

Blockchain in Development – Part II: How It Can Impact Emerging Markets

Blockchain is an innovative new technology with the power to disrupt existing economic and business models, as discussed in EMCompass Note 40. Blockchain also has enormous potential for emerging markets. These nations appear poised for a more rapid adoption of blockchain, though a framework is needed to assess how the technology can be deployed and which applications and use cases are likely to be seen in the near future. While the potential of blockchain is great, the technology is still at an early stage of development and will need to overcome potential setbacks—technical, regulatory, and organizational—before it becomes mainstream. In such a context of uncertainty, companies in emerging markets can neither afford to wait until the outcome is evident nor expose their existing business models to overly risky wholesale blockchain initiatives. Instead, they will need to adopt an experimental approach that allows them to develop options and thereby learn in the process, inform their strategies, and improve their value propositions.

Blockchain's full capability is difficult to predict at this early stage in its development. Yet while most of the attention surrounding blockchain has taken place in advanced economies, its greatest potential for decisive impact may lie in emerging market economies.

In 2016 Christian Catalini, Assistant Professor of Technological Innovation, Entrepreneurship, and Strategic Management at MIT's Sloan School of Management, and Joshua Gans, Professor of Strategic Management at the University of Toronto's Rotman School of Management, proposed an economic framework to assess the potential impact of blockchain and its capacity to disrupt the current market by reducing verification and networking costs.¹

Their paper concluded that when blockchain is combined with cryptocurrency, marketplaces can be 'bootstrapped' to function without the use of traditional 'trusted parties' and thereby result in significantly lower networking costs for participants.²

The paper also finds that open blockchains will likely have the most drastic effect on market structure, challenging the market power of incumbents and lowering the cost of entry for new entrants. Nevertheless, given the relatively high costs of the proof of concept, it is likely that most early adoptions of blockchain will take place in the form of (i) value-added applications built on top of existing blockchains such as bitcoin; (ii) private or semi-private blockchains targeting process efficiencies in financial services; or (iii) extensive margin applications enabling new marketplaces.

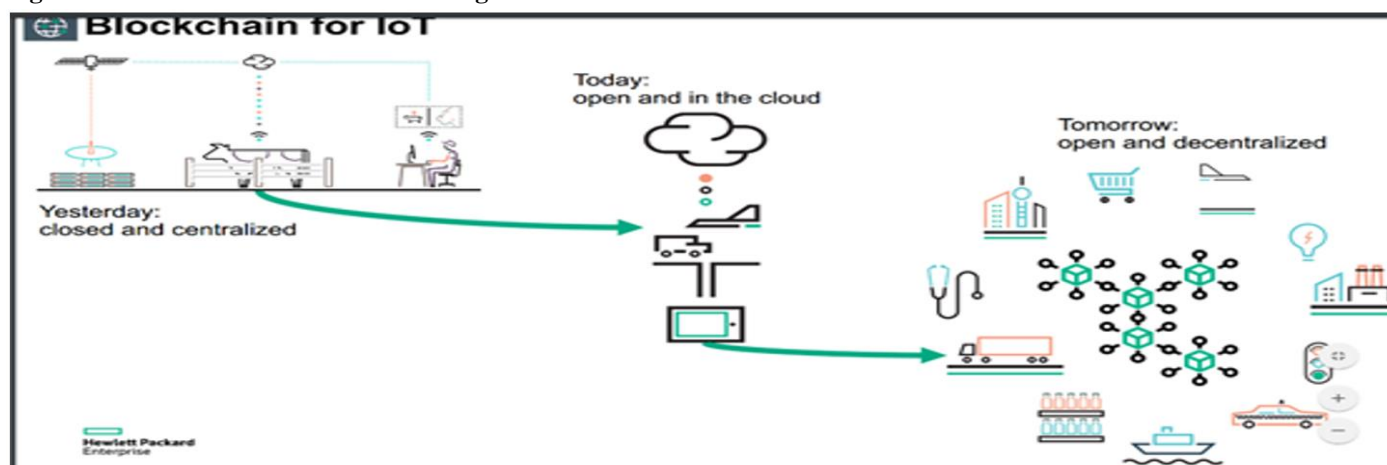
The coexistence of public and private blockchains is assured, depending on the type of services and the nature of the industry where they are applied. A compelling business case for blockchain can be made in currently neglected or underserved markets, where there is a less competitive market structure and high verification costs.

Use cases that are relatively simple to design and implement, and which are combined with already tested technological solutions such as cryptocurrencies, will likely find early adoption (for example, adding a digital currency payment option for wallets and cross-border payments). Intra-organizational projects intended to reduce organizational complexity and reconcile multiple databases would be another possibility.³

Financial services firms are extending that kind of collaboration to trusted counterparties to reduce costs through private blockchains. Truly disruptive blockchain solutions that depart from existing business practices carry high potential for future growth, but their heightened complexity and need for stakeholder collaboration (such as elaborate financial instruments and smart contracts) will likely delay their adoption.

Building on this hypothesis, emerging markets appear poised for a more rapid adoption of blockchain technology, as they meet many of the conditions listed above, including high verification costs, underserved populations, and in many cases

Figure 1: Blockchain for Internet of Things



Source: Hewlett Packard Enterprise

have a relative lack of traditional incumbents with significant market power to impede new entrants.

In financial services, for example, the existing infrastructure is shallow in almost all low-income countries, many of which have also suffered from de-risking in the wake of the financial crisis.

Fortunately, this handicap may accelerate adoption of blockchain, as a lack of financial infrastructure also means less organizational resistance to the new technology and lower transition costs for moving from a legacy to a new system. Consequently, regulators and existing financial institutions in emerging markets have less incentive to prevent the blockchain revolution, as it does not massively disrupt existing market conditions.

Global payments and trade finance are examples of sectors experiencing a flurry of initiatives from market frontrunners and new entrants alike. Both have high transaction and verification costs that blockchain can reduce by improving the speed, transparency, and process.

Emerging market nations have large population segments that remain underserved in terms of financial and banking services due to the high cost of customer acquisition for traditional financial institutions.

In addition, the extensive use of mobile based services, particularly in Africa and Asia, provides an easy avenue for a blockchain-based system to extend its services. Even in lower income countries, mobile penetration is extremely high, at 83 percent among the 16-to-65 age bracket.⁴ If blockchain manages to provide proof of concept for a viable business model in payments for mobile banks and other financial players, it would advance the longstanding developmental goal

of financial inclusion. Serving previously unprofitable customers and small and medium-sized companies can generate up to \$380 billion in additional revenues.⁵ So blockchain may provide emerging markets an opportunity to leapfrog traditional technologies, as happened with mobile technology in many emerging market regions, particularly Sub-Saharan Africa.

Financial Services

In the financial services sector blockchain initiatives fall under two main categories.

The first is **process efficiency rationale**, which occurs in countries with established financial market leaders (typical in OECD countries). Blockchain projects in such cases focus on a gradual application of the technology, leveraging process efficiencies in existing business models and utilizing private or semi-private blockchains, either within their organization or through consortia such as R3, Hyperledger, and Digital Asset Holdings.

And the second is **new market creation rationale**, in which new market players target the inefficiencies of existing business models to deliver value in emerging markets. These can be start-up businesses originating from advanced or from emerging market economies, or large non-financial players that see an opportunity in expanding the value chain of a current service. Global payments, or remittances, and digital wallets are examples.

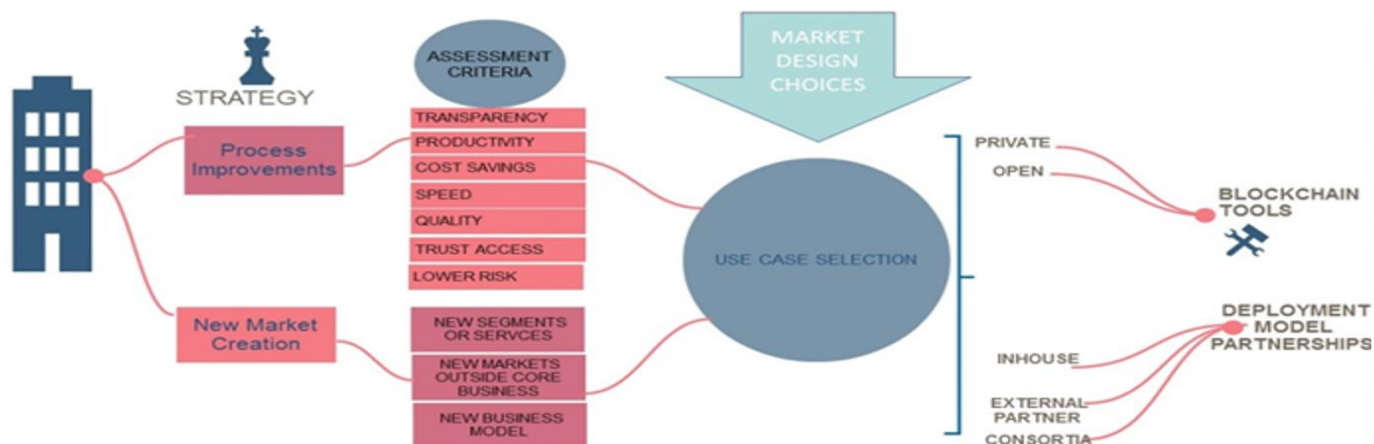
These initiatives tend to flourish in markets with a combination of relative volatility due to political or currency risk, an absence of a strong traditional banking system, large underserved customer segments, a digital or mobile finance culture, and explicit support or tolerance by regulators. In this sector, blockchain initiatives tend to be open networks, backed by a cryptocurrency—usually bitcoin—and tend to be local.

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Examples of such start-ups include BitPesa (Kenya), Bitso (Mexico), Remit.ug (Uganda), Satoshi Tango (Argentina), BitSpark (Hong Kong), OkCoin (China), OkLink/Coinsense (India), CoiNnect (Mexico/Argentina), Redit and Coin.ph (Philippines). There are also large players in this space, including MPesa, a mobile money transfer service launched by telecommunications giant Vodafone in Kenya, and e-commerce companies, including AliPay, a subsidiary of China's Alibaba.

China is a noteworthy player in this classification, with companies that have a dynamic presence in both segments (start-ups and large established players), with regional coverage across Asia and venture capital investors who have global ambitions beyond emerging markets.

Figure 2: Blockchain Strategy Assessment Matrix



Source: Marina Niforos

Bridging the institutional gap. The positive effect of blockchain in emerging markets can be not only technological, but also institutional. From a governance and societal perspective, blockchain's features of transparency can also serve to bridge the 'trust deficit' and put pressure on governments to improve services to citizens, forcing them to become more accountable and eliminating the need for decades of institutional development.

For example, in 2016 the Dubai Government established a Global Blockchain Council to assist governments and industry on how to best leverage the technology to improve services to citizens.

Recent Developments

Although it is still too early for definitive conclusions, 2016 saw a trend in terms of the flow of capital and investments in the blockchain industry, according to data provided by research firm CB Insights. There were signs that the sector is moving beyond hype and toward an inflection point, with a

consolidating interest from large corporates and venture capitalists into more complex financial applications, as well as global diversification:

- Investment into the sector remained flat with respect to 2015 (at \$550 million) but still significant (it stood at \$5 million in 2012), with capital concentrated into fewer deals, signifying perhaps an end to the investment bubble.
- Corporate venture capitalists entered the market dynamically, with investments rising 24 percent in 2016, to \$52 million, a sign that industry is mobilizing seriously around the technology.
- Financial services remained the most active corporate investors, with major banks joining.
- While the United States still dominated the sector with a 54 percent deal market share, its relative proportion

- diminished as Asia's share increased threefold to 23 percent; Asia emerged as a global venture capital investor in major deals.
- The sector matured with blockchain companies emerging beyond financial services, to the Internet of Things, identity management, and content distribution and supply chain, including Mediachain, BitMark, Filament, SatoshiPay, and Cambridge Blockchain.

Blockchain (R)evolution: What's next?

Distributed ledgers technology is evolving rapidly, driven by internal forces aimed at correcting some of the technology's limitations, with easy-to-use alternatives like Ethereum and other disruptive technologies that are shaping the Fourth Industrial Revolution.⁶ The combination of these innovative forces, including cognitive computing, robotics, the Internet of Things, and advanced analytics, will combine to create ideal conditions for altering the current economic infrastructure.⁷

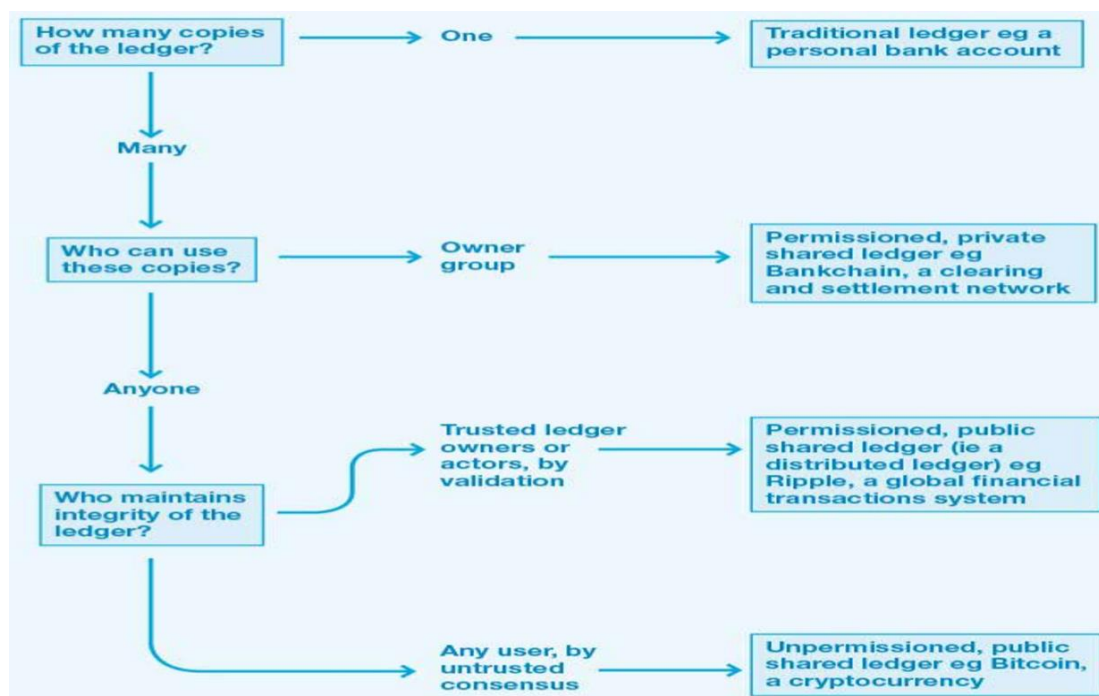
Smart contracts: With the advent of Ethereum, the "smart contract" concept was introduced, embodying a second-

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generation blockchain platform dissociating the digital representation of assets on the chain from digital currencies such as bitcoin. In addition to the speed and efficiency achieved through distributed ledger technology, smart contracts provide the ability to execute more complex and sophisticated tasks among parties.⁸

Unlike traditional contracts, smart contracts are embedded in code and can receive information and take actions based on predefined rules. They can be used in numerous scenarios, including the transfer of property titles, settlement of financial derivatives, and royalty payments for artists. The biggest impact is anticipated to be a combination of smart contracts and the Internet of Things.⁹

Figure 3: Distributed Ledger Taxonomy



Source: Consult Hyperion

Internet of Things (IoT): Internet of Things platforms tend to have a centralized model in which a broker or hub controls interactions between devices, an arrangement that can be expensive and impractical. Blockchain can alter that by decentralizing secured and trusted data exchanges and record keeping on IoT platforms, serving as a general ledger that maintains a trusted record of all messages exchanged between smart devices. It thus provides transactional capability for both person-to-person and machine-to-machine transactions in an increasingly interconnected world of multiple, enabled devices such as sensors and smart devices.¹⁰

This transactional capability among intelligent devices can facilitate the emergence of new business models. For instance, devices could also be used as *miners*, earning cryptocurrency rewards for the blockchain verification process. By dedicating computing cycles during idle time to securing a digital ledger, a cellular phone plan, for example, could be partially subsidized through its mining chip.¹¹

A blockchain-enabled Internet of Things can be applied to various scenarios, from industry to government, energy, agriculture, health, science, education, and the arts. IBM makes a compelling case in its report, *Device Democracy: Saving the Future of Internet of Things*, in favor of blockchain as the catalyst for rebooting the Internet of Things. It describes blockchain as “the framework for facilitating transaction processing and coordination among interacting devices. ...Devices are empowered to autonomously execute digital contracts allowing them to function as self-maintaining, self-servicing devices.”¹²

In collaboration with Samsung, IBM revealed a successful proof of concept in 2015, combining the Internet of Things with blockchain to develop the Autonomous Decentralized Peer-to-Peer Telemetry, a distributed IoT network that aims to provide a low-cost, secure way for devices to interact.¹³

Distributed autonomous organizations:

Distributed Autonomous Organizations are, in effect, virtual distributed firms. They consist of collections of smart contracts written on the Ethereum blockchain, which together define the corporate governance of the organization without resorting to a traditional vertical managerial structure.¹⁴

Taken collectively, smart contracts amount to a series of bylaws and other founding documents that determine how an organization’s constituency—including anyone around the world who possesses DAO tokens bought with ethers—votes on decisions, allocates resources and, in theory, create a wide-range of possible returns.¹⁵ Decisions are made through collective voting.

The decentralized nature of a Distributed Autonomous Organization’s “management structure” is revolutionary, striking at the heart of traditional hierarchical organizational

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models, the firms that have been the foundation of our economic system since the First Industrial Revolution. Blockchain technology blurs the lines between the market and the firm since it creates a more efficient way to manage the high transaction costs of economic coordination.¹⁶

The emergence of network-centered models based on blockchain technology can challenge the preeminence of existing digital platform giants and provide the underlying framework for a shared economy and reconfigured economic activity.

Potential setbacks

Despite the enormous potential that blockchain technology presents, technical, organizational, and regulatory challenges remain that stand in the way of its widespread adoption.

Can the network grow? The consensus based nature of blockchain validation mechanisms requires significant computational power and can delay transaction speed as the demand for data storage increases. This poses a serious technical obstacle to the scalability of the blockchain system and to attaining economies of scale.

Is it secure? The 2016 cyber-attacks on Distributed Autonomous Organizations, the result of a vulnerability of smart contracts, highlights cybersecurity as a concern for blockchain and indicates that the technology has not yet reached its maturity.

Can different blockchains work together? In order to benefit from a distributed system, the establishment of industrywide collaboration and common standards for interoperability is critical. However, the technology is still in its pilot phase and a certain period of prototyping will be necessary before industry standards emerge, suggesting that industrywide standards are not likely in the near term.

In the financial services sector, consortia initiatives are currently underway to provide space for coordination among stakeholders, such as Fabric by Hyperledger and R3 Corda.

Is data privacy guaranteed? Several ambiguities and concerns remain unresolved concerning data protection in the context of blockchain applications, including choice of applicable law and jurisdiction, right-to-be-forgotten inapplicability, and the availability of data to all parties. On the last issue, there are concerns regarding the vulnerability of personal data that could potentially be cross referenced and deciphered, despite the ‘anonymity’ on the blockchain.

Can regulation adapt quickly enough? This is arguably the most important hurdle preventing rapid adoption of blockchain. The existing regulatory framework has not been able to keep up with the rapid pace of digital innovation. Unclear or hostile regulations and a lack of government recognition of digital

assets can deter the onboarding of any new technology, including blockchain.

For distributed ledgers technology to be accepted in the financial services industry, it will need to comply with existing Know Your Customer/Anti Money Laundering regulations. Some countries, including the United Kingdom, China, and Singapore, have taken a hands-on approach to understanding the new regulatory needs, appointing special task forces to advise the government on its strategy or forming public-private partnerships, while others have adopted an arm’s-length approach, awaiting developments from the industry.

What is it going to cost? Another critical challenge is the potentially high costs, both financial and organizational, associated with the implementation of blockchain technology, even for a pilot phase. Companies need to weigh the potential but uncertain benefits that may result from the adoption of blockchain against the present and real costs of testing use cases. These costs include issues of integration with legacy systems as well as the limited pool of qualified human capital needed to bring a blockchain project to fruition. Firms in the financial sector are forming consortia with a view to mutualize costs so that the blockchain infrastructure can serve as an interoperable industry utility, yet issues of alignment and conflicts of interest among the various players remain.

These roadblocks, while not insurmountable, indicate that blockchain most likely will not have an immediate disruptive effect across industries. Adoption is likely to be gradual over the next five to ten years, and widespread onboarding will be necessary to attain full economies of scale and leverage the full network effects.¹⁷ The financial services sector is the first to mobilize in a concerted manner, as they are currently investing and are adopting a try, learn, and adapt approach.

Conclusion

On the road to blockchain implementation, two important risks should not be underestimated. First is the legislative and regulatory environment and how it may affect distributed ledger technologies in the jurisdictions in question, including compliance and data privacy. Second is an organization’s capacity for change and the talent pool available for dealing with the shift in the operations and culture of the organization.¹⁸ The decision-making process needs to originate in the company’s value proposition and its strategic vision and direction, moving to an analysis of how blockchain is affecting that space and how it could provide improvements in the company’s value proposition, or even create new markets for the business.

A review of key assessment criteria should link any investments to the value proposition, and should focus on providing business partners and customers with improvements in speed, convenience, and control over the product or service involved. Depending on the complexity of the process and the degree of

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trust required by participants and compliance requirements, firms will decide what blockchain tools to deploy (choice or private, semi-private or open networks) and whether they will be better served by developing the project in collaboration with external partners.

This process should lead to the selection of one or two pilots to render quick wins, to learn from the experience, and to provide informed feedback on how to adjust longer-term efforts. Whatever their choice and degree of involvement, companies must seriously consider the far-reaching implications of blockchain by conducting their own research to determine how it may impact their market and future value proposition, and then plan accordingly.

In doing so, companies will need to strike a balance between developing internal competencies and experimenting, while effectively managing potential risks and costs. To hedge exposure to risk, they may wish to pursue partnerships with industry peers and start-ups to mutualize costs of infrastructure building, as well as consider the regulatory threats and anticipate the governance complexity of consortia. ■

About the Author

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Additional EM Compass Notes about Blockchain

This note is the second in a series of five complementary EM Compass Notes by this author: The notes focus on: (1) a general overview of blockchain technology (Note 40), (2) an outlook for blockchain's implications for emerging markets (this note); (3) a general overview of the impact of blockchain on financial services (forthcoming), (4) an emerging market regional analysis of blockchain developments in financial services (forthcoming) and, (5) implications of the technology beyond financial technology (forthcoming).

Please also refer to EM Compass Note 38, "Can Blockchain Technology Address De-Risking in Emerging Markets?" by Vijaya Ramachandran and Thomas Rehermann, for how blockchain can be used to mitigate de-risking by financial institutions, which affects recipients of remittances, businesses that need correspondent banking relationships, and charities working in conflict countries.

About IFC and World Bank Group work on blockchain

IFC is part of the World Bank Group, mandated to foster development through private sector focused investment and advisory interventions. Within the World Bank Group, IFC participates in the initiative "Blockchain Lab" that was launched on June 27 by the World Bank Group VP Information and Technology Solutions (ITS) and CIO Denis Robitaille.

The Blockchain Lab serves as a learning, experimentation, and collaboration platform on DLT (Distributed Ledger Technologies) and Blockchain inside and outside the WBG. The ITS Blockchain Lab engages and partners with leading technology companies, start-ups, entrepreneurs, innovators and development organizations to experiment, develop, and roll out blockchain-enabled solutions. The Blockchain Lab conducts knowledge-sharing events open to anyone interested in topics related to blockchain and development.

This initiative aims to connect development practitioners and disparate efforts across the WBG in DLT and Blockchain technologies. The Lab will boost and contribute to increased WBG knowledge and expertise in DLT and Blockchain, and improve its capability to respond to client countries inquiries and needs. For more information please contact the Blockchain Lab team blockchainlab@worldbankgroup.org or Stela Mocan, Lead IT Officer, Business Solutions, World Bank at smocan@worldbankgroup.org

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² Bootstrapping refers to a self-starting process that is able to proceed without external input or financing.

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