

Setting the scene: definitions and uptake of AI-based worker management, effects on OSH, and overview of the regulatory contexts and policy initiatives in the EU

4 November 2021
Virtual workshop

Introduction

- **Objectives.** The research focused on identifying relevant AI-based worker management systems, estimating the uptake of AIWM across the EU, as well as evaluating how AIWM might, and in some cases already does, affect OSH, both in terms of creating opportunities and risks.
- **Methods.** The analysis was carried out using:
 - literature review (over 300 documents including academic, policy and grey literature)
 - EU-OSHA focal point (FOP) consultation
 - in-depth expert interviews (in total 22 experts),
 - and statistical data analysis (ESENER-3 was analysed, supplemented with ECS-2019 data analysis where relevant).

Operational definitions of AI and AI-based worker management

- **Artificial intelligence (AI) systems** (High-Level Expert Group on Artificial Intelligence, 2019, p. 6) – software (and possibly also hardware) systems designed by humans that, given a complex goal, act in the physical or digital dimension by perceiving their environment through data acquisition, interpreting the collected structured or unstructured data, reasoning on the knowledge, or processing the information, derived from this data and deciding the best action(s) to achieve the given goal. AI systems can either use symbolic rules or learn a numeric model, and they can also adapt their behaviour by analysing how the environment is affected by their previous actions.
- **AI-based worker management (AIWM)**; based on European Commission, 2021; European Parliament Research Services, 2020; High-Level Expert Group on Artificial Intelligence, 2019; Moore, 2019) – worker management systems that gather data, often in real-time, from the workspace, workers, and the work they do, which is then fed into an AI-based system that makes automated or semi-automated decisions, or provides information for decision-makers (e.g. HR managers, employers, sometimes workers), on worker management related questions.

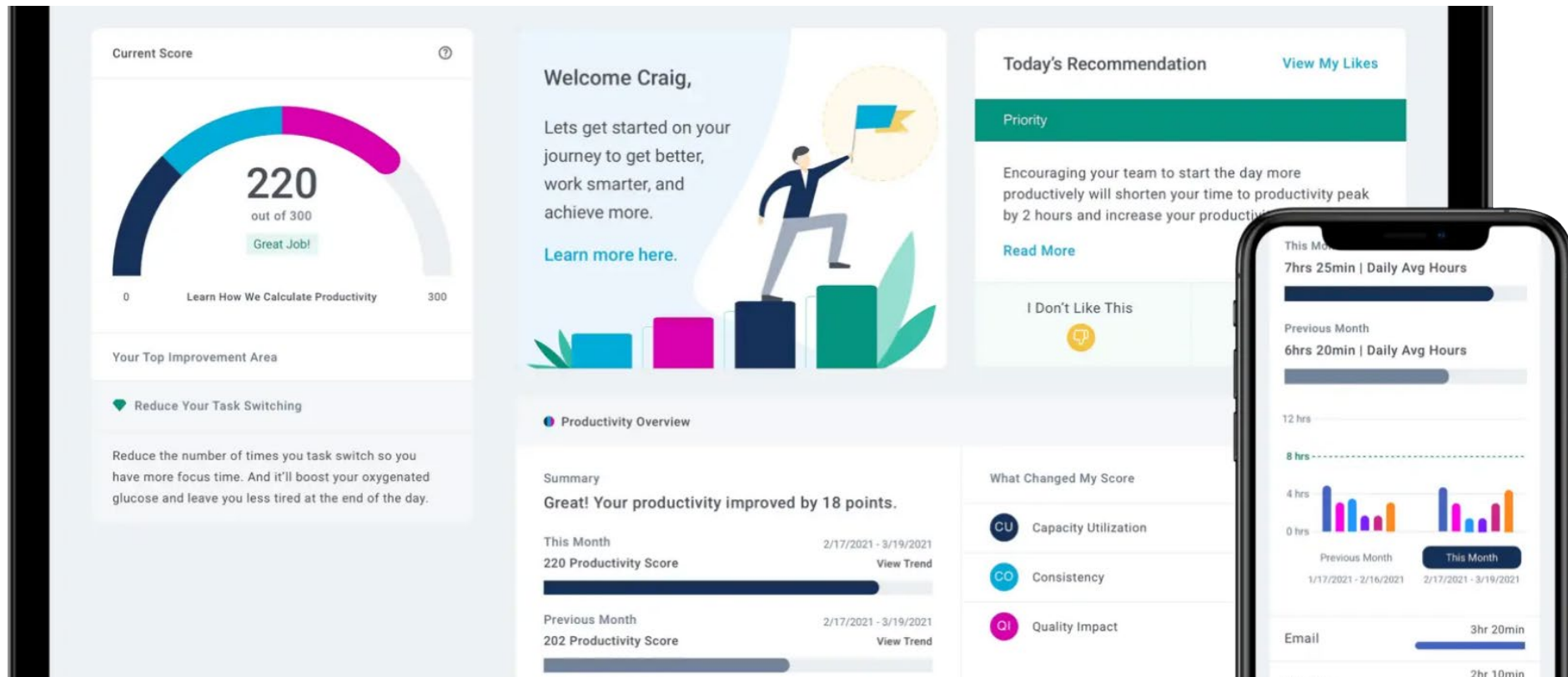
Operational logic of AIWM

Based on how AI systems function (according to OECD (2019), we can state, simplifying the process, that AIWM systems operate by:

- Collecting relevant data from an environment, such as the workplace, workforce, and work.
- Processing and preparing the data so that it can be used by AI-based worker management algorithms.
- Based on the data the aforementioned algorithm creates a representation of reality that allows to make predictions, recommendations, and decisions on worker management. The created predictions, recommendation, and decisions are given to machines or humans that act upon them, modifying how workers are managed.

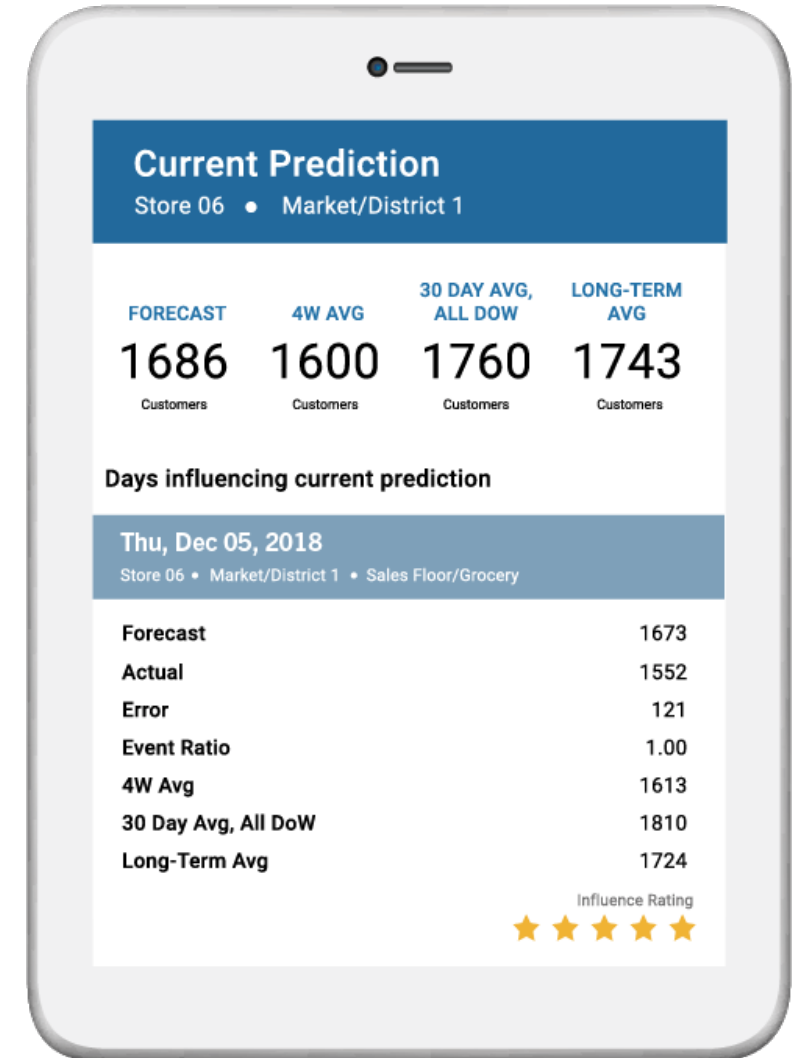
Examples of AIWM: AI-powered performance / productivity management tools

Such tools improve worker performance and productivity by evaluating it and providing recommendations on how it can be improved. For example, a tool called *enable* measures how quickly employees complete various tasks and suggests ways to speed them up (Heaven, 2020).



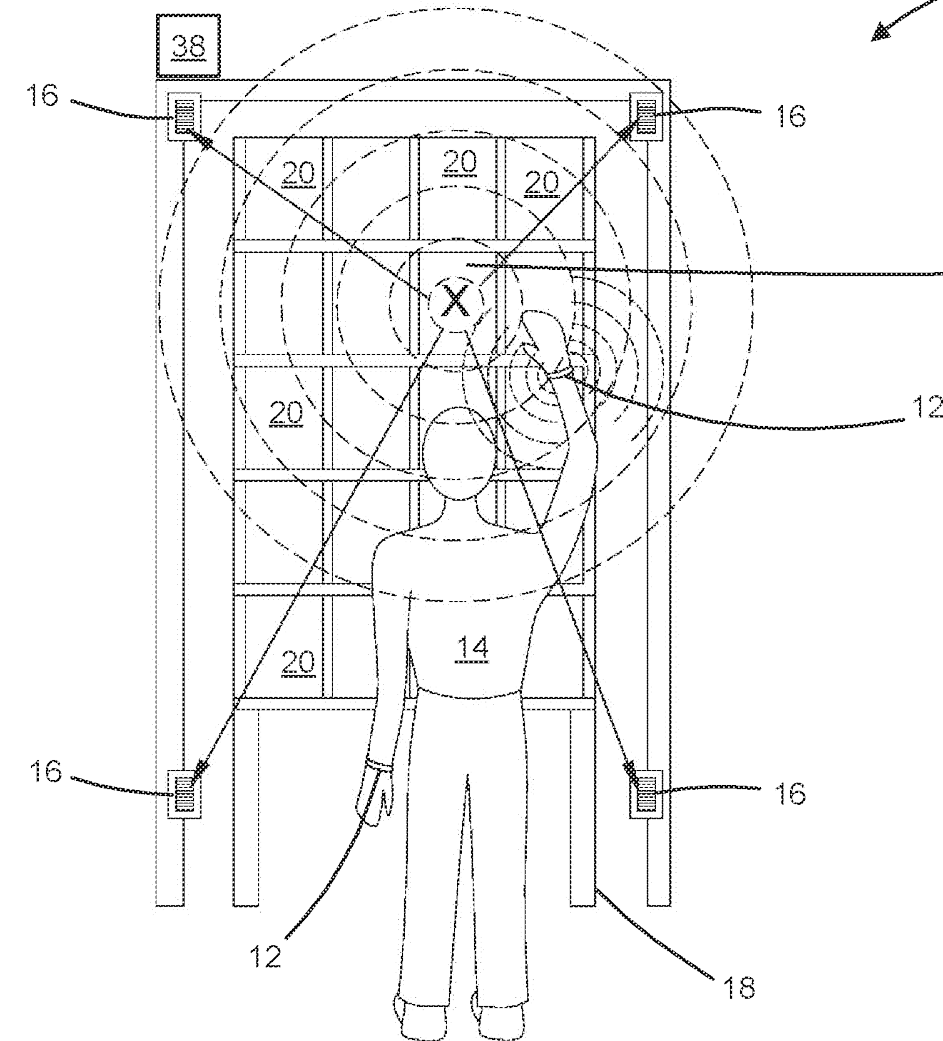
Examples of AIWM: AI-based scheduling and task allocation

- Scheduling systems that can automatically schedule tasks to specific workers (i.e. match skills with tasks), as well as ensure optimal labour coverage for every shift.
- For example, *Kronos AIMEE* – an AI-powered scheduling tool – boasts that it can forecast customer demand based on the weather forecast and provide recommendations on how many workers should be in the shift and who, based on skills and experience, should be scheduled for a particular task (Kronos, 2018).



Examples of AIWM: AI-powered worker direction tools

- Tools that can provide instruction, direction, or guidance to workers on how to perform their task better.
- For example, the image to the right, from patent US20170278051A1, is a visualisation of how such tool could operate, where the wristband identifies the location of an item and vibrates when the worker moves his/her hand closer to it, in such a way “steering” the worker towards the right direction.



Uptake of AIWM

- According to interviewed experts, the literature review, and statistical data analysis, in general, **the uptake of AIWM systems is relatively low across the EU27 (2020), but it is growing.**
- However, as there is lack of data specifically measuring the use of AIWM systems, the uptake can only be inferred from proxies, for example:
 - 71 % of international companies consider people analytics a high priority (Deloitte et al., 2017).
 - Demand for worker monitoring software increased by 87% in April 2020 compared to pre-pandemic (Top10VPN, 2020).

Uptake of AIWM based on ESENER-3

Additional insights on the uptake can be also derived from the ESENER-3. However, as ESENER-3 does not contain questions specifically targeting AIWM, different technologies that enable it have to be used as its proxy in order to capture the uptake.

Weighted percentage of workplaces from EU27 (2020) that use different technologies related to AIWM (ESENER-3)

Types of technology used (ESENER-3 Q310 answers)	Weighted answers	
	Yes	No
Personal computers at fix workplaces	87%	13%
Laptops, tablets, smartphones or other mobile computer devices	77%	23%
Robots that interact with workers	4%	96%
Machines, systems or computer determining the content or pace of work	12%	88%
Machines, systems or computer monitoring workers' performance	8%	92%
Wearable devices, such as smart watches, data glasses or other (embedded) sensors	5%	95%

Data was weighted using the estex variable, from ESENER-3 which: "extrapolation to the universe of establishments in the countries covered by the survey" (EU-OSHA, 2020, p. 81).

Uptake of AIWM by company characteristics

- **Larger companies are more likely to employ technologies that are related to AIWM than smaller workplaces** due to their need to manage, and often control, a large workforce (Eurofound, 2020; Mateescu and Nguyen, 2019; Wujciak, 2019). This is also supported by ESENER-3 analysis.
- **AIWM is used more heavily by organisations from sectors that have a lot of manual tasks that are routine in nature.** This is supported by interviews with expert, academic literature (Dzieza, 2020; Mateescu and Nguyen, 2019), and by ESENER-3 (i.e. technologies mentioned prior are more frequently used in sectors such as manufacturing, transportation, and agriculture).
- **AIWM systems are more frequently used on blue-collar workers** who have a lot of routine tasks, and hence they can be easily monitored, evaluated, and managed (Dzieza, 2020). However, experts and some literature also highlights that **white-collar occupations, especially those that have more routine tasks, are also susceptible to AIWM** (Boiral et al., 2021; Gigauri, 2020). This includes individuals working in call-centres and similar occupations, as well as workers that work from home.



Opportunities that AIWM can create for OSH

- AIWM can alert of a dangerous situation
- AIWM → hazard monitoring as a sub function (toxic substances, indoor air quality, noisy environment)
- AIWM → mental health monitoring, burnout detection
- AIWM → digital counselling
- AIWM → foster health promotion
- AIWM → increase in employee engagement and satisfaction

Examples:

- Pandemics 2020-2021: monitors employee's proximity
- Smartphone apps: StressSense, EmotionSense

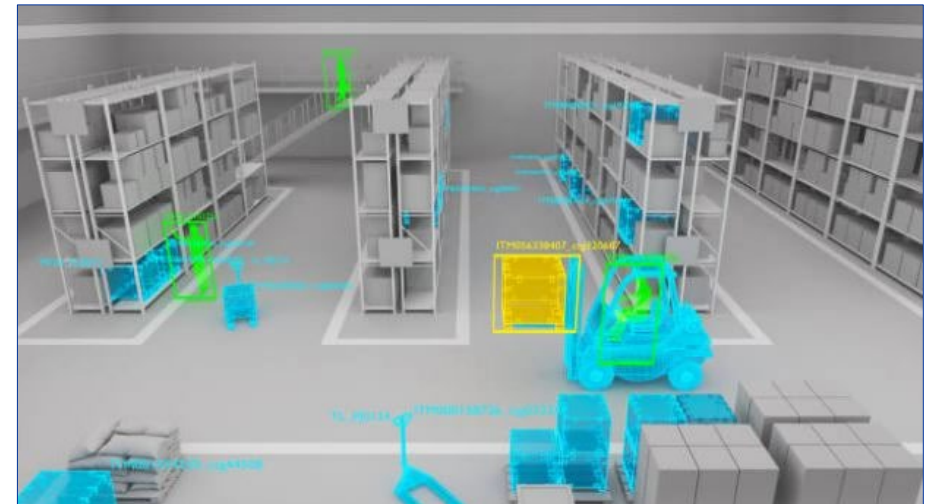
Prevention of physical and mental ill-health

Opportunities that AIWM can create for OSH (*continued*)

- AIWM → real-time accidents and incidents factor analysis
- AIWM → support the workers with disabilities
- AIWM → alarm workers on risky/hazardous situations
- AIWM → design safety training programs

Example:

- Warehouses - The workers and fork-lifts can be monitored to detect their positions and movements: a risk of collision can be predicted by algorithms.





Risks and challenges that AIWM can create for OSH

AIWM facilitates

- Increased work pace
- Constant monitoring
- Losing the ability to recognise the hazards
- Increased level of electromagnetic fields

- AI can be unpredictable
- Being monitored by AI → no human interaction with managers
- Risk assessment by AI → less workers participation

Health impact: MSD, cardiovascular diseases, disorders of the urinary system, increase in the systolic blood pressure, work-related stress, fatigue, exhaustion, burnout, anxiety or fear of losing their job, techno-stress, techno-anxiety and techno-fatigue, decreased cognitive and intellectual behaviours, creative thinking, loss of autonomy, shortness of independence of thought.



Risks and challenges that AIWM can create for OSH (*continued*)

AIWM facilitates

- “Algorithmic control”
 - Constant monitoring
 - Privacy issues
 - Transparency issues
 - Data protection problems
 - Less control over work
 - Dehumanising of workers
 - “Datafication”
 - Trust issues between workers and employers
- AIWM may foster deskilling of the workforce as well as the need for upskilling, reskilling
 - AIWM systems can be manipulated by workers

Health impact: MSD, cardiovascular diseases, disorders of the urinary system, increase in the systolic blood pressure, work-related stress, fatigue, exhaustion, burnout, anxiety or fear of losing their job, techno-stress, techno-anxiety and techno-fatigue, decreased cognitive and intellectual behaviours, creative thinking, loss of autonomy, shortness of independence of thought.



Risks and challenges that AIWM can create for OSH (*continued*)

- AIWM malfunctions → humans can be at risk
- AIWM directs to work without mini-breaks and with high speed → promotes risky/unsafe behaviours
- Aging workforce → more severe injuries
- Mix-up between modern technology and old systems
- AIWM and absence of human example in safety behaviour may lead to lower safety culture
- If the acceptance of AIWM is low, workers may try to find ways to resist it
- Errors made by machines → not accepted

Impact on safety: human errors, risky behaviour, incidents, and accidents

EU regulatory framework

At the EU level, basic AIWM regulation is already ensured by:

- The EU OSH acquis that implicitly applies to risks posed by AIWM at work
- General Data Protection Regulation (GDPR) that has extensive provisions preventing organisation from abusing private data, including, according to Art. 22: “preventing decision based solely on, automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her”.
- EU Charter of Fundamental Rights and the General Framework for Equal treatment in employment and occupation

EU regulatory framework (*continued*)

In addition, **in April 2021, the EC has proposed a new regulation that explicitly targets AI, including AIWM, titled Proposal for a Regulation on a European approach for Artificial Intelligence (the Artificial Intelligence Act).**

In very broad terms, the proposal covers:

- Safe deployment of AI-systems, prohibiting some of them, while casting others as “high-risk” requiring more safeguards and for the design, development, and use of these systems.
- The proposed list of “high-risk” systems includes AIWM tools, such as AI systems used for recruitment or selection, and AI systems used for making decisions on promotion and termination of work-related contractual relationships, for task allocation and for monitoring and evaluating performance and behavior of workers.
- Proposes compliance with mandatory requirements for high-risk AI systems, e.g. establishing and maintaining risk management systems throughout the life cycle of AI systems, training these systems with human oversight.

National regulatory framework

At the national level, majority of EU countries have adopted AI strategies and have ongoing debates regarding general AI-issues. There are also some emerging examples of regulations, guidelines, strategies that can be connected to AIWM and OSH, including, but not limited to:

- In France, Germany, and Czechia national strategies on AI make direct references to the use of AI in the workplace.
- The French national AI strategy points to two actions relevant to AIWM and OSH: (i) encouraging the inclusion of workers into ex-ante discussions regarding AI usage in workplaces; (ii) urges for the launch of a legislative reform to adjust governing working conditions in the digital age with a specific focus on increasing human-machine complementarity.
- The Czech national AI strategy, in addition to other provisions, lays down measures to address the impacts of AI on the labour market and social system, such as the need to analyse the possible risks and opportunities of telework.



How to prevent the OSH risks and challenges and maximise the opportunities for OSH?

- Development of an ethical framework for digitalisation in and particular for AIWM at the national and enterprise levels
- Strong ‘prevention through design’ approach that integrates a human/worker-centred design approach of AIWM is needed.
- AIWM should respect workers’ characteristics, agency, and autonomy, and contribute to their safety, health, and well-being.
- AIWM should be designed, implemented, and managed in a trustworthy, transparent, empowering, and understandable way, guaranteeing workers’ consultation, participation, and equal access to information, as well as putting humans in control ensuring that AIWM is used not to replace workers but to support them.
- It must be ensured that AIWM systems are safe, sustainable, reliable, resilient, and secure.
- There is a need to increase knowledge and awareness about AIWM and to provide training for organisations and workers on how to use these systems, focusing on OSH as well as for the developers of such systems.



How to prevent the OSH risks and challenges and maximise the opportunities for OSH? (*continued*)

- Ensuring that organisations only collect data that is strictly necessary for AIWM systems to operate.
- An open and effective dialogue between workers and employers, as well as participatory approach (e.g. effective workers' involvement) need to be implemented within organisations, in particular when AIWM is used.
- A participatory approach and workers' involvement is essential from ex-ante assessment to design, implementation, use and ex-post assessments of AIWM.
- Advanced OSH risk assessment of AIWM need to be conducted both at the development stage by developers and when these AI-based systems are used (e.g. workplace risk assessment).
- Diversity, non-discrimination, and fairness needs to be acknowledged in order to avoid negative implications of AIWM. There is also a need to develop certain mechanisms in order to ensure responsibility and accountability for AIWM and its outcomes (High-Level Expert Group on Artificial Intelligence, 2019).

Next steps

The next steps will include:

- Finalising the Work package 1 of the project based on the comments and suggestions provided during this workshop. This includes integrating the results of the workshops into the:
 - **Task 1 report** – New forms of worker management based on Artificial Intelligence: definitions, mapping of uses, and overview of policies, strategies and initiatives
 - **Task 2 report** – New forms of worker management through AI-based on Artificial Intelligence: An assessment of the implications for OSH
 - **Policy briefs** that will accompany the two reports.

Your inputs are very valuable for the success of this project!

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