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Qualis A3 ISSN: 2178-2008

ARTIGO

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Revista Processus de Estudos de Gestão, Jurídicos e Financeiros

Free, open source and paid programs offer. Increasing social surplus

Microeconomia da oferta dos programas gratuitos, de código aberto e pagos. Como aumentar o bem-estar

DOI: 10.5281/zenodo.14990843

Recebido: 17/02/2025 | Aceito: 05/03/2025 | Publicado *on-line*: 07/03/2025

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Abstract

The overall impact of programs embedded in information technology applications have special characteristics. The structural offer of new technology programs has, today, three options: Free software, Open source, and paid software. The paper discusses each offer and explores weaknesses and strengths analysis of the goods and services produced. Strengths, weaknesses, and benefits advocated are increasing or decreasing private and Welfare surplus impact. Different offers, or a mix of offers, deserve attention because the resulting framework implied users risks, regulations, collective and private property rights, and benefits changing more Welfare surplus. As a result, we guess software innovation is better suited to a common good or collective property or better to a common math-based language than a private right. We suggest bypassing Free, Open source, and paid offers and the conflict based on the property rights system to increase the Welfare surplus.

Key-words: AI programs. Free software. Open Source. Welfare. Collective goods.

Resumo

O impacto global dos programas incorporados nas aplicações de tecnologia da informação tem características especiais. A oferta estrutural de programas de novas tecnologias tem três opções hoje: Software Livre, Código Aberto e Software Pago. O artigo discute cada oferta e explora a análise dos pontos fortes e fracos dos bens e serviços produzidos. Os pontos fortes, fracos e benefícios defendidos estão a aumentar ou a diminuir o impacto do excedente privado e do bem-estar. Ofertas diferentes, ou uma combinação de ofertas, merecem atenção porque o quadro resultante de riscos, regulamentos, direitos de propriedade colectivos e privados e benefícios implícitos aos utilizadores muda ainda mais o resultado sobre o bem-estar.

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Como resultado, acreditamos que a inovação de software é mais adequada a um bem comum ou propriedade coletiva ou melhor a uma linguagem comum baseada em matemática do que a um direito privado. Sugerimos mudar ofertas gratuitas, de código aberto e pagas e o conflito baseado no sistema de direitos de propriedade para aumentar o excedente de bem-estar

Palavras-chave: *Programas de IA. Software grátis. Código aberto. Bem-estar. Bens coletivos.*

1. **Introduction**

Software productions have been remarkable over the past few decades, and future projections indicate even greater growth. Technology of Information (TI) offers reshaping job skills and redefining all business processes. The work market is becoming increasingly digital and shifting toward continuous dedication to projects, processes, and, today, generative AI (AVENI 2024a).

However, despite innovations, learning access to new technologies and skills is not free and always accessible. People with new generation of tools (smartphones, laptops, internet connections) must pay for professional software upgrades, applications, and certifications. Proficiency in English is mandatory. The best option for those who want to work today is to save money to live between one job and another while studying for qualifying because of mutating skills demands. That is a challenge, especially in developing countries because the innovations need good infrastructure and paid access to the Internet. However, that happens in developed countries too. In the new context, there is an increasing gap between skilled workers for new technologies and the other workers.

The full democratization (free software), the middle form (open software), and a monopoly (paid software) TI offers have different impacts on prices and market structures, job opportunities, and wages. Completely free software reduces copying and unauthorized use of software but also the motivation to improve programs if there is no reward. Millions of possible users of new technologies will never have access to improve competencies or have the only option to pay. Free software and a full democratization of software is the chance to increase Welfare surplus. On the other side, the Intellectual Property System states that rights must be protected to motivate the offer of applicative or service for the market. Thus, a free software solution decreases producers' and customers' surplus.

The evaluation complexity of the overall effect is increased by dominating economic positions, insecurity, unauthorized copies of the software, bad attitudes toward doing business, and regulations. The actual economic equilibrium in the market is reached with the mix of free and paid software offers through open-source production, national regulations, and world intellectual property systems. Thus, the present seminal paper's goal is to understand the differences between paid, open, and free software offered to users (private and public administration) and the economic impact on Welfare surplus.

It is urgent a way to increase the Welfare surplus and the social gains of the new technologies. That depends on high-tech corporations, and it is unsustainable for social purposes because an oligopoly of few corporations and few producer countries decreases Welfare surplus. We guess public administration management of citizen rights of labor and dignified life or citizenship could be reached using institutional intervention in the market-changing intellectual property rights system. We need to think outside the box and define different types of offers to increase social surplus.

The paper's conclusion suggests treating AI and TI innovations or so-called cutting-edge software as a common good. Software is a math-based language developed by Greece and, after the XVII century, the leading language of science. Why not consider all software a common language? We could move from a private rights system to a common rights system of AI generative and new tech innovations. It does not mean a collective economy or socialism (worse than the actual system) but a fair TI offer system balancing different surpluses and increasing Welfare.

2. Methodology

The paper is a discussion seminal working paper about new technologies production as a total offer to understand the total market Welfare surplus or the social result of the information technology marginal offer. We use economic theory application and public administration concerns that will follow these steps:

- Defining three forms of new technology and AI total offer
- Seek Public Administration's use of new technology and AI.
- Seek AI economics of the actual market offer characteristics and impacts on Welfare.

As final suggestion we will use the BOP theory. The Bottom of the Pyramid (BOP) is a socio-economic definition that allows the world's poorest citizens to constitute an invisible and unserved market realizing their human potential for their own benefit, those of their families, and that of society at large (López-Morales, Rosario-Flores, and Huerta-Estevez, 2020).

3. Discussion

A general offer analysis explains innovation for information technology and interactions for the whole market. As an example, Open-source LLMs are, as is well known, available to all developers freely, providing access to their design, data, and pre-trained versions. Thus, when someone uses AI generation text, it must agree to the subscription or the interface used. The interface producer does not own all LLM source code used, but it adds it to its application. If the software is free for you, however, you must know your rights and the interface producer's rights and what's going on in that application background. It could be possible to produce something that will be owned by the interface application owner by the subscription agreement.

We can't divide what is free for the user in a software application but almost all interfaces are corporations owned or for profit. A free offer from a corporation means an information exchange agreement. It costs you nothing but it allows the interface to own something not for all the software but the one added to Open Source. At minimum level the corporation can sell clients statistics to marketing agency.

Another case is generative AI. Even if not all AI programs have intellectual property registers, if they are part of software, they are also part of the production process resources like labor and capital. They are immaterial capital or intellectual rights, but free source is not included in the financial capital balance sheet. It means that not all the costs (real and figurative) are included in the offer prices. Moreover, the overall economic impact of AI programs embedded in every information technology application. Like generative AI and LLM, they needs special care attention when analyzed by economic models because of their special characteristics:

-Information technology software are not only private intellectual property (IP) but the results of collective processes and adoptions. There is a social capital to be evaluate in the market.

-Information goods and economy must be differentiated from every good and service market. They have different characteristics and social impacts (Varian and Shapiro, 1999; Varian, 2014; Acemoglu, Makhdoumi., Malekian, and Ozdaglar, 2019). In the information applications market (Shapiro and Varian 1999, Raban and Włodarczyk 2024, Acemoglu, D., Makhdoumi, A., Malekian, A., & Ozdaglar, A., 2019) is important the number of users and distribution as the main drive for the success of the apps and that support the idea of to reward the investments with protection.

-The economic total Welfare in the market based on Marshall (BLAUG 1997) depends on institutions and regulations, as was seen, and was awarded the Nobel on the relationship between economic growth and political institutions. Generally speaking there is a taxation and control costs included.

That last characteristics explain why recent events[2] became a struggle between coding, intellectual rights, and properties. The implications for copyright policy are evident. It is unlikely that all corporations involved in AI will allow their products to be bogged down in the courts with copyright infringement lawsuits[3]. Many millions of code lines and libraries are disposable-free, and when not disposable could be stolen or copied, and the architecture of AI solutions and programs could change fast. Once a new application scheme is ready, there is little time to launch and use it as a property right to earn royalties. Then, programs offer is a matter of how the intellectual property and rights management system is managed.

A mix of free software or open software is the base for paid software and the paid software could be protected by the intellectual property system. In the information applications market (Shapiro and Varian 1999, Raban and Włodarczyk 2024, Acemoglu, D., Makhdoumi, A., Malekian, A., & Ozdaglar, A., 2019) is important the number of users and distribution as the main drive for the success of the apps and that support the idea of to reward the investments with a protection. However, a change in the intellectual property system won't end the problem of still making money from an intellectual activity that could benefit someone and have a benefit in exchange. The willingness to benefit the community by producing free software must be protected as well as the willingness to sell the intellectual production.

The market offer is influenced by international regulation like the European AI Act in 2021 (EU 2024) is focused on rights protection and risk assessment but not on the basic conditions to avoid an irregular attitude. There is no regulation on new technologies or AI development and anti-trust effective control of TI. New rules are defined to prevent AI and innovative technologies from running out of control using personal data or bypassing the intellectual property system. So, the economics of information (and consequently of AI programs) is more complex than Shapiro and Varian's (1999) model, based on network economy, because of social surplus, institutions, and Welfare analysis. The information market analysis or microeconomics of information goods is only a part of the puzzle (Grigoreva et Ali, 2021).

If we use the economic model theory (Varian, 2014) the question is if there is a best offer solution (quantity and price) in the information market? The initial cost of

[2] https://apnews.com/article/deepseek-ai-chatgpt-openai-copyright-a94168f3b8caa51623ce1b75b5ffcc51
[3] https://www.technollama.co.uk/will-deepseek-impact-the-ai-copyright-wars

software distribution and marketing is returning when and for whom? Is it a good strategy to build a software fabric corporation, or is it better to use free software and focus on services, distribution, or the end of the supply chain?

As a suggestion, at the end of the discussion, we explore, according to Aveni (2024b), a possible solution to avoid that is to seek all innovations based on software as common goods changing IP systems. The common good in the Intellectual Property System implies a fee that is not a tax to be paid (low or high) and used, for instance, for educational goals or increasing social surplus directly with a lower price and indirectly increasing workers' skills.

3.1 - New tech offer / supply types.

The Intellectual property system (WIPO 2024), which a paid offer is based, needs a single inventor or a corporation owner of the innovation (Aveni 2024b). The Free Software offer, on the other side, emphasizes the user's freedom to use, study, share, and modify the software. While often overlapping with open source, "free" here refers to freedom, not price. This meaning is championed by organizations like the Free Software Foundation (FSF) and R. Stalmann.

A great number of researches is disposable for Free software[4], Open Sources and paid software also between Institutions[5] (OECD 2024, WIPO 2024, Thebenet Ali. 2021). Free or paid software has not only economic but also a moral attitude on technology information offer. The Free Software proposal claims more democracy and public access as moral solutions. That does not avoid the risk of a bad use of free software and the right to see the intellectual result of the work that also a moral right (or labor right).

According with Feller (2005), Crowston et Ali. (2008) and Gosh et Ali. (2002) researches, the Open Source Software (OSS) is the actual great support the whole software offer. It could be confused with OpenAI (a corporation) and free software as FSF. OSS refers to software whose source code is made freely available for anyone to view, modify, and distribute. It is developed collaboratively by communities of developers and organizations, often emphasizing transparency, peer review, and shared improvement. Examples include the Linux operating system, Apache web server, and LibreOffice.

According to Gosh et Ali. (2002) and Crowston et Ali. (2008), as benefits for users, Free Software advocates: 1)Freedom (right). Free software advocates, exemplified by figures like Richard Stallman and organizations like the Free Software Foundation (FSF), prioritize the ethical implications of software freedom. They emphasize users' rights to use, study, modify, and distribute software, including AI, without restrictions. This perspective extends to AI where they argue for user control, transparency, and the absence of proprietary restrictions; 2) Community and Collaboration. They believe in a decentralized model where communities of developers collaborate openly. This approach fosters innovation, encourages ethical practices, and promotes user empowerment through transparent code and governance. 3) Ethical and Social Impact. Free software advocates highlight the ethical considerations of AI development, such as ensuring fairness, accountability, and user privacy. They oppose AI technologies that undermine individual freedoms or perpetuate biases.

According to Gosh et Ali. (2002) and Crowston et Ali. (2008) Open Source advocates the following benefits: 1) Practical collaboration, value transparency, and

[4] https://www.gnu.org/philosophy/free-sw.en.html
[5] https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

collaboration but often emphasize practical benefits like faster innovation, reduced development costs, and increased reliability through peer review. They promote the accessibility and customization advantages of open source AI frameworks and tools; 2) Business and Innovation. Open source encourages businesses to leverage AI technologies without the barriers of proprietary licenses, enabling faster adoption and adaptation to specific needs. It fosters a competitive landscape where companies can build upon existing technologies to create new AI solutions; 3) Security and Quality. Open source proponents argue that transparency enhances security by allowing more eyes to scrutinize the code for vulnerabilities. They advocate for robust community-driven practices for security audits, rapid bug fixes, and continuous improvement.

The software development process of both is Community Collaboration. Developers from diverse backgrounds work together online, using platforms like GitHub or GitLab, and seek transparency or code, discussions, and documentation are publicly accessible. Developers submit code improvements (via pull requests), which are reviewed and integrated by maintainers based on the interactive process. Projects may be governed by individuals, organizations, or foundations (e.g., the Apache Software Foundation).

Finally paid software dominates sectors where proprietary solutions are preferred or required due to specific functionalities, support needs, or industry standards and consulting. That all includes many enterprise applications, professional software tools, and specialized industry solutions. Corporations often focus on proprietary AI technologies as a competitive advantage, protecting intellectual property and market share. They invest heavily in research and development, aiming to monetize AI innovations through licenses, subscriptions, or service models (VARIAN and SHAPIRO 1999).

Scale and integration in AI programs cater to large-scale deployments across industries as they prioritize features like performance optimization, enterprise support, and integration with existing systems. Corporations, while profit-driven, are aware of ethical and regulatory considerations in software development. They invest in ethical frameworks, compliance with data privacy laws, and responsible deployment practices to mitigate risks and build trust with users and regulators (Men´endez-Caravaca et Ali. 2021)

There is no real-time data or specific percentages regarding the market share of free, open-source, and paid software across all sectors. Free software and open-source software have seen significant adoption across various industries, particularly in technology, academia, and government sectors. Projects like Linux, Apache, MySQL, and various programming languages (e.g., Python, Java) are widely used and contribute to a substantial portion of infrastructure and development tools.

To get precise percentages and up-to-date market share figures, you would typically refer to industry reports, market analysis from research firms like Gartner, Forrester, or Statista, or specific studies on software usage patterns. These sources regularly publish insights into software market dynamics, including the prevalence of free/open source versus paid software in different sectors [6].

[6] https://www2.deloitte.com/content/dam/Deloitte/in/Documents/risk/in-ra-open-source-software-license-noexp.pdf

3.2 - AI programs, new technologies, and Public Administration.

New information technologies are also useful for public services and they benefit citizens by offering public goods and services though the public administration. Governments and institutions worldwide have embraced open and free software but are also paying TI corporations for services. Many governments recognize the benefits of open-source and free software, adopting and promoting it to improve transparency, reduce costs, and foster innovation.[7].

For example: European Union Promotes open-source use in public projects through initiatives like the European Interoperability Framework; Many cities and governments, such as the U.S. government, use open software to power platforms for sharing public data. Developing software with public funds and ensuring it is open or free maximizes its value for citizens. It promotes transparency, equity, and sustainability, ensuring that such investments benefit the whole society rather than serving private interests (EU 2020).

Here are some key pros of AI and new technologies to be used by Public Administration:

-Transparency and Trust

Open Access: Open or free software allows anyone to inspect the source code, which increases transparency. Citizens and stakeholders can verify public funds effectively use, and that there are no hidden vulnerabilities or unethical practices (e.g., data misuse).

Public Accountability: Open development ensures that the project remains aligned with its stated goals, as the community can monitor progress and hold developers accountable.

-Cost Efficiency

Reuse Across Projects: Free and open-source software (FOSS) can be reused and adapted for other government or public-sector projects, saving money and reducing redundancy.

-Avoiding Vendor Lock-In: Open software eliminates dependence on proprietary vendors, reducing costs associated with licensing fees, long-term contracts, or expensive upgrades.

-Innovation and Collaboration

Community Contributions: Open-source projects invite contributions from developers worldwide. This collaboration can improve the quality of the software, add features, and fix bugs quickly.

Encourages Innovation: FOSS serves as a foundation for innovation, allowing third parties, startups, or individuals to build upon public-sector investments.

- Accessibility and Equity

Universal Access: Making the software free ensures that all citizens, institutions, and businesses, regardless of size or budget, can benefit from its use.

Bridging the Digital Divide: Open software can be localized, modified, or customized to suit the needs of underrepresented or disadvantaged communities.

[7] https://interoperable-europe.ec.europa.eu/collection/open-source-observatory-osor/interactive-resource-map and https://interoperable-europe.ec.europa.eu/sites/default/files/news/2022-07/SC%20596%20OSS%20Catalogue%20Benchmark%20D01.05%20D03%20D04_final.pdf

-Security and Sustainability

Crowdsourced Security: With the code open to scrutiny, the vulnerabilities are more likely to be detected and fixed by the broader community, making the software more secure.

Longevity: Open software ensures the codebase can be maintained and updated even if the original developers or contractors move on.

-Ethical Considerations

Public Ownership: Software developed with public money should be treated as a public good. Open software ensures that the public retains ownership and control.

Knowledge Sharing: Free software embodies the principle of sharing knowledge and technological progress, reinforcing the values of education and collaboration.

Here are some examples in Europe (EU 2020):

1. European Union (EU)

Policy: The EU promotes the use of OSS across member states through initiatives like the European Interoperability Framework (EIF), which encourages public administrations to use open standards and share open-source solutions.

Example: The EU Commission launched the Open Source Software Strategy (2020-2023) to enhance collaboration and reusability of digital solutions in government.

2. Germany

Migration to Open Source: Cities like Munich pioneered the use of OSS by transitioning public administration systems to Linux and LibreOffice (the LiMux project). Although some aspects reverted to proprietary software, it highlighted the potential of OSS in government.

GovTech Projects: The German government encourages open development for public IT projects to avoid vendor lock-in and enhance transparency.

3. France

Public Code: France implemented the "Free Software for a Free Society" policy, mandating that publicly funded software be released as open-source by default.

Example: The French Gendarmerie National transitioned thousands of workstations to Linux, LibreOffice, and other open solutions.

3.3 - Economics of new technologies offer impacts.

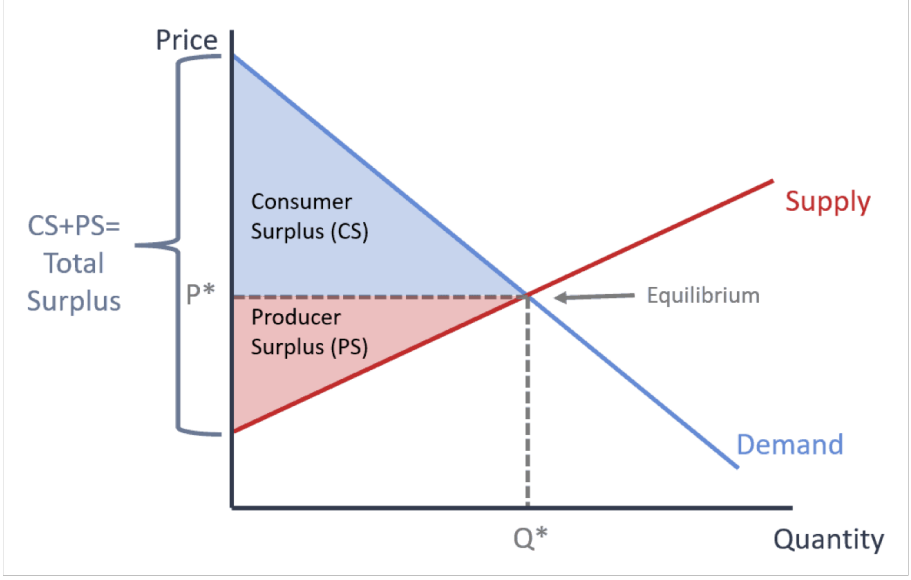
In the present section we seek to explain economic impacts and especially the economic Welfare surplus. The Welfare economic surplus, also known as Marshallian surplus (after Alfred Marshall) (BUILDING 1945), is divided into producers and customers.

In a perfect market, the price and the quantity are optimized and could be shown in a demand offer figure like the following Figure 1. There are two areas of benefits: for consumers and producers. That is the total quantity multiplied by the price paid. In other words, when the price of the product or service decreases, the customer surplus increases for all the customers in the market or society. On the other side, It decreases when the price goes up. Economists depict this surplus in graphs as a triangle as in Figure 1 below.

When a monopoly or a Corporation's dominant position in the market higher price determines the increase of producer surplus and a DWL zone. That zone measures the loss of surplus for both customers and producers.

DWL or deadweight loss is due to the production/consumption of a good at a quantity where marginal benefit (to society) does not equal marginal cost (to society). It happens when: 1) goods are being produced despite the cost being larger than the benefit, 2) additional goods are not being produced despite the benefits of their production being larger than the costs. That net benefit is missed and represents the loss for both customers and producers.

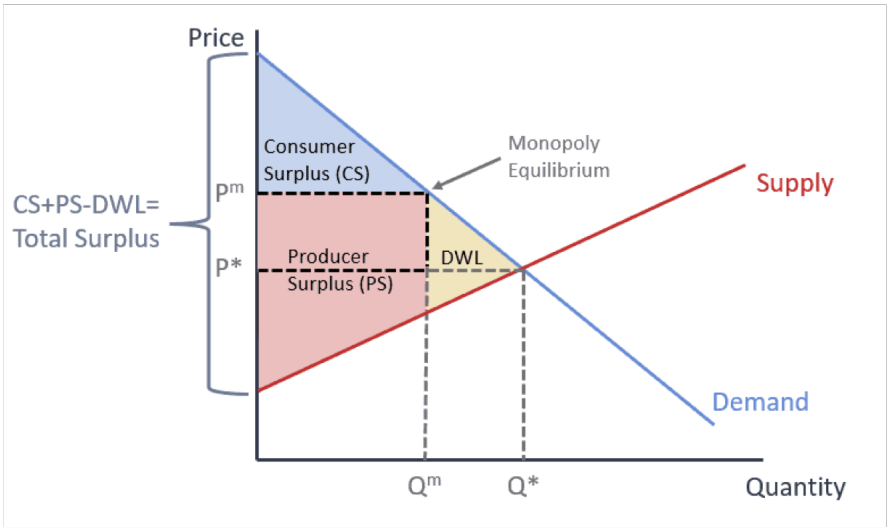
Figure 1 - Demand and offer in an information technology market.



Source: https://inomics.com/it/terms/welfare-economics-1522906

According to Grossman, S. J. & Stiglitz, J. E. (1980), Stiglits (2000) and Dugast, J. & Foucault, T. (2018) there are different perceptions of prices and information bias effects or there is a reduction price informativeness because it reduces the demand for more precise signals. So the DWL is not very clear because the optimum price is difficult to evaluate.

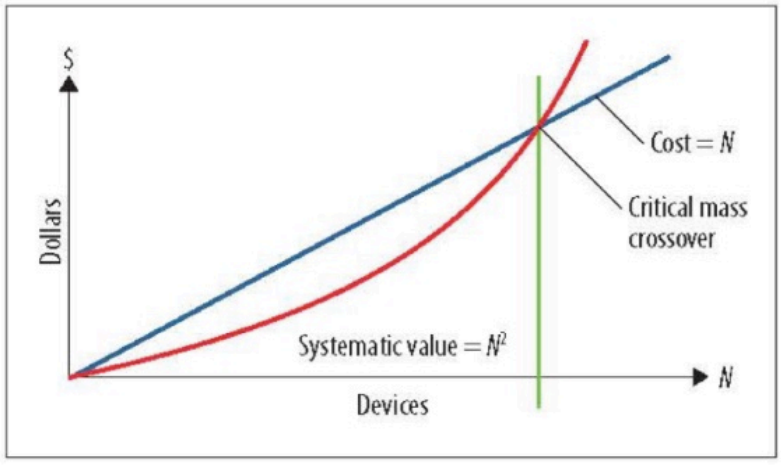
Figure 2 - Monopoly or oligopoly market



Source: https://inomics.com/it/terms/welfare-economics-1522906

Regarding the quantity offered, in the information economy, the optimum quantity depends on the critical mass shown in Figure 3 (Braman 2006, Shapiro and Varian 1999). The quantity depends on the number of devices (access points to the applications) or the network. Thus, the infrastructure, the devices, and the skills are less than the optimum quantity in the market, having a world of consumers. In Figure 2 the Qm will be less than Q*. The price is higher even with part of the offer free, and the producers will earn a surplus. There will also be a DWL or a loss of surplus.

Figure 3 - Optimal quantity offer in information economy



Source:https://gaidigitalreport.com/2020/08/25/network-effects-in-action/

The DWL zone of Figure 2, will decrease the Welfare surplus. Moreover, there are social impacts not included in the graph. The new technologies are producing effects for consumers who will use them. The qualification of people and the learning framework disposable must be adequate to the market. In other words, the collective capital of the total people who are the potential customers of applications is less than the optimum.

There is another indirect effect of the decrease in Welfare surplus. Less collective capital (people skilled and prepared to use AI programs) could not be used by corporative processes and services. The satisfaction and the use of applications depend on tool costs, free education paid online, and the amount of family investment in education. That decrease the optimum quantity and quality of programs.

In other words, the way to elevate qualifications is to save money to pay for college and studies. It is possible to access instruction for free using and cheap hardware or lease it. The effect of software democratization is people in less developed countries could study as programmers and software from home and offer low-cost services. That new learning framework lets people re-qualify themselves sometimes for free if their job skills change. The wide access to new technologies will increase the use and consumption of information goods and services beyond the actual amount of the market. The increase of education benefit offer and demand.

With sharing, distributed economy, and artificial intelligence (the whole system from machine learning, neural networks, natural language processing, and robotics) is possible, with low or null cost, to create, generate, or manage processes, services, and goods or to access almost unlimited resources of knowledge. But the cost of production will not be equal to zero.

Corporations and public administrations pay for services like security, infrastructure, etc. The reality is that in developing countries without infrastructure and with paid access will always be difficult to access the surplus of the information offered. In a world demand there are different benefits levels both for by income and by region.

What is the better form to offer new technologies and have, in the same time, a social surplus and good social effects? Is it better to have free or paid offers? Who will be the producer? A private corporation or public administration?

Today the ownership o goods and services produced must be defined to distribute the total benefit. There are at least three ways to develop software and register the intellectual origin to define who is the producer. The offer new technologies, goods, and services could: 1) register Intellectual Property in the WIPO system, 2) participate in a software project in a corporate or firm T.I., 3) write and register software (also only as a contribution) as free, open source or other traceability systems.

The first solution allows you to rent the property, the second enables you to receive a salary from a private commercial organization or another organization where you sell your working time, and the last is free or voluntary participation on the market but no cost is paid. Commercial or paying software applications are more services or licenses than goods (WIPO 2024). People pay for use, not to buy software sources. That leads us to understand why virtual machines and the cloud are growing. In the cloud, everyone can use whatever software configuration is associated with the service paid.

The future of software consumption is no longer restricted to the device (or the computer model or CPU) but to network connections (internet and mostly wireless infrastructure) and the storage need. The disposable services start from hosting to building and consuming and follow the classic Iaas, Paas, and Saas[8] basic configurations.

[8] https://cloud.google.com/learn/paas-vs-iaas-vs-saas

Open and free software also needs talent to develop new software. For an organization, today, is more important to manage new configurations, skills, and worker education. The business organization cost shifts from hardware infrastructure to talent, but the infrastructure remains as cost and increments its value.

We can conclude the future of services offer depends on virtual and social capital. The core offer resource is education and talent. That are the key performance or core value generation is a resource present in the market as immaterial capital (social, personal and organizational) (Chiu 2023). Thus, in the market marginality scheme, the market social capital increase and surplus aren't the goal, a value can be measured only by price and quantity.

The value of social capital is a result of the surplus accumulated multiplied by the number of people that can use the information good. Social capital can't be purchased as a production resource. Education and the network (or social attitude) are important to develop the market and we need to invest in them. (Bennett 2011, Cross Francis, Tan, and Nicholas, 2019, Cukurova, Luckin, and Kent, 2020, Zawacki-Richter, Marín, Bond, and Gouverneur, 2019).

Open source does not increase social surplus alone, and the externalities of an imperfect market caused by the concentration of information technology corporations. Public administration use and support in the information market is not increasing Welfare surplus in the job market. A general effect of education and cheap information technology tools made the difference between industrial production and the digital world (Chiu, 2023).

The development and use of new software and innovations quickly spread and generated a positive effect all over the world because all are using it. Everyone is using it because is cheap or free and useful. By leveraging community expertise and adhering to best practices, organizations can enhance the security of their software deployments while benefiting from the innovation and flexibility that open source offers.

The new technologies' costs could be categorized into several key concerns:
-Privacy and Data Security costs.
-Bias and Discrimination Costs.
-Job Displacement Costs and Economic Risks.
-Dependence and Loss of Autonomy social costs.
-Transparency and Control.

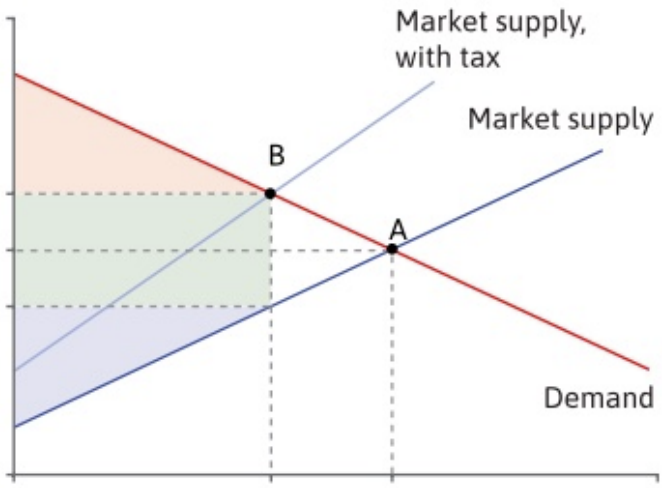
To decide what offer and costs configuration, is better for the community, Public Administration must prove that it is necessary and the best solution to buy or produce it. Public regulation is not welcome by Corporations and neither for Free Software, but theoretically benefits the public and mainly the less advantaged or vulnerable part of the population. The cost to elevate part of the population to a better level of education and to create work opportunities depends on information service costs that increase social capital.

The discussion result is there is not solutions classifying the type of producer offer or private/public offer as the best option. Considering an analysis that includes a Corporation organization and risks matrix, compliance systems and assessments, regulations, and laws, the conclusion is there are also other risks in the analysis considering regulation of the markets. The cost of information goods changed with regulations too.

Regulations could be seen as taxes. The variation in demand in response to a variation in price is called price elasticity of demand. We consider information demand

elastic because if lower the price is the quantity demanded increases. As we consider the whole new technologies closer substitutes, the higher the elasticity is likely to be, as people can easily switch from one good to another. If we add a tax or pay royalties, the total surplus decreases. In Figure 4 the green area is the total surplus from producers and customers that is now government surplus. That is added to DWL in Figure 2.

Figure 4 - effect of a tax



Source: https://inomics.com/it/terms/welfare-economics-1522906

Tax revenue is used to benefit society in another market. Compared to the situation before the tax, some of the surplus has been transferred from consumers and producers to the government, and the total surplus is lower. The DLW zones decrease or we have more surplus distributed, even if it is distributed differently. If the tax is spent on goods and services that enhance the well-being of the population, we might nevertheless conclude that this benefit to society outweighs the loss to consumers and producers, even though it reduces the surplus in the particular market that is taxed [9].

If the elasticity (as we assume) is high, the effect of the loss is high tax is better when the elasticity of the goods or service is low or the demand is inelastic. To have a social surplus taxes or royalties must have a direct impact that could be calculated and compared. For social surplus and long-term investment, like education, it is almost impossible to assess a social surplus without subjective evaluations. The solution of a general tax or royalty is a matter of subjective assumption. Nevertheless is the basis of the Intellectual property system and AI controls and restrictions imposed by all the Nations on new technologies.

4. Results

All the strengths and weaknesses of information goods and service markets seen above are conflicting and do not solve the initial problem of increasing Welfare surplus without a DWL. How much the social capital and the total economy will develop its potential compared with the actual context? Is it possible to merge in one market all information offered?

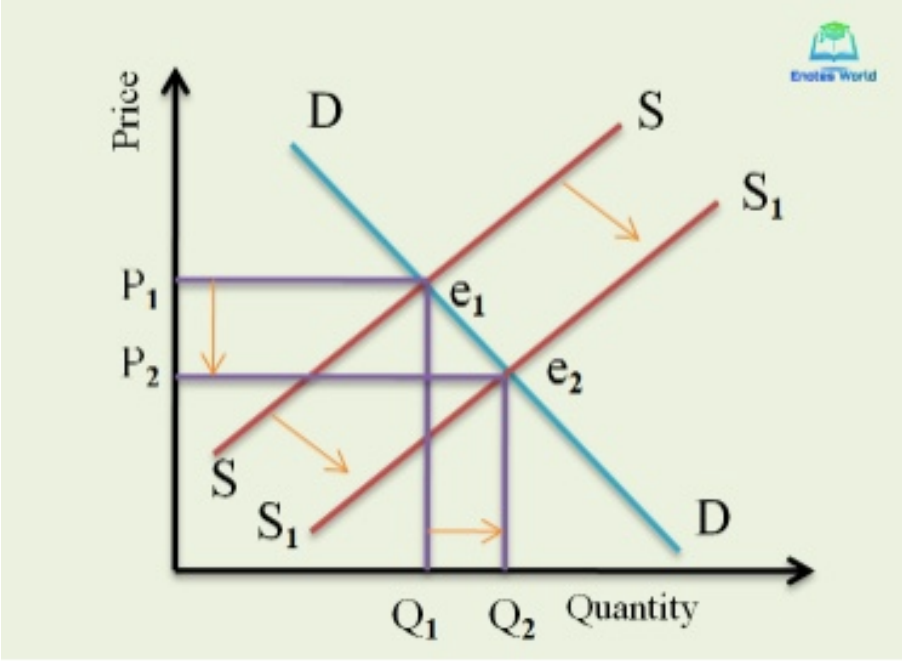
[9] https://www.core-econ.org/the-economy/microeconomics/08-supply-demand-12-effect-of-tax.html

For an interesting discussion about control agencies and the eventual concentration or fusion of high-tech corporations or having one or more producers, Neven and Röller, Lars-Hendrik (2000) evaluate a possible scenario and a Welfare surplus conclusion. We guess a common good or service will be able to reduce costs and distribute infrastructure costs for all through public administration. It could be done by any citizen with an ID. In that case, the software is free for all (as praised by Open and FSF), but the royalties for the use of programs are distributed to pay the cost of infrastructure, security, and consulting.

The resulting surplus is not a monetary measure (like price, costs, and quantities) but must consider an opportunity cost. It must be assessed by calculating immaterial capital or social capital increase (the number of people who can use and have benefited from new technologies) and the willingness to pay to evaluate it. (Aveni 2024b).

A common property is a slightly different scenario from above marginal market economic explanation, where the price paid is reduced because it is defined as a low price for the market that increases demand and increases surplus. It means that is possible to translate the offer or lower the cost of the offer for the market. If the supply curve (the offer) shifts down it means the cost of producing the good has decreased. It means changing the structure of the market' offer without changing technologies or the costs of the goods.

Figure 5 - decrease on supply curve



Source https://enotesworld.com/effect-of-changes-in-demand-and-supply-on-market-equilibrium/

In other words, with a common property and a structural change of the offer curve, the increase of price expected by an increase in quantity if the offer and relative demand for an elastic good result an equilibrium with more quantity and lower price. That reduce the DWL zone and increase the Welfare surplus. The price paid is only the production cost and a little royalty paid to social benefit without profit. The same

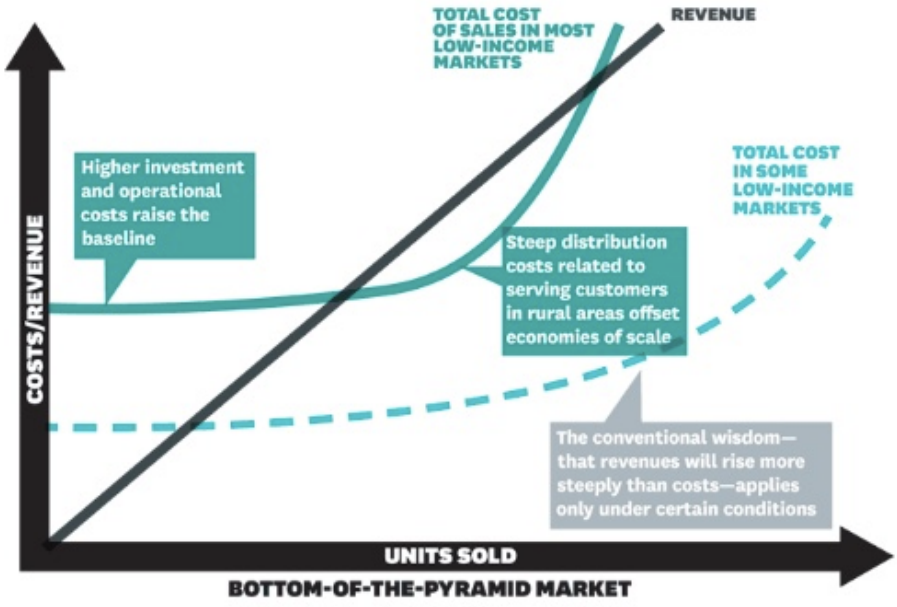
could be achieved expanding the quantity and control price to be the lowest possible or affordable in every place.

The offer of information has now a new equilibrium. That is possible because of special information market characteristics. People who want to enter must be subjected of these rules. To build a corporation with profit in this market the only possible profit is a little value with a huge quantity. That is the loss in absolute surplus value, but it must be compensate by a cumulative effect of little value for incredible quantity of demand. That is in other world a discussion of the bottom of Pyramid[10] effect. The idea is to have a resulting value only with the greatest quantity of the market.

Profit-making value is possible when consulting and offering education services are developed for people to increase their skills or share experiences. In this situation the decrease of DWL depends on the decrease of producers surplus. The point is to know if the elasticity and the increase in demand will compensate for the producer's loss. If part of the royalty included in the price is used not only for education but also to support the infrastructure costs of all producers, what will be the effect on producers?

The optimum quantity demanded by the market answer is in Figure 3. The total cost per unit must be the minimum cost to offer new information technology for the maximum number of people in the network. We started the discussion with the hypothesis that even though the information market today is big, it is possible to expand it to all the world population or make it several times bigger. In fact, there is today a demand for only a small part of the world's population, and the total quantity demand must be increased for the world population.

Figure 6 - BOP microeconomics



Source: https://hbr.org/2012/06/reality-check-at-the-bottom-of-the-pyramid

Thus, the loss in absolute value for the producer is great, but it must be compensated by a cumulative effect of little value for an incredible quantity of demand. That is the discussion of the bottom of the Pyramid effect (López-Morales Satsumi

[10] https://www.britannica.com/money/Bottom-of-the-Pyramid

José, Rosario-Flores, Felipe de Jesús Huerta- Estevez Antonio.2020) [11]. (See Figure 6)

The Muhammad Yunus Grameen Bank[12] experience is a robust experience of what is possible to achieve expanding quantity offers and low prices in a greater market without corporation positions. It is a matter of opinion to maintain a costly information market or allow it to expand changing the structural definition of goods and services. It means not considering information as a free good or service or corporation to sell it, but to consider information offer to be accessible for all.

In the paper appendix there is an exercise with some figures to explore mathematically the discussion above.

4. Concluding remarks.

The paper discussed free Software, Open Access, and Paid software Total Offers in the market. The paper also discussed Welfare surplus relating to these different offer types. We consider information (and information technology) as a collective immaterial capital constructed (like society and culture) again like a language over centuries. If we consider information and information technology innovation a common good or a collective property, everybody must have access to it. The use of a common capital could result in a basic amount collected to pay the basic cost of development and infrastructure to develop the common good. As a language, it is not considered a private or individual construction but a social resource.

The resulting Immaterial capital (social capital) and intellectual property will need regulation and control, develop opportunities, and spread benefits for the communities. That way the new technologies could be useful to fill the gap between generations and income levels. That is because we need to plan and organize resources to develop necessary adaptations for all economic activities: industry, education, public services, etc., and we lower the risk of an increasing economic divergence between developed and less developed countries and between different income levels. This risk is the result of today's information market as it is.

Thus, we need to change the actual information technology offer in the market structure and the Intellectual Property system to reduce communities' education diverging gaps and increase social capital Welfare surplus by lowering the information market price. This does not mean reducing corporation profit but increasing the free offer of the market to the bottom of the pyramid. It is possible to pay it with a basic royalty to use programs to pay for infrastructure and security that will, in turn, increase Welfare economic surplus and social capital.

[11] see Hart, S.L "Capitalism at the Crossroads" (Wharton School Publishing, 2005)
and Prahalad, C K (2004) Fortune at the bottom of the pyramid: Eradicating poverty through profits. Upper Saddle River, NJ: Prentice Hall.

[12] https://grameenbank.org.bd/public/assets/archive/annual_report/1707643963_Annual%20Reort%202022%20PDF_1_11zon-1.pdf

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APPENDIX - SURPLUS EXAMPLE CALCULATIONS.

We imagine a market with an equilibrium Quantity (600) and Price (200). We are considering 600 million clients or the USA and Europe market roughly. The maximum price for 1 unit of demand is 400, and the minimum cost for a producer to enter the market is 100. At that price, however it should be possible reach 3,500 total quantity sold (the world market). We also imagine a situation in which an efficient point of equilibrium, a tax and common good. The basic model currently does not include the external costs economic players impose to the macro-environment or attribute any meaning to equity.

1 - We must think about The Pareto-efficient level of output—where it is not possible to make one group better off without making the other worse off. That is equilibrium. In the equilibrium point E* = (200,600), a customer has [(400-200)x600]/2 of surplus or 60.000. The producer has [(2000-1000x600]/2 of surplus or 30.000. The total maximum surplus is 90.000. It is also the Welfare surplus.

If the price is higher than the equilibrium point E1 = (210, 500), a customer has [(400-210)x500]/2 of surplus or 47500. The producer has [(210-100x500]/2 of surplus or 27500. The maximum surplus is 75.000 and the decrease of Welfare or the DWL zone is 15.000 compared to equilibrium point.

2 - If we imagine a price ceiling (10% of the price in equilibrium) in the equilibrium point E*t it could reduce producers surplus (minimum price) or customer price ceiling. If we pay a tax like a royalties to be paid in the Intellectual system, we reduce quantity at 400. It will reduce Total welfare. The total tax amount will be of [(220-200) x 400] = 8.000 . The customer surplus will be [[400-220)x400]/2= 36.000 and producers [[220-100)x400]/2= 24.000. The DWL zone is equal to (90.000-8.000-36.000-24.000)= 22.000. A similar effect, or a DWL, is obtained when reducing the price to a minimum or to subside the producers[13].

3 - Using the BOP definition we can expand the market to a maximum quantity (new point (3.000, 110)) at a price of 10% more than the minimum offer in the market or with a curve almost completely elastic[14]. The Total surplus will be in the new equilibrium [(400-110)x3500]/2 of surplus or 507.500. The producer has [110-100x3500]/2 of surplus or 35.000. The total maximum surplus is now 542.500. It is also the Welfare surplus.

If the total surplus is that amount with a 10% plus the minimum cost for producers we increase the total surplus without reducing the customers and the producers. That is reshaping the offer curve structure, or the cost structure to be more efficient. Thus, the total cost of a corporation a function that include salary and cost of capital (or share coupons) has an increase of these production factors. In absolute value they increase by the difference of the quantity sold at the equilibrium point fo 600, vs the equilibrium point of 3.500. In other word the absolute value increase from (100*600)= 60.000 to (100*3.500)= 350.000.

That demonstrate that even with an increase of cost, or the offer price up to minimum for the producers, in a BOP market there is an increase of total surplus. If the 10% amount includes a value to be used for education or increase workers skills it is another effect (externality) in the other markets. The price in equilibrium of the information today is artificially reduced not because of the market total capacity but because of a wrong marketing and an oligopoly in the market that fix a price well over the optimum quantity. The total market goal is not the top of the pyramid but the bottom. That is because corporation CEO prefer a short term strategy of profits and to compete in a bloody market[15].

[13] for an extended example https://pressbooks.bccampus.ca/uvicecon103/chapter/4-6-taxes/
[14] it follow from the basics of information network market structure that has a marginal cost almost equal zero when reached a minimum network
[15] see Blue Ocean strategy https://www.blueoceanstrategy.com/what-is-blue-ocean-strategy/