



Towards Wisdom: Knowledge Management and the Ethical Use of Big Data in Organizational Decision-Making

MADDIE HARE

SCHOOL OF INFORMATION MANAGEMENT

ABSTRACT

The volume, velocity, and variety of big data pose enormous opportunity for organizations looking to gain competitive advantage. As they look to derive new insights from massive datasets, Knowledge Managers play a crucial role in how data is ethically utilized by organizations to produce knowledge, and subsequently, how that knowledge is operationalized. This paper advocates that those in the evolving responsibilities of knowledge managers require the prioritization of KM strategies that consider the ethics of using big data and that they should advance those considerations in all areas of their organization. This paper discusses what big data is and how traditional definitions can be expanded to account for factors like embedded bias and its associated risks. It discusses the intersections of big data and Knowledge Management in organizational practice and considers how using big data in Knowledge Management and organizational decision-making can be done in a socially responsible way. It argues that this can be achieved through knowledge managers implementing Knowledge Management strategies and systems that contend not only with big data's magnitude, but also with its depth.

Keywords: Knowledge Management; big data; decision-making; ethics

Introduction

At this point in the twenty-first century, stating that big data is changing our world seems almost like an old platitude. Data's permeation into every aspect of our lives facilitates the common acceptance of this fact, as well as its exponential growth being nearly conceptually

unfathomable: experts predict that by 2025 we will have produced over 181 zettabytes of data (one zettabyte is equivalent to 10^{21} bytes, or roughly five quadrillion Word documents, for reference) (Jacobson, 2021, para. 5, 6). Further, the institutions and practices of governmentality and consumer culture were once more visible to the everyday person; polls, surveys, and census data involved active participation from those providing their data (Gitelman & Jackson, 2013). Data generation and collection still require our participation, but their processes have become more invisible as the digital age progresses; the generation and warehousing of larger amounts of data are supported by the internet and cloud computing, distancing end users from their tangible processes. (Sumbal et al., 2017). The ubiquitous presence of digital interfaces like mobile devices has facilitated connectivity and informatic personhood, blurring understandings of what data we are generating, where it is being stored, and significantly, whom it belongs to (Lee, 2021). Questions of the decision rights surrounding data's usage have been acknowledged as both the greatest source of opportunity and contention for organizations working with data, posing difficult challenges in design and analytics, but also opening the doors for discussion, organizational agility, and innovative approaches (Schrage, 2016).

Mammoth amounts of data have generated enormous structural change in our societies; the accelerated recent history of the digital economy, rapidly changing labour market, and prerogatives of decision makers in business and science are all manifest of "big data hype", as Microsoft researcher Kate Crawford describes it (Lee, 2021; Gitelman & Jackson, 2013, pg. 2; Crawford, 2013, para. 1). Data-centric insights are being capitalized on to meet the changing

demands of our world; big data market revenues are projected to rise from \$42 billion in 2018 to \$103B in 2027 (Jha & Sahoo, 2021). In these ways, big data can be understood not just as massive datasets generated externally to organizations or internally through their own activities, or as technologies and practices that help to analyze that data, but also as a phenomenon that promises more insight and value from that data (Boyd, 2016). As organizational use of big data for competitive advantage becomes increasingly prevalent, developing the capacity to derive insights from it is not merely an incentive, but is mandatory for survival (Lamont, 2012). As we collectively navigate the parsing of our societies and our lives into data, we must also ask how that data can be ethically used to produce knowledge and meaningfully operationalized.

Literature on the linkages of big data and Knowledge Management (KM) has steadily been growing. Subsequent sections outline in-depth definitions of each concept, but KM can be thought of as how organizations capture, manage, and operationalize knowledge, and big data as large and complex datasets. Knowledge generation using big data is a comparatively new field that has been gaining increasing recognition (Sumbal et al., 2017). Studies have been growing in number as organizations tap into the potentials of big data and how to best integrate it into existing organizational practices. Chierici et al. (2018), for example, explore how social media insights, a commonly used source of big data, can help organizations improve their KM practices, as well as enhance their innovative capacities. However, as organizations seek to use big data to produce valuable knowledge and to advance their organizational goals like quickened decision-making, they must also question how the use of big data is changing the very decisions they make, and the impact of those outcomes on our world. With an abundance

of data translated into a wealth of knowledge-making capabilities, it is more critical than ever that organizations are tactful of its social implications. If knowledge involves some degree of reflection, as Erickson & Rothberg (2014) forward, how do organizations ensure that reflection directed towards ethical goals is occurring, and by whom? This paper aims to identify KM's position in facilitating greater organizational awareness of the ethical implications of using big data and attests to the need for organizations to attend not just to big data's magnitude in their KM practices, but also to its depth (Crawford, 2013).

Big data, created by humans, has the capacity to advance business intelligence and extend human knowledge. The benefits and drawbacks it carries are largely dependent on choices made by human beings at every stage of an organization's business systems and processes. As the discipline of KM progresses alongside the unfolding of the era of big data, it has been suggested that disciplines related to KM such as Business Intelligence and Intellectual Capital are more effective for working with big data (Erickson & Rothberg, 2017). However, it will become the responsibility of those in KM roles to prioritize the implementation of KM strategies that consider the ethics of using big data and advance those considerations in all areas of their organization. This paper first discusses what big data is and how traditional definitions can be expanded to account for factors like embedded bias and its associated risks. It then discusses the intersections of big data and KM in organizational practice. Finally, an argument is made for how using big data in organizational KM and decision-making can be done in a socially responsible way, largely propagated by knowledge managers and evolving KM strategies and systems. The practice of using big data in knowledge organizations is now so

entrenched that rather than justifying or vilifying its use, we should direct our attention to making sure it is being utilized and employed as ethically as possible. This can only be done through an interrogation of how and where big data is created, our individual and collective roles in shaping and interpreting it, and a thorough understanding of how to utilize KM to guide its use. This paper explores the use of big data in organizational decision making and its intersections with KM practices in order to analyze how such data sources can be used in ethical and socially responsible ways.

Big Data

Big data can be understood simply as structured or unstructured data of enormous volume and is characterized by the seven "V"s: volume, velocity, variety, veracity, value, variability, and visualization (Rialti et al., 2019). These attributes bring benefits to organizations such as improved business functions, quickened decision-making, novel insights, and the ability to make decisions based on evidence rather than intuition (Khan & Vorley, 2016; Rialti et al., 2019). Conversely, they also present challenges through variety of data format, dimension, and how to use such large volumes of data to inform specific decisions and develop a competitive advantage (Rialti et al., 2019; Khan & Vorley, 2016). Indeed, 80% of big data is unstructured (Khan & Vorley, 2016) and so those working to use it to enable KM processes have turned to new tools such as data analytics, in order to unlock its utility and tap previously hidden knowledge.

While decision-making at every stage of the KM process is imperative to the ethical use of big data, Erickson & Rothberg (2014) point out that the most important decisions occur Towards Wisdom

before big data is even generated or collected. The phrase "raw data" itself is misleading; it facilitates how data is viewed as a starting point, or the bottom of the DIKW hierarchy, lending the assumption that data is transparent, self-evident, and fundamental of truth itself, which Crawford refers to as "data fundamentalism" (Rowley, 2006; Gitelman & Jackson, 2013; Crawford, 2013, para. 1). While it may appear that the interpretation of data, or giving data its "voice", comes after the steps of creation, collection, and processing, it is, in fact, the exact opposite: "Data needs to be imagined as data to exist and function as such, and the imagination of data entails an interpretive base" (Crawford, 2013, para. 2; Gitelman & Jackson, 2013, pg. 3). If different data sets maintain the interpretive structures of their imagining, as Erickson and Rothberg (2014) maintain, then data lacks objectivity and neutrality from its very conception, harboring biases and presenting considerable risk (Crawford, 2013). Taking into account these concerns is imperative for organizations using big data to produce knowledge, that is- every organization on earth- ethically. Lee (2021) sees data-mediated relationships as helping individuals connect to broader contexts of data, but in reverse, also allowing structures to reach down to their subjective cultural and historical context through data. Being aware of data's subjective conditions and their ongoing changes can facilitate an organization's ability to make ethical decisions. While this task may seem daunting because of data's ceaseless growth, it presents the opportunity for knowledge managers to interrogate how to position themselves in organizations to maximize their use of big data in a socially responsible way.

Big Data and Knowledge Management

Erickson & Rothberg (2017) describe how big data has alerted knowledge managers to the fact that valuable assets can be identified by organizations both internally and externally. The Big Data Value Chain describes how data moves through the phases of generation, acquisition, pre-processing, storage, analysis, and visualization and exposition, or more simply, from creation to destruction, where at each stage organizations have the opportunity to extract value (Jha & Sahoo, 2021). Large-scale companies like Netflix employ big data analytics to track viewer behaviours and tailor suggestions to keep users on the platform (Jacobson, 2021). Amazon analyzes massive datasets generated on its site in real time, considering competitor pricing and user shopping patterns to update its product prices and generate higher rates of purchasing. On top of targeting and pricing, big data can assist with business activities like forecasting revenue, product development, and predicting demand, to name a few (Jacobson, 2021). Organizations wishing to capitalize on the value of this data face concomitant challenges in its magnitude, diversity, and complexity; because it resides in an array of sources, processing big data into something structured and subsequently transforming it into relevant knowledge requires employees with technical know-how, suitable KM processes, and infrastructure that supports knowledge creation and translation in all areas of an organization (Big hopes for big data, 2017). In this sense, substantial barriers exist to working with big data. Scholars have found that traditional KM tools are not up to the task of working with such large and robust datasets, and there is a general lack of expert staff versed in analytics, as well as IT infrastructure that is up to the task (Big hopes for big data, 2017; Sumbal et al., 2017). Companies that can afford to equip employees with the tools and infrastructure for handling big

data may be better able to address challenges of magnitude and complexity and identify greater nuance in the data they are using for specific business processes, like pricing and advertising. As they proliferate, however, barriers to implementing technologies like machine learning, analytics, and networking are decreasing, making them more widely available for organizational use (Hota et al., 2015). Once these technical and practical challenges are surmounted, a significant epistemological problem remains- one bigger than big data itself- aggregated data fails to accurately reflect the social world (Crawford, 2013).

Crawford refers to inequities interfering with accurate data collection based on various social factors as a "signal problem" (Crawford, 2013, para 3). Addressing signal problems merely with the proliferation of technological and digital tools is inadequate; technology is differentially used and is a moving target (Crawford, 2013). Furthermore, biases inherent in collected data may be mirrored, or worse magnified, as companies use computational tools and machine learning to assist with working with big data, automating algorithms, and eliminating human intervention at certain steps (Boyd, 2016). The case of Google's AdSense is one example of how the collective actions and aggregated data of racist individuals manifest in an algorithm that can perpetuate harm (Leonard, 2013). Rahim et al. (2014) discuss how big data collected in the form of electronic medical records are viewed from a healthcare perspective as essential to providing the best treatment possible. However, from a patient perspective, concerns over privacy arise, requiring new mechanisms and technology to consider patient preferences (Rahim, et al., 2014). While these problems may seem far from the influence of KM, activities like targeted marketing which aids Google's financial priorities, and the collection of healthcare information, are built

into the layers and relationships of data with technologies and organizational KM practices, as indicated helpfully by Jha and Sahoo (2021) in Figure 1. Further, "data availability" is an indicator that is directly related to data and information, which are precursors to knowledge (Erickson & Rothberg, 2017).

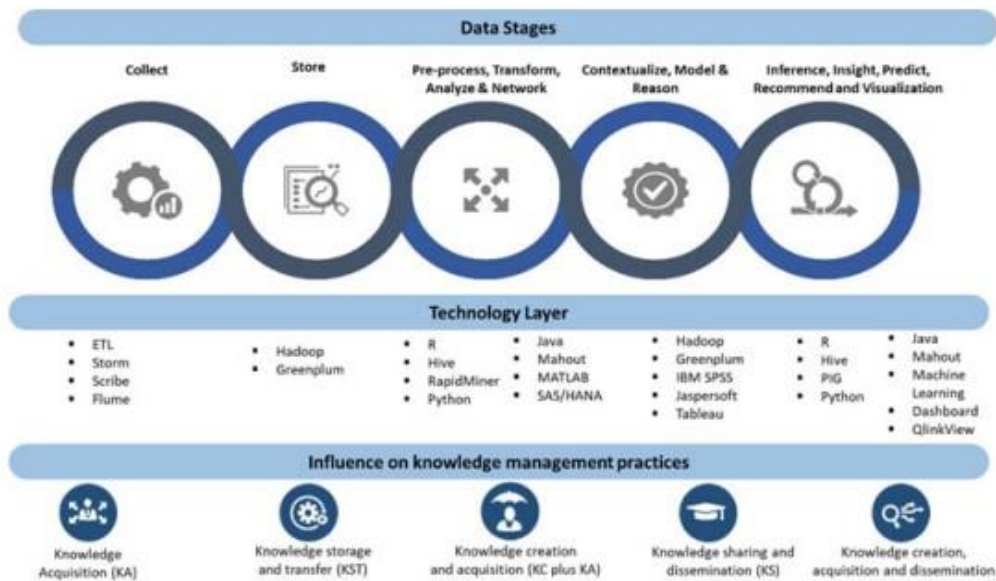


Fig 1. Big Data in Knowledge Management (Jhan & Sahoo, 2021, pg. 519).

In other words, if KM describes the processes of knowledge acquisition, storage, creation, and sharing, it is connected to every business activity in an organization. Similarly, anything involving customers (targeted marketing), business intelligence (forecasting and metrics), and analytical applications (risk quantification) all involve big data analytics, as Sumbal et al. (2017) assert, and so big data can be viewed as the heart of a business, integrated into its every aspect. Thus, big data's impacts are exerted from all extensions of an organization, which provokes concern regarding the ramifications of its associated risks, like disseminating bias.

However, KM is employed in organizations to ensure that all business processes can be conducted effectively with the knowledge assets available, meaning that it is a joining factor that can influence change in all areas of an organization.

KM has established itself in organizations as imperative for collecting, identifying, managing, and sharing knowledge assets to gain a competitive advantage in an economy of knowledge. However, this economy can also be characterized as one of data; alerting organizations to the need for determining how to leverage data and link it with their KM capabilities (Sumbal et al., 2017). Jha and Sahoo (2021) stress the need for organizations to have robust KM systems and practices in order to retain different types of knowledge in their learning and sharing ecosystems to best leverage the benefits of big data. Jacobson (2021) stresses that insights from big data are only useful if they are effectively shared across organizations and with technological tools to facilitate autonomous and agile decision-making on the part of employees. Organizations have invested heavily in these areas, leveraging KM systems like data warehousing and mining to process, manage and store data in centralized repositories, and big data analytics to identify patterns within that data (Hota et al., 2015; Sumbal et al., 2017; Jacobson, 2021). Now that big data has established itself alongside KM practices, processes, and systems, deeper attention must be paid to how it impacts organizational decision-making.

Big Data in Organizational Decision Making

Sumbal et al. (2017) succinctly identify the relationship between how big data can be used to further KM's objectives of identifying relevant knowledge and enhancing organizational performance. Ekambaram et al (2018) describe how big data can facilitate organizations' Towards Wisdom

evaluation of projects and introspective decision-making processes. Referring back to "raw" data and how it is used in the DIKW hierarchy to subsequently convert one thing into the other, data can be understood as discrete facts or observations that become information when provided with context, and subsequently, information combined with personal experiences, intuition, and understanding may become knowledge (Sambal et al., 2017; Erickson & Rothberg, 2014). Awareness of data's context and biases it may carry which remain present in the production of information can help business actors draw in a different way from the experience and intuition they possess than if they were otherwise unaware of its context. Such cognizance is vital for organizations' ability to prioritize ethics in their practice. When information is processed with business intelligence tools and then scrutinized by human analysts, actionable knowledge is created, which is a crucial point of change that can happen through KM (Sambal et al., 2017). Bose describes decision-oriented analytic applications for big data as, in essence, KM initiatives where best practices for each decision-making process of an organization are embedded logic within the end users' analytic applications (Bose, 2009). There are a variety of tools and techniques available to aid with decision-making: as Khan & Vorley (2016) describe big data's potential to aid with effective decision-making and Bose advocates embedded logic, Schrage (2016) presents the RACI (Responsible, Accountable, Consulted, Informed) framework of decision rights. This framework details individual decision-makers and their choices surrounding certain tasks, designed to promote accountability for decision-making (Ekambaram et al., 2018; Schrage, 2016).

As discourse on big data progresses, actors in business and science are becoming increasingly aware of the realities and imperatives of making these changes in their KM processes. Fortunately, KM is well placed to do this: KM already places onus on the person-to-person and person-to-system interactions affecting the practice of KM systems (Erickson & Rothberg, 2017). Crawford provides suggestions for addressing the shortcomings of big data and accounting for more nuance. She believes that big data science can be improved by incorporating more qualitative studies, addressing cognitive bias in data, combining ethnography with analytics, providing greater context awareness, or using smaller datasets, when possible, in conjunction with big data to account for multiple levels of granularity (Crawford, 2013). Similarly, Erickson and Rothberg (2017) testify to the need for more attention paid in KM to its pre-knowledge inputs, offering opportunity for the "cross-fertilization" of related disciplines like Data and Business Analytics, and Intellectual Capital (pg. 103). Merendino et al (2018) find that big data has interrupted board-level decision-making in companies; they run into challenges with cognitive capabilities, bias, and overload, requiring new ways of using big data in decision-making, such as building internal capabilities and outsourcing to external stakeholders. These are just a few of the changes organizations can make to account for big data in KM and decision-making.

Ultimately, equipping decision-makers with the capacities and go-ahead to use their humanity, and to interrogate their own humanness, is the way to integrate these things into technology, IT infrastructure and architecture, and analytic tools used in conjunction with KM processes. In a knowledge economy, the human factor is what bridges knowledge one step

further to wisdom.¹ It has been suggested that big data can offer rare creative insights better than KM (Erickson & Rothberg, 2017). Indeed, big data's applications are wide: examples include insights generated about Precision Livestock Farming, competitiveness for SMEs in the agri-food sector, Customer Knowledge Management in the tourism industry, and even Personal Knowledge Management (Fote et al., 2020; O'Connor & Kelly, 2016; Del Vecchio et al., 2018; Liu et al., 2016). Where KM traditionally aids other disciplines is with knowledge transfer and human-system interaction, and as previously mentioned, traditional KM tools and practices may not be fully equipped to handle the accompanying "V"s of big data, requiring the addition of new tools and technologies (Erickson & Rothberg, 2014). However, IT cannot be left alone to judge the kinds of data an organization collects, interprets, and values; KM is essential for developing a strategy adapted to a particular organization that has the potential to instill new value (A KM super-strategy, 2019). Though IT is not the answer in and of itself, it will become increasingly more crucial to integrate it with KM as the two work together to handle the volume, velocity, and variety of big data; this was projected in 2012 as the most intensive and important infrastructure change for IT (Lamont, 2012). Ferraris et al (2018) found that to fully benefit from big data, organizations must have both analytic capabilities and a reasonable level of KM orientation.

Further, related disciplines Contemporary Business Analytics, Competitive Intelligence, and Intellectual Capital also feature cross-functional and focused teams like KM does and can

¹ I specifically use the term wisdom to emphasize the ethics of decision-making that accompany the impact of those choices on humans, rather than using the often-interchanged term "intelligence" which implies decision making and strategy employed towards achieving the goals of the business which may not be as humanistic- that is, concerned with human welfare.

effectively work with intangible inputs like data in more tactical ways, which, when applied, enable the construction of a full strategic landscape for an organization (Erickson & Rothberg, 2014). Scholars suggest that these disciplines have also become the contemporary version of wisdom, which has been previously vague in definition and not subject to the same processes as knowledge creation (Erickson & Rothberg, 2014). However, the introduction of big data into organizational management of intangibles has reconfigured the DIKW into "something running from data/information to explicit knowledge, then tacit knowledge to insight/intuition, becoming less structured and more inclined to human analysis and interpretation. One immediate contribution is the closer connection data and information have to explicit knowledge as well as the closer relationship of intuition or insight with tacit knowledge" (Erickson & Rothberg, 2014, pg. 95). Essentially, the choice and combination of KM with other disciplines must be strategic and based on organizational circumstances. As Erickson & Rothberg (2017) note, for knowledge managers looking to influence how such intangibles can be better used in organizations, opportunity is available if we only expand our view of valuable intangibles; steering other fields that use big data in a way that emphasizes the value of knowledge insights and integrating multiple perspectives for valid decision making (Erickson & Rothberg, 2017; Lamont, 2012).

Conclusion

Big data is an emerging frontier with enormous potential for producing innovative knowledge (Jha & Sahoo, 2021). This analysis has surveyed important considerations surrounding big data that will have bearing on our world. It has discussed how human decision-

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making and imagining are responsible for and shape big data's existence. It has also considered how KM will play a crucial role guiding organizations in their use of big data (Pauleen & Wang, 2017). Finally, it has looked at the important possibilities big data brings to KM, pushing the expansion of KM systems and practices as it becomes embedded in all aspects of organizations and society (Pauleen & Wang, 2017). Jacobson asserts that choosing the right KM strategies and platforms can ensure that big data is put to good use. How big data is utilized by organizations for their positive ends should not look different from how it can be used for the positive ends of our world. Knowledge managers can position the organizations they work for to use inconceivably large data sets to conceive something good for themselves, certainly, but also for our world. This will require an interrogation of KM as a discipline, and how it can adapt to the usage of big data, integrating these considerations into the conceptualization of new processes and the use of KM systems.

Gitelman & Jackson ask, "What are we to data and data to us?" (2013, pg. 1). We rely on humans for so many aspects of business: creativity, critical thinking, and innovation, to name only a few. These are things that cannot be offloaded to machine learning decision-making based on big data because they cannot be genuinely replaced. What truly differentiates an organization is the impact it has on society. Conscious awareness of the social world data is generated in is imperative to ensure that impact is positive because the unique nuances of the people that create data, and subsequently knowledge, cannot be genuinely replaced by aggregate assumption. Industries reliant on "well-understood transactional, operational, and logistical principles" propagated by data and its purposeful, iterative analysis can only take

advantage of new learnings with KM systems; it is the task of knowledge managers to make sure that those systems consider the ethics of how to operationalize those learnings (Erickson & Rothberg, 2017, pg. 107; Lamont, 2012). Expertise may not be where it has previously been found in organizations with the rising use of big data, and so they must maintain a level of reflexivity to maximize cross-functional cooperation (Ferraris et al., 2018). Ferraris et al (2018) argue that it is not enough to connect people with the right data, we must also connect data to people who have problem-solving techniques to effectively "exploit" it (pg. 1932). Fostering an organizational culture that uses language evocative of exploitation will not benefit anyone in the end; data should be connected to those who can effectively use it, but more importantly, to those who have the wisdom to know how and if it should be used.

Del Vecchio et al. (2018) note that big data offers a "socio-technical paradigm of growing complexity" that can foster and advance research in the field of KM (pg. 1355). As discussed in previous sections, KM can keep up with big data by partnering with related disciplines, adopting new IT infrastructure, and making use of cloud-based and AI technologies. In this way, big data is facilitating the rapid growth and improvement of KM as it progresses through its third decade as a discipline (Pauleen & Wang, 2017). Goluchowski & Filipczyk (2021) note that managers and scientists must not only study but shape organizational realities through integrative thinking, which combines systems thinking and design thinking to create new patterns of future business processes. It is imperative that in considering these designs, these actors also study and shape the world their organization is situated in and the intangibles they draw on to create a better future (Goluchowski & Filipczyk, 2021). Advancing KM will remain imperative to progressing

these efforts. Similarly, De Pablos & Lytras (2018) find that big data can support scientific intervention to real-world social problems, and moreover, that soft skills are critical components of data-driven tasks. Waller and Fawcett (2013) emphasize that the use of big data cannot be separated from domain knowledge when applied to solving relevant problems. They believe the integration of big data and KM will become policy-driven, prioritizing socially inclusive economic growth and sustainability (de Pablos & Lytras, 2018). In looking to the future of a data-centric society we no longer hurtle towards, but are fully immersed in, responsible and ethical knowledge practices that seek to address real-world problems, rather than manipulate and amplify harmful biases, can be led by knowledge managers. KM will play a fundamental role in the management and application of big data through its conceptual base and practical experience (Pauleen & Wang, 2017). Future research can focus on producing more case studies of organizational decision making informed by big data to produce lessons learned models. Further, multidisciplinary research can investigate how KM works effectively with different facets of organizations and how it can draw from other disciplines to inform its practice. If knowledge managers position themselves as arbiters of contextually aware and reflective big data practices, they can not only help organizations manage their knowledge, but apply it ethically, moving them towards wisdom.

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