5 focuses on the ethics of Internet neutrality and Information Diversity. The normative nature of both principles is assessed offering an explicit definition of how they should be related. In the conclusions, the sixth and final section, the general argument offered across the whole paper is summarised outlining how Information Diversity alongside Information Ethics do

[2] See: European Parliament, Regulation (EC) no 1211/2009 of the European Parliament and of the Council of 25 November 2009 establishing the Body of European Regulators for Electronic Communications (BEREC) and the Office (2009).

[3] For example, Peha (2007) maintains that: "This paper argues that the debate should shift towards the complex details of differentiating harmful discrimination from beneficial discrimination, and away from high-level secondary questions like whether discrimination is inherently just, how important general design principles are, *what abstract rights and freedoms consumers and carriers deserve*."

[4] http://www.savetheinternet.com/

not substitute the effort of policy makers but constitute a foundation on which it may be ethically grounded.

2 What is Network Neutrality

Several authors have already pointed out that one of the main problems of the network neutrality debate is the lack of a precise and commonly agreed definition (Peha 2007; Miralles 2007; Lehr et al. 2007). As a consequence, a variety of domain-specific research streams have flourished around the issue of network neutrality but most of them remain independent of each other (Miralles 2007).

Strictly speaking, in 'network neutrality' the attribute 'neutral' indicates absence of prioritisation in the typology of connection—e.g. informational, mechanical or electrical—that allows the identification of a particular group of elements as a network. For example, assuming the flow of goods as the type of connection characterising the network of the United Parcel Service (UPS),[5] it is possible to say that the UPS network is neutral if and only if goods are sent from and to any customer with the same quality of logistic service. Analogously, the support network connecting the UPS customer to the UPS support centre can be said to be neutral if and only if there is no prioritisation of support effort based, for example, on customer profiling.

Network neutrality, when referred to the Internet is usually called 'Internet neutrality'.[6] This terminological difference is justified by the increased semantic complexity assumed by the term 'network neutrality' when considered in the context of the Internet. The Internet offers a multitude of typologies of connections and has far reaching economic, cultural and social implications. It should come as no surprise, then, that Internet neutrality has been analysed and defined in many different ways, depending on the type of network, connections and stakeholders taken into consideration. For example, Wu (2005) focuses on the potential impact of the lack of neutrality on the technological evolution of Internet-based applications. Other studies have instead analysed the consequences of different types of discrimination—i.e. neutrality violation—on market structure (Economides 2008; Miralles 2007), consumers' wealth and behaviour (Peha 2007; Sidak 2006) and the relationships between network neutrality, end-to-end and intermediary regulation approaches (Palfrey and Rogoyski 2006).

Other approaches to Internet neutrality focus on problems of jurisdiction, as for example, when Google states that 'Users should choose what content, applications, or devices they use, since openness has been central to the explosive innovation that has made the Internet a transformative medium' (Davidson and Tauke 2010; Google 2010). Others focus on problems of economic equipotentiality. Berners-Lee writes 'Net neutrality is this: if I pay to connect to the Net with a certain quality of service, and you pay to connect with that or greater quality of service, then we can

[5] http://www.ups.com

[6] For reasons of clarity and consistency, from now on the term 'Internet neutrality' will be used to indicate the debate concerning the neutrality of the Internet. The term 'Internet neutrality' will be adopted also when referring to authors that have used the term 'network neutrality'.

communicate at that level' (Berners-Lee 2006). Finally, several analyses of Internet neutrality look at the way in which the information flow is designed. Lessig, for example, argues that "It was in large part because the network respected what Saltzer, Clark and Reed called the 'end-to-end' principle that the explosive growth of the Internet happened" (Lessig 2007).

Internet neutrality can be better understood when the complex nature of the Internet to which they refer is taken into account. Differently from other communication networks, the Internet consists of a multilayered infrastructure that enables the storage, sharing and management of information on a global scale. Table 1 offers a representation of the stakeholders and features of the Internet on which different approaches to Internet neutrality focus.[7]

In Table 1, third column, the 'physical' layer consists of the hardware that is needed to create and connect the nodes of the Internet. The logical layer comprises all the protocols and applications that enable the flow of information across the Internet. Finally, the user layer amounts to all the individuals and agents that use the two underlying layers to communicate, store, share, mine, create or destroy information, buy and sell goods and in general perform all the other activities that can be conducted inside and through the Internet.

Different categories of stakeholders pertain to each layer (Table 1, first column). Telecommunication companies, cable and broadband operators, ISPs and academic institutions operate, among others, at the physical layer of the Internet infrastructure offering or selling Internet access and utilisation. Software houses, software developers but also multimedia industries and news agencies are just few examples of stakeholders that create the content and build the services and the instruments of the Internet that are offered to end-users.

From a communication point of view, the stakeholders of the Internet may be differentiated into providers and recipients (Table 1, second column). Connectivity providers operate at the physical layer, the service and content providers at the logical layer, while the content recipients occupy the user level. Clearly, some stakeholders may play different roles in multiple layers providing services while being recipients of others. The simplified distinctions offered in the second column of Table 1 underlines that, from a communication point of view, the same flow of information on the Internet can be seen differently, depending on the peculiar characteristics of the relevant stakeholders taken into account. As a consequence, it is relevant to distinguish between a global view of the Internet flow of information and a localised, unavoidably partial one.

Table 1 offers a better understanding of the different levels at which Internet neutrality has been defined. It also clarifies that all the reviewed approaches to Internet neutrality share three characteristics: being localised, prescribing absence of differentiation and—more or less implicitly—aim to promote fairness. Internet neutrality, as defined in the previous paragraphs, is localised because applied to a specific element of the Internet infrastructure and/or to a specific category of users.

[7] Table 1 may be extended to obtain a more detailed description of the Internet infrastructure. For example, the logical layer of Table 1 could be specified following the four layers of the TCP/IP model (Braden 1989b, 1989a) or the seven layers of the OSI Reference Model (ITU-T 1994) while the user layer could be differentiated into multiple typologies of end-users and/or service providers. Nonetheless, the details offered in Table 1 are sufficient to outline the multiple levels at which Internet neutrality has been defined.

Table 1 Internet infrastructure and stakeholders taken into account by different definitions of Internet neutrality

Stakeholders	Communication	Architecture
End-users	Content recipients	User layer
Multimedia industries, news agencies	Content providers	Logical layer
Software companies, developers, web architects	Service provider	
Telecom corporations, cable and broadband companies	Connectivity providers	Physical layer

Google, for example, focuses on end-users, while Lessig on the physical and logical layers. The same applies to the Berners-Lee's definition, which takes into account the connectivity providers and the quality of service that they offer to their users.

The quoted definitions of Internet neutrality all prescribe an 'absence of differentiation'. They advocate that no difference should exist in how information flows on the Internet irrespective of the device that is used to access it. Analogously, users paying for a given quality of service should not experience differences in how they can use the Internet or, once routed, Internet packets should not be treated differently, depending on what data they carry or who or what has generated them.

The prescription of an unconditioned, exceptionless 'absence of differentiation' leads to a strong notion of Internet neutrality. A weaker notion is endorsed when the necessity to avoid differentiations is balanced by the need to improve performance or the right to properly manage and develop data networks. In this context, Nuechterlein and Weiser (2007) help to understand how Internet neutrality should be endorsed not as a universal principle forbidding every kind of differentiation but as a pragmatic notion based on the separation of "'good' deviations from 'bad' ones" (p. 175).

Both a strong and a weak notion of Internet neutrality aim to promote a *fair* network. The difference is in whether fairness is achieved by a complete absence of differentiation or by carefully selecting where to implement such an absence. The common assumption—often left implicit or presupposed as a given background—is that, depending on the definition of Internet neutrality considered, introducing differences at the communication, logical or user layer could be equivalent to introducing some form of discrimination. Differentiating among types of packages, of devices or of usage patterns could imply a discrimination of one application, one type of user or one type of protocol compared to another. Users could not be free to access parts of the Internet and/or to choose how to access it because of, for example, unilateral interests of other stakeholders. This could create a discriminatory and hence an unfair situation, an unfairness that often is assumed not to be present in the Internet as it was initially designed.

These characteristics can be used to formulate a generalised definition of Internet neutrality to which all the quoted, domain-dependent definitions can be reduced:

> Internet neutrality. A principle prescribing a partial or complete localised absence of differentiation finalised at preserving or promoting the fairness of the Internet.

This definition not only subsumes all the referenced ones, it also makes explicit the potential local/global dichotomy that might exist between a localised absence of differentiation and an intended, ethically loaded, globalised effect—the preservation or increase of fairness. The roles of the stakeholders and the layers at which they operate are intertwined. Changes at one layer are likely reflected in the rest of the network. Because of this intertwined nature of the Internet, each definition of Internet neutrality that pertains only to a specific layer or to a specific category of stakeholder risks to be partial.

In the next section, the connection between neutrality and fairness is further analysed in order to clarify the ethical implications of Internet neutrality.

3 Internet Neutrality and Fairness

The definition of Internet neutrality as a way to maintain a partial or complete absence of differentiation in order to preserve or promote, implicitly or explicitly, some form of fairness is a so-called *persuasive definition*. Stevenson (1944) clarifies that a persuasive definition is characterised by adopting terms that have, at the same time, indefinite and emotional meaning. The word 'neutrality' is vague when applied to the Internet and it carries a positive emotive meaning generically associated with favoured values such as objectivity, free from bias, not taking sides, impartiality.

The alleged fairness of Internet neutrality rests on the assumption that there is a set of values, such as equality, freedom of speech or unbiased communication opportunities, which can be promoted and sustained only by a neutral playing field. A playing field is neutral when it offers levelled access and use conditions, avoiding relevant discrimination[8] based on the origin, the nature, the sender or the receiver of a communication. A neutral Internet would then be fair as it would not make or impose any type of discrimination that would hinder the assumed set of values. This kind of network would supposedly guarantee desirable consequences, such as a sustained innovation rate, open access to information and a democratisation of the participation to the Internet.

This argument involves democratic and egalitarian principles that may be desirable when related to the dynamics of information flow on the Internet. Nevertheless, the modalities in which these principles are supposed to be applied, namely via Internet neutrality, are too simplistic. In the case of a strong take on Internet neutrality, a completely levelled playing field does not guarantee the fairness of the Internet information flow. In some circumstances, a levelled playing field favours or penalises some classes of users and applications. For example, applications that need a constant flow of data with low latency between two or more nodes of the Internet are penalised by a routing model based on a first-come, first-served policy (Wang and Crowcroft 2002). While this type of routing is perfectly fair for applications with analogous

[8] The loaded term 'discrimination' can be used here without confusion as it is part of an ethical argument involving the general concept of fairness. As seen in Section 2, the term 'differentiation' should be used in a non-ethical context.

requirements in terms of latency and communication load, it is not fair when dealing with a set of heterogeneous applications that need to share the same communication infrastructure.[9]

In a levelled routing playing field, applications for videoconferencing, media streaming or server administration are disadvantaged with respect to applications for Web browsing, mailing or text-based chatting. This disadvantage is gratuitous because giving priority to videoconferencing or media streaming requests does not impair the proper functioning of reading mails and browsing (not highly interactive) Web pages. So much so, that many routers do endorse this type of prioritisation (Xiao and Ni 2002). As noted also by Jordan (2007), there is no valid reason to avoid this form of prioritisation in the name of the principle of neutrality, which, in this case, would simply create an inefficient and unfair network.

Another example of how Internet neutrality can lead to unfair consequences for users, when implemented dogmatically, is given by considering the effects that a certain class of application produce on a levelled routing playing field. For example, peer to peer (P2P) applications are efficient instruments for sharing large amount of data because they are designed to create hundreds of connections in parallel and constantly move data across such connections, potentially 24/7. At the ISP level, the use of a large amount of the available bandwidth—especially of the upstream one—is the price paid for such efficiency (Rodriguez et al. 2006). Few P2P users consume large quantities of the ISP network resources, and when the resources are exhausted, other users of the same communication network start to experience service degradation. The P2P users are potentially capable of exhausting the commons because of a routing that is unable to de-prioritise selectively the P2P connections when other users start to suffer excessive connection deterioration or when the routing node starts to become congested.[10]

These examples stress that, while a strong notion of Internet neutrality may guarantee a levelled playing field, it does not necessarily also guarantee a fair playing field. Conversely, implementing a strong notion of Internet neutrality can generate unfair situations, with undesirable consequences for many Internet stakeholders and, potentially, for the whole Internet domain. The problem does not lie on the motivations behind Internet neutrality, but on the proposed solution: neutrality is not always the right instrument for the job. The given examples clearly show that absence of routing prioritisation and a scarcity of

[9] Note that it is commonly accepted that the 'end-to-end' design principle on which Internet neutrality is often grounded (see for example, Lessig 2007) can be overlooked for performance reasons (Blumenthal and Clark 2001). While it is *usually* more efficient to implement the communication intelligence in the end points, in some conditions it might be desirable to implement this at the routing level. This means that the end-to-end design principle is relative to performance considerations and is not something that ought to be implemented dogmatically. The same should apply to Internet neutrality.

[10] Note the P2P is here adopted as an example of a type of application architecture that uses a large amount of available bandwidth potentially degrading the overall performance of the data network. Any application that has this characteristic can be used in the given example instead of P2P. VOIP, multimedia streaming are all examples of applications that in some conditions can degrade the overall performance of a data network. Furthermore, there is no intention to criminalise P2P applications and no inference or distinction about the users of such applications is drawn. For an analysis of the ethical implications of the P2P, specifically for what concerns an environmental ethical perspective, see Taddeo and Vaccaro (2011).

multi-tiered economic models of Internet access and utilisation alter the dynamics of the Internet. As much as the neutrality could create fair communication conditions, it may also create situations in which a single stakeholder imposes unfair usage conditions on the community of users.

Of course, not everything about Internet neutrality should be discarded and a weaker approach to Internet neutrality can be endorsed so that a localised absence of differentiation is implemented only in those situations in which a levelled playing field is clearly desirable in order to guarantee fairness. Consider, for example, the case of the fragmentation of the Internet into silos managed by ISPs that end-users can access only through applications that are not in direct competition with the ISP core business (Stelter 2010; Cellan-Jones 2009; Collins 2010). This phenomenon, sometimes described as the Balkanisation of the Internet (Frieden 1998), imposes discriminatory filters on the flow of information based exclusively on the interest of single stakeholders. These filters negatively affect many other users, including the end-users generating that type of traffic and the owner of the applications used to access and distribute it. In a neutral Internet, such filters are ruled out because a routing discrimination based on the application that has generated the traffic is not allowed.

The previous examples clearly outline the conundrum faced by Internet neutrality. In some cases—see the P2P example—it is desirable to implement an application-based routing filtering, while in other situations—see the Balkanisation problem—this is undesirable. In the former case, it is fair to limit the bandwidth usage of a category of applications, while in the latter it is unfair to discriminate among types of applications. The origin of this conundrum can be traced back to the need to discriminate between fair and unfair lack of regulation. In situations in which single stakeholders have the power to impose their personal interest on a whole community, regulation is required to preserve fairness to protect all the other stakeholders involved. In other cases, the peculiar properties of the whole system lead to self-regulation in the absence of explicit regulations. A strong concept of neutrality is too coarse to allow one to discriminate among these two categories of situations, while a weak one requires another normative principle in order to exercise such discrimination.

Adopting a weak concept of Internet neutrality, by which some aspects of the Internet are made neutral only when it is fair to do so, is a way to recognise the limited scope of the concept of neutrality. Weak Internet neutrality has to be grounded on and ultimately justified by a stronger normative principle that, applied specifically to each situation, offers the opportunity to discriminate fair and unfair Internet usage. Both weak and strong approaches to Internet neutrality promote the need for a localised absence of differentiation. The difference between the two concepts is in the range of their application, not in the connection between ‘localised absence of differentiation’ and a fair Internet.

Jordan (2007) suggests that the vagueness implied by Internet neutrality might be overcome by adopting a ‘layered’ approach, in which only specific layers of the Internet are made neutral. While this approach is consistent with the analysis developed so far in this paper and the emphasis placed on the locality of Internet neutrality, it is also another clear indication of the limitations of the term neutrality when applied to the Internet. Adopting a layered approach implies the

acknowledgement that the problem with Internet neutrality is its locality and its consequent lack of discriminative power between what is fair for the Internet as a whole and what is not.

Once such limitations are recognised, Internet neutrality simply becomes a generic label for the well-known debate about the problem of when and how regulation should be applied to a system involving multiple and possibly incompatible interests. From an ethical perspective, this problem mandates the development of an ethical framework in which to evaluate the substance and effects of possible (lack of) regulations.

In the next section, we propose *Information Diversity* as a better alternative to Internet neutrality. We shall argue that, when considering the fairness of the Internet as a whole, Information Diversity, alongside a suitable ethical framework, enables one to avoid the described shortcomings of Internet neutrality while maintaining its potential benefits.

4 Information Diversity as an Alternative to Internet Neutrality

The Internet, as its stakeholders experience it today, is much more than a communication network. It is a whole informational environment based on a globally distributed communication infrastructure. In the emphatic words of Malin Littorin-Ferm:

> "We young people have a whole platform on the Internet, where we have all our social contacts—it is there that we live. The state is trying to control the Internet and, by extension, our private lives" UPI (2009).

The success of social networks platforms like Facebook[11] or its predecessor MySpace,[12] the growing amount of business conducted online, the creation of new professional figures or the cultural changes that the Internet has generated—for example in reading habits (Schilit et al. 1998; Wyatt 2008) and educational practices (Rosenberg 2001)—are just few indicators of how the Internet is rapidly becoming an integral and necessary part of our 'informational' life.

The full information life cycle takes place in the Internet. Internet stakeholders create, elaborate, share and store many types of information in multiple formats. A growing number of traditional information providers are attracted to the Internet environment in order to provide their information-related services to citizens, customers and whoever can be 'online'. Endogenous information providers evolve inside the Internet too. The political and social role played by Twitter[13] in the events involving popular protests (Cha et al. 2010) are a paradigmatic trend of such an evolution. Finally, proactive information entities like botnets and other programs operate on the Internet contributing, sometimes substantially (Carlson 2007), to the overall information life cycle. Altogether, the Internet is the place where many types of informational entities—Web sites, avatars, mails, pictures, movies, online

[11] http://www.facebook.com/
[12] http://www.myspace.com/
[13] http://twitter.com/

individual profiles, medical databases, magazines, newspapers, bills or apps and botnets—have the opportunity to flourish.

Evaluating the fairness of the Internet requires an ethical framework that takes into account the informational nature of such an environment and of the entities existing and performing operations in it. Information Ethics (Floridi and Savulescu 2006; Ess 2008; Floridi 2008a) is an ethical framework that is being developed taking into account the moral stance of informational entities. It is an environmentally oriented framework, inspired by medical ethics. It is founded on a meta-ethical and ontological analysis of the value of information in itself and offers four principles that have to be respected when developing ethical arguments involving informational entities. The four principles – zero to three – are overridable, meaning that they represent minimal conditions to be achieved, zero being the most fundamental and one to three being progressively desirable. The four principles are:

0. Information entropy ought not to be caused in the infosphere;
1. Information entropy ought to be prevented in the infosphere;
2. Information entropy ought to be removed from the infosphere;
3. Information ought to be promoted by extending, improving, enriching and opening the infosphere, that is by ensuring information quantity, quality, variety, security, ownership, privacy, pluralism and access.

'Entropy' as it is used here is a technical concept indicating the destruction, impoverishment or vandalisation of information. It is completely distinct from the concept of entropy developed and used by physicists. Floridi (Floridi 2008b) offers an exhaustive explanation of the differences between these two concepts and detailed arguments about how information entropy should be defined and intended.

As seen in Sections two and three, while the debate on Internet neutrality is centred on the necessity to defend or promote fairness on the Internet, Internet neutrality fails to serve such an ethical purpose, once the vagueness, strength and self-sufficiency of the concept of neutrality is taken into account. Implementing Internet neutrality does not necessarily guarantee a fairer Internet and, at best, it demands a stronger normative concept in order to discriminate between the fair and unfair application of a localised absence of differentiation. In a neutral Internet, applications may suffer for excessive latency while a specific category of users may, in some situations, deplete the majority of available resources. As a consequence, exactly because of a supposedly levelled playing field, the Internet environment is impoverished, as information cannot be accessed by its potential users or, when accessible, it is deteriorated to the point that it cannot be used.

When information flow is degraded, blocked, or of a quality no longer compatible with environmental requirements, portions of the Internet cannot flourish. New information cannot be created or propagated; new services cannot be deployed, more or less large sectors of the environment may start to stagnate, and the wellbeing of the agents involved is negatively affected.[14] In these conditions, the informational

[14] Consider for example the difficulties faced by providers wanting to serve real-time, high definition multimedia content. The limitations imposed by a neutral Internet slow down the development of suitable applications and, as a consequence, the growth of a potentially large market. Similar problems are faced by any other application with comparable requirements such as VOIP or P2P applications.

environment – the Internet – suffers a damage that, on the basis of the four principles of the Information Ethics, can be deemed unjust.

It is important to note that Information Ethics does not argue against the morality of the selection of the fittest in an informational environment. For example, Internet applications that outperform other applications are fully compatible with the four principles of Information Ethics. They contribute to the flourishing of information through a more efficient, rich, empowering design. Rightfully, such an application should be preferred to a less efficient application of similar kind. Losing—for example by deletion or lack of replication—the code of the less efficient application would not impoverish the overall informational environment. On the contrary, those applications that deplete the globally available resources to the point that other applications are starved obtain the opposite effect. They deprive the informational environment and, as such, they should be contained or eliminated. This is nothing new. When an environmental ethical framework is adopted to evaluate a biological environment, for example that of the planet Earth, a population that exhausts the available natural resources while damaging the whole environment is considered unethical. Consequently, the behaviour of such a population should be discouraged and, ideally, halted altogether.

The four principles of Information Ethics provide a framework within which fine grained regulations can be formulated. While sharing information is, generally speaking, a way to make an informational environment flourish, considerations about privacy, anonymity or confidentiality should be taken into account in order to *regulate* the flow of information on a case-by-case basis. Whatever set of norms and hierarchical considerations among competing interests are embraced in order to evaluate specific cases, the outcome for the overall environment should be consistent with the four principles of the adopted ethical framework. Considering every specific case becomes a matter of applied ethics and, ultimately, of a policy-making activity.

According to Information Ethics, the more informationally rich an environment, the less information entropy there is in that environment. The richness of the environment depends on both the quantity of informational entities and the *type* of entities existing in that environment. This follows directly from the fourth principle of Information Ethics, where the variety as well as the quality and the quantity of the informational entities are explicitly taken into account as parameters for the flourishing of the infosphere. The variety of the informational entities and the level of the entropy in the environment are in an inverse relation: any decrease of the variety of the informational entities determines an increase of the entropy in the environment.

It is now possible to define ‘Information Diversity’ as:

> Information Diversity Every type of informational entity has an initial right to exist and flourish in the infosphere, and the diversity of the types of informational entities populating the infosphere ought to be preserved and promoted.

The decrease of the types of informational entities is not the only way in which information entropy may increase. Every entity and behaviour endorsed, present or

performed on the Internet that leads to destruction, impoverishment or the vandalizing of information increases entropy and, as such, should be avoided. This is why Information Diversity is defined as part of the framework of Information Ethics. The four principles of Information Ethics constrain Information Diversity so that only the diversity that does not harm or vandalize the environment is preserved. Ontologically, all the informational entities have an *initial* right to be part of the informational environment. A right that is overridable depending on the effects that that informational entity has on its environment. As a consequence, informational entities like spam, computer viruses or malware should be destroyed or contained. They lose their initial right because they harm their environment. It is important to stress that this argument does not involve any semantic consideration. Informational entities are not here regarded as meaning or truth-bearing entities. A true and meaningful but unsolicited message is still spam as much as a well-formed but malicious and unwanted code is still a virus or a malware.

The principle of Information Diversity alongside the Information Ethics framework deems unethical the fragmentation of the Internet as it has been attempted by Internet providers and telecommunication companies—one of the main reasons to advocate for a neutral Internet. Regulating a service only for personal, business or unilateral motivations affects the flourishing of the overall environment and its potential to develop a further degree of informational diversity. At the same time, regulating a service that is exhausting the common good is a way to preserve Information Diversity and the overall informational environment. This is why it would be unethical for a connection provider that also provides VOIP services to throttle the competitor VOIP traffic, while it would be ethically acceptable for it to regulate a congesting traffic, i.e. bandwidth intensive services like P2P or VOIP.[15]

Embracing the principle of Information Diversity allows for the evaluation of the fairness of other typical cases associated with the debate of strong or weak Internet Neutrality. For example, from an Information Diversity perspective, the way in which Comcast addressed the problem of unbalanced bandwidth consumption (TAP 2008) is fair. While initially Comcast had targeted all the file-sharing applications in order to restore a balanced use of its bandwidth resources, it then changed its approach to traffic shaping by directly targeting the "bandwidth-hogging users" (Stone 2008). The problem here is not the practice of traffic shaping, namely the departing from a purely neutral approach to the management of the Internet network traffic. The relevant issue is to avoid impoverishing the Internet environment by starving an entire category of applications independently of the resource usage. Targeting users that are consuming excessive amount of common resources guarantees a balanced distribution of the resources and, as a consequence, the protection of Information Diversity.

Analogously, the principle of Information Diversity alongside the Information Ethics framework can be adopted to evaluate the issues of competiveness, as those

[15] A parallel issue is whether some services like audio/video conferencing, multimedia streaming or gaming should use the Internet at all. The process of shifting services from independent and dedicated platforms to the Internet is relevant from an environmental perspective, especially when considering that the Internet offers a limited amount of resources and cannot expand boundlessly. Information Ethics offers a normative framework that can be taken into account when developing specific policies about resource allocation.

faced for example by Skype[16] (O'Brien 2010) when trying to run on smartphones. While the economic protectionism of the mobile carriers forbidding their users to VOIP traffic (like the one generated by Skype) might be seen as a plausible market strategy, from the point of view of the Internet environment it cannot be considered fair. This form of protectionism undermines the flow of information inside the Internet and restricts the development of an entire category of applications. Mobile carriers try to avoid the competition for the environment resources by introducing an artificial distinction between mobile-based and cable-based information flow. In this way, the Internet environment is fragmented moving towards its Balkanisation.

It should be noted that adopting an ethical principle that makes the Balkanisation of the Internet unfair does not imply the unethicality of multitier Internet services. Once information remains accessible, usable and sharable[17] and the conditions for the diversified flourishing of the whole informational environment are assured, there is no reason, from an environmental point of view, to always consider unfair specialised services such as dedicated networks connections for online gamers (Kobie 2010), online file sharers, or people who want to use VOIP applications on mobile networks. The Information Diversity principle singles out the Balkanisation of the informational environment, not the diversity of services that can be offered, at different cost, in that environment.

Information Diversity and Information Ethics are a platform on which to elaborate detailed environmental policies for the fair management of the information flow and of the informational entities of the Internet. Information Diversity alongside the principles of Information Ethics is consistent with a constrained evolution of the Internet infrastructure thereby optimising the existence and development of a whole information society. As such, they offer an ethical framework in which to evaluate the implementation of localised absence of differences, thereby overcoming the limitations of a strong concept of Internet neutrality and offering the normative framework required by a weak concept of Internet neutrality.

5 The Ethics of Internet Neutrality and Internet Diversity

It is now time to outline the ethics of Internet neutrality and Internet Diversity. As seen in Section 2, the localisation is a defining property of Internet neutrality and there is no such thing as an overall neutral Internet. The meaning of the term 'neutral' is captured by qualifying its referents in terms of what Internet layer is affected, what kind of user, service or provider is involved and what kind of perspective is adopted—economical, juridical, technical. Without such a qualification, the term 'absence of differentiation' remains generic, underspecified and ultimately meaningless.

As described in Section 3, the locality of Internet neutrality translates into its ethical contingency. A neutral situation, dynamic or relationship in the Internet can be good, bad or ethically neutral depending on contingent evaluations concerning

[16] http://www.skype.com/

[17] Please remember that accessibility, shareability and usability are all rewritable principles in case, for example, of privacy, anonymity or confidentiality requirements.

specific stakeholders and/or informational entities. Such evaluations should not be generalised to the whole Internet. While in a specific situation, a neutral relationship between two given stakeholders can be positive, the global effects of such a relationship could be negative.

Because of its contingency and in accordance with a weaker approach to neutrality, Internet neutrality should not be maximised in every possible situation. Neutrality is not a necessary property of a fair Internet and, as such, it should not be considered inherently good. Internet neutrality should be applied to specific situations only when it implies desirable consequences for the stakeholder directly involved and does not imply negative consequences for the Internet as a whole.

Uncovering the limits of Internet neutrality does not address the problems that it was originally conceptualised to address. It is still necessary to promote and maintain a fair(er) Internet, an Internet in which all the stakeholders can exercise their interests, innovate and freely coexist, and in which the informational environment can flourish as a whole. In order to guarantee the minimal conditions for the Internet to prosper as an environment, the global principle of Information Diversity should be maximised and an ethical framework like Information Ethics should be adopted. Diversity is good because, without it, there is no evolution, innovation, competition, no possibility to choose among alternatives and, ultimately, a heterogeneous flow of information. Without sustained and globalised Information Diversity, the Internet would regress into a communication network losing its environmental characteristics as described in Section 4.

Diversity is a necessary but not sufficient pre-condition for the informational environment to flourish. Information Diversity alone cannot guarantee that the informational environment will effectively develop. Its presence does, however, ensure that one of the necessary elements is available in order for the environment to do so. Information Ethics is the framework that can be adopted in order to evaluate whether a continuously actualising diversity is consistent with the wellbeing of the informational environment or, in other terms, whether the diversity is and stays virtuous. The possibility of having a diverse informational environment must go hand in hand with the capability of selecting what diversified situations, dynamics, relationships or identities should exist and endure. Information Ethics offers a framework and a set of criteria that are useful to operate such a selection.[18]

The normative relationship between Information Diversity and Internet neutrality can now be explicitly stated:

> Some form of localised absence of differentiation may be instrumentally implemented if and only if it promotes fairness in a specific situation, dynamic or relationship and if and only if it does not damage a globally and virtuously diverse informational environment.

A globally diverse informational environment is one in which diversity is promoted. Such diversity becomes virtuous when it is selected and maintained on the

[18] Note that no assumption is made about the possibility to choose other ethical frameworks for the same purpose. Information Ethics has been chosen here because it is consistent with the assumptions made about the Internet as an informational environment. The peculiar characteristic of Information Ethics is not that of offering original evaluation criteria – it is, after all, inspired by the environmental approach of medical ethics – but that of grounding such criteria on an ontological theory of information.

basis of an ethical evaluation performed by adopting an ethical framework like Information Ethics. The distinguishing characteristics of a diversified informational environment may be overlooked in some specific situations without damaging the overall informational environment. Overlooking differentiations locally can be instrumental to create a desirable condition for a specific portion of the environment in a contingent situation.

6 Conclusions

During the past decade, the Internet has become a pervasive media of communication. The growing number and types of stakeholders and of online services that they want to provide and enjoy demand advancements in the design of the Internet. This is not an easy task. The social and cultural impact of the Internet is so intertwined with the processes of information creation, fruition and sharing that any alteration to its structure is guaranteed to have far reaching, critical consequences.

In order to guide the evolution of the Internet, it is desirable to devise principles, frameworks, guidelines and policies that are specifically tailored to the Internet phenomenon. In this context, ethical frameworks play an important role as in any other environment. While this does not imply that economic, political and cultural policies are unimportant, it stresses the need to accept the necessity to evaluate ethically the very same nature of the Internet, not only the behaviours of the human individuals that use it.

There is little debate about the fact that the nature of the Internet is informational. Even less debated is the idea that the Internet is a multilayered infrastructure where multiple stakeholders conduct a vast array of economic, social, cultural, ethical or recreational activities. It is this dual nature of the Internet, environmental and informational, that must be taken into account when considering its design principles and whether and how to make policies for it.

In this paper, it has been argued that from an environmental and informational point of view, Internet neutrality is a conceptual tool too simple to discriminate among situations that require or do not require regulation. Internet neutrality does imply desirable consequences but, unfortunately, it fails to rule out undesirable ones. It has been explained that while from a localised point of view—that of some class of users or some application developers or providers—a fundamentally unregulated, network may be desirable, it is not so from a global, environmental point of view. An alternative approach, capable of saving the good consequences granted by the Internet neutrality but powerful enough to be acceptable for the entire informational environment is required.

Information Diversity has been proposed as the foundation of such an alternative approach. Defined inside the framework of Information Ethics, Information Diversity is a principle that can be used to guide the policy maker when she or he tries to understand what consequences her or his set of policy should guarantee. Preserving Information Diversity as defined in Section 4 means to avoid Internet balkanisation, unfair prioritisation or unfair regulation while granting room for implementing quality of service, multi-tiered services, intelligent routing and

competitive market offers. In other words, saving what Internet neutrality is invoked for while avoiding its drawbacks.

Clearly, there is no intention to say that Information Diversity alone can guarantee all this. In Section 5, it has been explained that Information Diversity should be considered a necessary but not sufficient condition to guarantee the flourishing of the informational environment. Moreover, it has been argued that Information Diversity requires an ethical framework in order to be evaluated. As with any principle, Information Diversity needs to be enacted into policies, possibly laws and overall best practice. This is where the applied work happens. It is the role of policy makers to set hierarchies and priorities and balance the competing interests of different types of stakeholder. Information Diversity alongside Information Ethics assures that normative lighthouse that is fundamental to navigate the perilous waters of Internet evolution.

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