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ARTICLE

Regulation and Competition in Digital Ecosystems: Some Missing Pieces

Eliana Garces

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1. Introduction

Given recent developments in the digital space, one could be forgiven in thinking that regulators have embarked on an extensive exercise of platform design targeting the largest players in online services. Critics of recent regulatory provisions in the EU and of many of the remedial actions from competition investigations maintain that they are limiting the ability of large platforms to operate as fully governed ecosystems, imposing on them duties and restrictions akin to those required from utilities' infrastructure.

Digital platforms are as much a complex multi-stakeholder organizational construct as they are a technology infrastructure. By ignoring the flow of value exchange and the central role of ecosystem governance in digital platforms, regulators may be missing important elements relating to the value created, innovation, and competitive dynamics in that space. Joint production, efficiencies, and inter-platform competition are seen as being given insufficient weight in the regulatory framework being developed for the online platform space.

Policymakers have been considering how to intervene in the digital platforms space for more than a decade. Several competition policy investigations have been carried out, and the debate currently centers on the need for further legislation. The European Union has adopted the Digital Markets Act (DMA), which imposes stringent obligations on very large platforms that are designated as "gatekeepers"; the UK is proposing a Digital Markets, Competition, and Consumers Bill (DMCC); and the US legislature is considering several bills such as the American Innovation and Competition Online Act (AICOA) and the Open App Markets Act.

These various initiatives differ in scope and ambition, but all the interventions, past and foreseen, apparently build on a shared vision of the source of harm from online platforms and the broad nature of the appropriate remedial action. This paper provides an overview of questions that could be raised about the completeness of the current framework and its adequacy in addressing the economic concerns of stakeholders in a way that protects the value that the technology has to offer. In this discussion, considering some elements of ecosystem theory may prove useful in contributing to the debate about effective intervention in the digital platforms space.

2. Current regulatory approach to large online platforms

The current regulatory approach to digital platforms emanates from a series of market investigations and reports commissioned over the last decade by competition authorities around Europe and by think tanks in the United States.[1] A series of antitrust and merger cases have further articulated the concept of dominance and the theories of harm that constitute the intellectual underpinning of the current investigations and policy proposals.[2] The most important regulation, and the one that aspires to be the global trendsetter, is the European Union's DMA. It is also the most rigid and all-encompassing. Others provide more flexibility, such as the UK DMCC, or have a narrower scope, such as the US AICOA and the Open App Markets Act. But all rely on the same economic framework of analysis that produces a shared vision of the dynamics of competition in digital services and a shared assessment of the merits of some of the platforms' business conduct.

The prevalent framework can be said to consist of a series of principles and presumptions, which are more or less rebuttable depending on the jurisdiction and legal instrument. These presumptions and principles, which appear to compose the core elements of the current regulatory approach, manifest themselves in the different digital platform competition investigations as well as in the provisions of the DMA. These regulatory principles and presumptions can be summarized as follows:

[1] The most notable ones are: European Commission, Directorate-General for Competition, Montjoye, Y., Schweitzer, H., and Crémer, J., "Competition policy for the digital era," Publications Office (2019), https://data.europa.eu/doi/10.2763/407537; HM Treasury, "Unlocking digital competition, Report of the Digital Competition Expert Panel (2019)," (2019); Lasserre, B. and Mundt, A., "Competition law and big data: The enforcers' view." Antitrust & Public Policies 4.1 (2017); Chicago Booth, Stigler Committee on Digital Platforms: Final Report (September 16, 2019)

[2] Illustrative cases are: European Commission, Google Search (Shopping) AT.39740 (27 June 2016); European Commission, Google Android AT.40099 (18 July 2018); German Federal Competition Office, B6-22/16 Facebook; European Commission, M.9660 Google/Fitbit (17 December 2020); Netherlands Authority for Consumers and Markets, ACM/19/035630 (24 August 2021); Italian Antitrust Authority, A528 Amazon (30 November 2021).

- The largest platforms (i.e., "gatekeepers") are assumed to have achieved sufficient scale-led efficiencies to have "tipped," making them unassailable in the short and medium terms in their core activity. Such a position is presumed to give the platforms strong bargaining power vis-a-vis businesses that are considered to be uniquely dependent on their services to reach customers at scale.

- The protection of competition primarily targets the market for the provision of complementary services on the platform (including upstream and downstream services). Regulators maintain that the competitive process for such complementary services should be open, fair and, if needed, protected by regulatory means. They believe that platforms should not be able to benefit from significant advantages compared to their rivals in those markets. Importantly, every complementary service is treated as a market in itself.

- Because all services are considered separate markets, the expansion of a platform into a new activity is scrutinized for anticompetitive leveraging of market power from the core market into complementary ones. Mechanisms of leverage can include tying, exclusivity, preferential treatment given to a platform's own services, and integration of services or data.

- Mergers are viewed with particular suspicion as they could provide opportunities to consolidate an unassailable position in a new activity or further reinforce the platform's advantage in its core activity.

- A large platform's market advantage and bargaining power is assumed to create competitive harm that is generally not compensated by efficiencies from the technology or organization.

The provisions of the DMA mostly assert these presumptions and principles. Consequently, the DMA works to disintegrate the targeted platforms and enforce a more siloed supply of services it identifies as core platform services. The regulation forces a disintegrated platform design by making data integration across services subject to consent (Art. 5.2), by prohibiting any tying of core services (Art. 5.8), by disallowing single logins for the different core platform services (Art. 5.2), and by mandating a user choice for default complementary services offered on operating systems, personal assistants, or web browsers (Art. 6.3).

Besides disintegration, the regulation also imposes some elements of platform neutrality. It does so by providing complementors on the operating systems and virtual assistants with the same access to platform features as first-party services (Art. 6.4). Self-preferencing by the platform in ranking, indexing, or crawling is also forbidden (Art. 6.5). Rights and obligations are also changed as complementors gain

direct access to users and become able to establish direct communication and drive them out of the platform (Art. 5.3). In addition, business users gain access to the data they generate (Art. 6.9),[3] which the platform can no longer use to its own advantage (Art. 6.2).

This set of measures support a platform design where the platform delivers its core service while supporting a set of distinct complementary digital services that it cannot itself deliver using any of the privileges or advantages from being the platform owner.

Current competition policy interventions also focus on complementors' access to the core service infrastructure and resources (technology features, users, data) and seek to establish similar conditions between business users and the platform with the view of preventing undue advantages in competition or any exploitative terms in access conditions.

Antitrust cases such as Google Shopping, Google Android in the EC, Amazon in Italy and the EC, Facebook/Meta in Germany, and Apple in the Netherlands have mostly replicated this approach, pushing measures towards platform disintegration and a certain degree of neutrality in complementary markets.

3. Platform and ecosystem analysis: a more complex framework

The current regulatory approach treats each digital platform as a digital service provider of one or more distinct services that grants the platform's users access to a set of competing or complementary suppliers. This approach treats platforms as little more than an infrastructure on which other businesses can build and deliver their services to the users connecting on the platform (a "platform as infrastructure" approach).

But some business experts and academics, notably in the field of business strategy and information systems, maintain that most large digital platforms are much more complex organizations than simple "gatekeepers." They can be more usefully described as ecosystems, a concept borrowed from ecology that is particularly suited to describing the type of organization that has become prominent in the digital economy.[4]

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[3] European Parliament, Council of the European Union, Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act), EUR-Lex – 32022R1925 – EN – EUR-Lex (europa.eu).

[4] For a review, see Tiwana, A., Platform ecosystems: Aligning architecture, governance, and strategy, Newnes (2013).

There are arguably two important omissions in the "platform as infrastructure" approach to platform regulation. One is the consideration of platform value-generation mechanisms and the characteristic way value is actively created on platforms. Platforms are effective at reducing information, search, or transaction costs. But the most notable source of efficiency created by platforms is their ability to innovate, constantly creating new services and processes by sharing and recombining digital assets and capabilities. Scholars have extensively described the generative potential of digital ecosystems and have characterized the active role that platforms can play in supporting this process.[5]

The second omission is the relevance of the evolutionary nature of platforms and the importance of dynamic considerations for the assessment of the competitive landscape. Platforms' ability to innovate by repurposing assets and capabilities creates expansion and entry opportunities that generate inter-platform competitive pressure in ways that have not yet been fully integrated into the prevailing regulatory framework. Social media's expansion into commerce is one example of this overlooked phenomenon, with Amazon having to respond to TikTok and Instagram's shop buttons with the creation of its own in-app feed and with TikTok's search function effectively challenging Google search.[6] The current framework presumes that all very large platforms are in a static situation of "tipped" dominance, which they leverage to enter other markets, and this is scrutinized as potential harm rather than as a contribution to the competitive process.

Orchestration and joint value generation

Large platforms comprising different types of participants have been described by scholars as innovation ecosystems and, more technically, as "a community of hierarchically independent, yet interdependent heterogeneous participants who collectively generate a coherent, ecosystem-level output [...] targeted at a defined user audience."[7] The main features of these ecosystems are a joint production of value, a non-hierarchical organization so that there are typically no straightforward vertical

[5] Cusumano, M. A., Gawer, A., and Yoffie, D. B., The business of platforms: Strategy in the age of digital competition, innovation, and power. Harper Business (2019); Autio, E.. "Orchestrating ecosystems: a multi-layered framework." Innovation 24.1 (2022): 96-109; Jacobides, M. G., Cennamo, C., and Gawer, A., "Towards a theory of ecosystems," Strategic management journal 39.8 (2018): 2255-2276.

[6] "Amazon's TikTok-like Inspire shopping feed is now available to all customers in the US," Tech Crunch May 5, 2023, https://techcrunch.com/2023/05/05/amazons-tiktok-like-inspire-shopping-feed-available-all-customers-us/ (accessed July 17, 2023); "For Gen Z, TikTok Is the New Search Engine," The New York Times, Sept. 17, 2022.

[7] There are multiple definitions of innovation platforms, and this one comes from Autio E., "Orchestrating ecosystems: a multi-layered framework', Innovation, 24:1,96-109, (2022), DOI: 10.1080/14479338.2021.1919120. For a theoretical discussion on innovation ecosystems, see: Autio, E., and Thomas, L., "Innovation ecosystems," Oxford handbook of innovation management (2014).

relationships as in a supply chain, and a coherent, self-sustainable total value proposition.

All types of participants in a large online platform, including individual users, can typically create and contribute to the value generated by the platform for other participants.[8] Joint production of value in a platform takes the form of contributing, sharing, or integrating resources, such as when a user posts a review on a merchant site, a messaging app is used to share content from a music streaming app, or a map service is used to calculate the travel time blocked on the calendar app. In all these examples, a platform participant enhances the value of other participants in a way that is facilitated by the supporting platform. Most, if not all, platform participants benefit from and contribute to the whole platform ecosystem.

Large platforms typically play a central role in facilitating joint value creation. They actively contribute to and build for the development and success of the complementary services they support.[9] They do so at the onset by developing the core platform technology in the form of operating systems and technology standards to be used by all participants to interconnect and build, but they also typically develop a set of platform tools that are available to developers to help them improve product performance or product function, gain or manage audiences, and implement trust building and other governance features. This form of organization based on the externalization of the value creation by way of application programming interfaces (APIs) has been called the "inverted firm."[10] Examples are Zalando' s internal developer platform Sunrise; the various Meta business tools that include analytics, action buttons, or media integrations; and even Apple iOS or Android photo-taking capabilities that can be integrated into third-party apps such as Snapchat. These tools conform a "service layer" on the platform and are used selectively by different types of platform participants. Their stated purpose is to facilitate improvements, recombination, and generativity on the platform.[11]

Platform tools are sometimes referred to as "boundary resources," and they shape the way developers and the platform interact.[12] Boundary resources establish

[8] Jacobides, M. G., Cennamo, C., and Gawer, A., "Towards a theory of ecosystems," Strategic management journal 39.8 (2018): 2255-2276; Autio, E., and Thomas, L., "Value co-creation in ecosystems: Insights and research promise from three disciplinary perspectives," Handbook of digital innovation (2020): 107-132.

[9] Autio, E., "Orchestrating ecosystems: a multi-layered framework," Innovation 24.1 (2022): 96-109.

[10] Parker, G., Van Alstyne, M, and Jiang, X., "Platform ecosystems: How Developers Invert The Firm," MIS Quarterly 41.1 (2017): 255-266.

[11] Yoo, Y., Boland Jr., R. J., Lyytinen, K., and Majchrzak, A., "Organizing for innovation in the digitized world," Organization science, 23(5), (2012): 1398-1408.

[12] Gawer, A., "Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces," Long Range Planning, 54(5), (2021): 102045; Ghazawneh, A., and Henfridsson, O.,

the possibility of a connection for different types of players, define the conditions of participation of businesses and developers, and ultimately define the platform value proposition and services provided.[13]

Platform owners typically exercise control over their complementary contributors. This power is used to increase the overall value of the platform, and this requires ensuring businesses and developers are properly incentivized to participate and contribute value.[14] Typical relationships on platforms are not simple, one-to-one hierarchical relationships as in a traditional supply chain because one contracting side cannot clearly specify what the other contracting party needs to deliver.[15] Instead, platform owners often need to incentivize or establish rules for others to make voluntary inputs that are consistent with the ecosystem's value proposition.[16] Rules and incentives work to align participants across platforms. These rules may impose platform-preserving restrictions, for example, preventing participants from directly competing with the platform's core services or threatening the platform's monetization strategy.

Other crucial choices also help generate the desired value proposition. They relate to the level of standardization versus variability, the open or closed nature of platform resources, or even the choice of how many types of participants ("sides" in the platform economics literature) to bring onto the platform.[17] Platforms must also resolve trade-offs between participants' sometimes conflicting objectives by imposing restrictions on some to preserve others' incentives.[18] This happens when merchants must comply with contractual clauses that facilitate individual users' transactions or when some services are excluded from the platform to preserve the business of another. A famous example of the latter was AT&T's initial request that the iPhone not host any VOIP application.[19]

"Balancing platform control and external contribution in third-party development: the boundary resources model," Information systems journal, 23(2) (2013)

[13] Ibid. Tilson, D., Sorensen, C., and Lyytinen, K., "Change and control paradoxes in mobile infrastructure innovation: the Android and iOS mobile operating systems cases," 45th Hawaii international conference on system sciences, IEEE (2012).

[14] Boudreau, K. J., and Hagiu. A., "Platform rules: Multi-sided platforms as regulators," Platforms, markets and innovation 1 (2009): 163-191; Autio, E., and Thomas, L., "Value co-creation in ecosystems: Insights and research promise from three disciplinary perspectives," Handbook of digital innovation, Edward Elgar Publishing (2020): 107-132; Wareham, J., Fox, P. B., and Cano Giner, J. L., "Technology ecosystem governance," Organization science 25.4 (2014): 1195-1215.

[15] Autio, E., "Orchestrating ecosystems: a multi-layered framework," Innovation 24.1 (2022): 96-109.

[16] Jacobides (2018); Erkko Autio (2022) Orchestrating ecosystems: a multi-layered framework, Innovation, 24:1, 96-109, DOI: 10.1080/14479338.2021.1919120

[17] Wareham, J., Fox, P. B., and Cano Giner, J. L., "Technology ecosystem governance," Organization science 25.4 (2014): 1195-1215.

[18] Cennamo, C., Ozalp, H., and Kretschmer, T., "Platform architecture and quality trade-offs of multihoming complements," Information Systems Research 29.2 (2018): 461-478.

[19] Eaton, B., Elaluf-Calderwood, S., Sørensen, C., and Yoo, Y., "Distributed tuning of boundary resources," MIS quarterly, 39(1) (2015): 217-244.

There is still much research to be done on how platform business models are determined, and in particular, on the technology and value propositions driving platform choices.[20] The literature on digital ecosystems has proposed frameworks to assess the merits of rules and design choices implemented by platforms. One premise is that the objective of the platform is to ensure its survival and that of its ecosystem. This entails the provision of a stable, productive, and resilient environment for the ecosystem and its participants, and the combination of stability, innovation, and adaptability indicators is a measure of the "ecosystem health."[21] One could argue that for rules and design choices to be assessed positively, they must contribute to the platform ecosystem viability interpreted as the benefits the platform delivers to its stakeholders and its aptitude for survival. This approach incorporates an element of assessment that goes beyond the fairness of the allocation of value across platform participants and introduces an assessment criterion that looks at the generation of value for the entire set of platform participants.

Platform evolution and platform maturity

The DMA only concerns so-called "gatekeepers," which it defines as large platforms supplying a "core platform service" with more than 45 million active end users, 10,000 business users, and a yearly turnover of EUR 7.5 billion for at least three years. The regulators' rationale is that these platforms have managed to attract sufficient users and businesses to have become entrenched in their positions, thanks to barriers to entry generated by their size and possibly due to abusive conduct. The regulatory approach presumes that these "mature" platforms are no longer challenged by competition and have an incentive to exploit their position to focus on rent extraction mechanisms rather than value generation. In this view, behavior that might be legitimate for smaller platforms should be subjected to greater scrutiny in the case of large ones.

Platform economics predicts that a platform initially focuses on attracting participants and developing the network effects that will support platform growth, possibly with subsidies and other incentive mechanisms.[22] As it grows, the platform switches focus to attracting new, strategically chosen complementary providers and

[20] For a discussion of a research agenda on platform ecosystems, see McIntyre, D., Srinivasan, A., Afuah, A., Gawer, A., and Kretschmer, T., "Multisided platforms as new organizational forms," Academy of Management Perspectives, 35(4) (2021): 566-583.

[21] Cobben, D., Ooms, W., and Roijakkers, N. (2023); Wareham, J., Fox, P. B., and Cano Giner, J. L., "Technology ecosystem governance," Organization science 25.4 (2014): 1195-1215; Iansiti, M., and Richards, G. L., "The information technology ecosystem: Structure, health, and performance," The Antitrust Bulletin 51.1 (2006): 77-110.

[22] Erkko A., "Orchestrating ecosystems: a multi-layered framework," Innovation 24:1 (2022): 96-109; Gawer, A., "Digital platforms' boundaries: The interplay of firm scope, platform sides, and digital interfaces," Long Range Planning 54.5 (2021): 102045.

opens to more sides. Finally, the platform settles on a business model, focuses on monetization, and stabilizes its brand governance.[23] At this stage, the platform may also choose to leverage its capabilities into other activities.

An empirical analysis of online digital platforms reveals that platforms do evolve over time. An analysis of platform capabilities and organization of both Tripadvisor and Facebook, for example, reveals an evolution in the focus of each platform.[24] Tripadvisor evolved from a specialized search engine for travel information, to incorporating advertisement and user-generated content, to onboarding multiple types of partners such as restaurants, travel agencies, and hotels, and then partnering with other platforms such as Uber or Facebook while developing an array of platform tools such as instant booking. Facebook similarly evolved from a social networking site focused primarily on providing features to end users and with limited offerings to third parties to a complex ecosystem focusing on advertisement, commerce, and content generation that currently provides a variety of AI resources to external developers and businesses and is branching out towards hardware. Other successful platforms have similar stories of evolution, expansion, and diversification.

Yet, the concept of platform "maturity" seems, at this point, more theoretical than empirical. There is little evidence of the evolutionary process of platforms settling on pure rent extraction without any continuing elements of risky exploration. The factors that turn "expansion" into "leveraging" are theoretically and empirically unclear, as many entry attempts by very large platforms into new services either fail, or they succeed but without translating into expanded dominance. Google+ is a famous example of a very large platform's failed expansion into social media, and Apple Music is an example of expansion without dominance.[25] More research and empirical evidence are needed to characterize "tipped" or "mature" platforms as essentially different from smaller platforms in terms of value and competitive impact.

Large established platforms continue to enter risky new spaces with Meta and Apple entering the AR/VR space, Apple and Amazon betting on health services, Microsoft entering gaming, and Google developing cloud productivity tools. This

[23] Cennamo, C., and Santaló, J., "Generativity Tension and Value Creation in Platform Ecosystems," Organization Science 30(3) (2019): 617-641;Belleflamme, P., and Peitz. M., The Economics of Platforms. Cambridge University Press (2021).

[24] Alaimo, C., Kallinikos, J., and Valderrama, E., "Platforms as service ecosystems: Lessons from social media," Journal of Information Technology, 35(1) (2020): 25-48; Alaimo, C., "The Role of Boundary Resources in Ecosystem Innovation: A Study of Facebook's Evolution," (2022) available at SSRN 4026712.

[25] Caminade, J., and von Wartburg, M., 'The success of third party apps on the app store," Analysis Group, (April 2022) https://www.apple.com/newsroom/pdfs/the-success-of-third-party-apps-on-the-app-store.pdf

continued dynamism is consistent with platforms continuing to repurpose and recombine their capabilities, adding new partnerships and growing "sides."[26] Although large platforms' dynamism is currently analyzed under the lens of "leverage of dominance," the fact is that large platforms are often each other's biggest competitive threat. Focusing on the impact of platform entry on the smaller players obscures the fact that they represent a very significant component of the competitive process in the platform space.

4. Implications for the assessment of digital platforms

Scholarship suggests that the current analytical framework supporting both regulatory intervention and competition investigations in the digital platform space overlooks important economic features of platforms. Incorporating learnings from platform ecosystem research would help fill the gap and assess platform conduct in a way that accounts for the value that platforms generate and help generate.

As a general principle and as suggested by some scholars, regulators could favor platform governance rules that increase value for platform participants and expand the volume of overall services provided.[27] Under this view, enforcement should target only those platform design decisions and rules that allow platforms to appropriate value from third-party platform players without generating any countervailing benefits. Although the DMA does not accept objective justifications for conducts, some of these conducts may actually benefit the same stakeholders that the DMA intends to support with the regulatory measures. A redesign of platform rules forced by regulation could potentially eliminate the incentives to continue to provide some of the tools and services that support third-party businesses.

Regulators will have to acknowledge the need for monetization mechanisms, and scholarship suggests that the channel chosen for monetization must be coherent with the broader system of incentives established by the platform. Disturbing the mechanism for monetization is likely to produce ripple effects as new monetization mechanisms will change the terms for platform participants. A constraining factor for any business model is that platforms are able to reap the benefits from the services and value they provide to platform participants, including the tools and governance rules that contribute to their success.

In their drive to disintegrate or open some platform services, regulators will have to determine which services should remain under the control of the platform and be

[26] Zhao, Y., Von Delft, S., Morgan-Thomas, A., and Buck, T., "The evolution of platform business models: Exploring competitive battles in the world of platforms," Long Range Planning, 53(4) (2020): 101892.
[27] Cennamo, C., Kretschmer, T., Constantinides, P., Alaimo, C., and Santaló, J., "Digital platforms regulation: An innovation-centric view of the EU's Digital Markets Act," Journal of European Competition Law & Practice, 14(1) (2023): 44-51.

considered platform core service. Platform research would suggest that these core services could, in principle, entail all tools and features that belong to the platform layer and support complementors' growth, promote platform participation, and foster generativity.

Finally, the platform should be able to exert a sufficient degree of architectural control to ensure that it can support its value proposition and its brand positioning, and that it has the levers to maintain the main elements of ecosystem health: stability, generativity, and adaptability.

5. Conclusion

The current framework used to regulate platforms falls short of accounting for the full complexity of platform businesses. More research is needed to typify value exchanges on digital platforms and the relationships among participants of platform ecosystems, and to provide a more thorough account of joint value generation and value contributions. This may better inform assessment criteria for platform conduct, as well as the design of remedies that preserve the value of platforms to the businesses and individuals they serve.

Indeed, the time does not seem ripe for the type of generalizations that support "one size fits all" definitive policies. More-reasoned, case-by-case assessments will contribute to the progressive formalization of a new generation of digital platform economics that considers value generation in addition to access and pricing.

In the meantime, this brief overview of the characteristics of platform ecosystems should result in at least two predictions regarding the impact of the DMA. First, large platforms provide numerous products and services to platform participants for which they are currently compensated through channels that do not necessarily map the flow of that value. An impairment of existing monetization channels is likely to result in the emergence of new monetization streams as platforms seek compensation for these investments. Second, the evolutionary nature of large platforms and their proven success in repurposing capabilities make them likely to be the primary beneficiaries of the opportunities opened by the DMA.

Eliana Garces
Senior Advisor at the Analysis Group.

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