Enhancing Hackaton Practices in Software Engineering: a Neuroscience-Informed Model for Team Well-being and Software Quality

Alcione Ramos
DIMAp, Universidade Federal do Rio Grande do Norte
Natal, RN, Brasil
alcionejcr@gmail.com

Márcia Lucena
DIMAp, Universidade Federal do Rio Grande do Norte
Natal, RN, Brasil
marciaj@dimap.ufrn.br

ABSTRACT

High-pressure environments in the Information Technology (IT) sector have raised increasing concerns about mental health and team performance, particularly during intensive events such as hackathons. These collaborative, time-constrained gatherings, widely used in Software Engineering, often reproduce real-world industry stressors, negatively impacting how participants think and feel during the event. This paper presents a neuroscience-informed model designed to optimize hackathon practices by integrating human factors into their planning and execution. Structured into three interdependent dimensions: (i) Sustainable Cognitive Activation, (ii) Emotional Security and Interpersonal Relationships, and (iii) Regenerative Architecture. This model promotes well-being and enhances software quality under pressure. Grounded in cognitive neuroscience and aligned with Brazil's updated Regulatory Standard No. 1 (NR-1/2025), the proposal will be empirically validated through a controlled experimental study with randomized participant groups. The expected results include reduced stress, improved team dynamics, and higher-quality technical outcomes. Beyond hackathons, the model offers scalable strategies to foster healthier, high-performance environments in the broader IT sector.

KEYWORDS

Hackathons, Software Engineering, Mental Health, Neuroscience, Team Productivity

1 Introduction

The Information Technology (IT) sector has become one of the most dynamic fields globally, driving digital transformation and technological innovation. However, this dynamism is often accompanied by high-pressure environments, accelerated delivery cycles, and continued demands for creativity, all of which contribute to increasing concerns about professional mental health and well-being [18].

Software engineering professionals face significant challenges to their mental health, such as impostor syndrome, burnout, chronic stress, and social isolation. Recent studies indicate that impostor syndrome affects more than half of software engineers (52.7%) and is associated with reduced well-being and decreased productivity [9]. Burnout also remains highly prevalent, over 80% of developers reported experiencing symptoms of burnout during the 2019 pandemic, with workload overload identified as the primary contributing factor, according to systematic mapping studies [1]. In the same study, 77% of developers reported that their management was either unaware of burnout or had taken no action to support employees in coping with it.

In 2022, the World Health Organization (WHO) and the International Labor Organization (ILO) released global guidelines on mental health at work, highlighting the importance of addressing stigma and psychosocial risk factors in organizational contexts.

In Brazil, the situation is particularly critical. A 2024 report revealed a 68% increase in medical leaves due to psychological disorders, amounting to over 472,000 cases and generating an economic burden exceeding R$ 3 billion [16]. The country also has the highest prevalence of anxiety disorders in the world and leads Latin America in depression rates [14]. In response, Law No. 14.831/2024 established the "Certificate of Promoting Mental Company," grounded in three pillars: mental health promotion, employee well-being, and transparency and accountability [15].

In this scenario, mental health has become a key concern not only for occupational safety but also for productivity and software quality [5]. Understanding how social dynamics, behavior, and cognitive load affect brain performance is essential - particularly in complex, high-stress, and collaborative development environments [19], [2]. Despite this, human factors are still underrepresented in traditional software engineering practices.

This paper proposes a neuroscience-informed model designed to integrate well-being as a structural element of software development, especially in intensive contexts such as hackathons. The model aims to mitigate the cognitive and emotional overload that is typically found in these events by incorporating human-centered strategies that optimize brain function, improve team synergy, and promote a sustainable innovation culture.

Hackathons provide an ideal context for applying and evaluating the model. These events simulate the pressures of real-world software projects while requiring high levels of mental resilience, cooperation, and problem solving under tight constraints. The proposed model not only supports agility and creativity but also addresses the cognitive, emotional, and environmental factors that shape participants' performance and overall experience. In this view, the human factor is reframed as a strategic advantage.

To operationalize this vision, the model draws from neuroscience-based approaches including structured cognitive training (enhancing hard, soft, and "mad" skills) [4, 7], neurobehavioral management (targeting decision biases and workload regulation) [17], and neuroarchitecture (designing environments that support health and focus) [13]. These practices align with Brazil's updated Regulatory Standard No. 1 (NR-1/2025), which formally includes psychosocial risk management in the workplace [12].

By applying neuroscience to hackathon design, this work offers an innovative contribution to software engineering. It positions mental health not as a secondary concern, but, as a central axis for sustainable high performance, inviting new ways of thinking about how we structure, lead, and evaluate software innovation environments.

2 Theoretical Foundation and Related Work

The intersection of software engineering, mental health, and neuroscience presents a fertile ground for innovation. Understanding how the brain responds to pressure, and how this influences individual and collective performance, is crucial for designing human-centered and cognitively sustainable development environments.

2.1 Hackathons in Software Engineering

Hackathons are short, intensive, and collaborative events in which multidisciplinary teams create innovative solutions to specific challenges under tight deadlines [8]. Widely used in software engineering, they promote creativity, rapid prototyping, and talent identification, but also reproduce many stressors found in real-world development contexts.

Despite their benefits, hackathons often induce prolonged cognitive and emotional overload. Participants are typically exposed to extended screen time, sleep deprivation, excessive stimuli (visual, auditory, and social), and high performance expectations. These conditions impair decision-making, reduce creativity, and increase susceptibility to burnout [20]. Repetitive exposure to such environments may discourage participation by experienced professionals and undermine the innovative potential of these events.

The literature increasingly recognizes that hackathons require rethinking—not to eliminate their intensity, but to support cognitive resilience, emotional safety, and environmental adequacy. These adjustments can turn hackathons into not just sprints of innovation, but healthy, high-performance experiences. This research contributes to that vision by proposing a model that integrates neuroscientific principles into hackathon planning and execution.

2.2 Mental Health in the IT Sector and Regulatory Context

Mental health has become a central concern in the IT sector. Globally, mental disorders at work cost over US$ 1 trillion annually in productivity losses [16]. In Brazil, 2023 and 2024 witnessed alarming rates of psychological sick leave and increasing diagnoses of anxiety, stress, and depression in technology professionals [14].

The rapid pace of technological change, intense cognitive demands, and constant delivery pressure are key contributors to emotional exhaustion. These conditions often manifest as absenteeism, presenteeism, and a reduced capacity for innovation.

In response, Brazil's updated Regulatory Standard No. 1 (NR-1/2025) explicitly includes the management of psychosocial risks. It requires organizations to identify, assess, and mitigate factors that compromise the mental health of their workforce, promoting safe, ethical, and performance-driven environments [12].

The model proposed in this work is aligned with these guidelines, offering a practical path for applying psychosocial risk management strategies to knowledge-intensive environments such as hackathons.

2.3 Cognitive Neuroscience and Work Performance

Cognitive neuroscience provides essential insights into how stress, overload, and social interactions impact brain function. Prolonged exposure to stress triggers the amygdala and suppresses prefrontal activity, impairing executive functions such as memory, creativity, collaboration, and problem-solving [3]. In high-pressure contexts, such as hackathons, these impairments become critical. Neuroscience-informed interventions help restore balance by promoting emotional regulation, cognitive stimulation, and environmental control [3, 10].

Mental wellbeing is a multi-level challenge [22]. This paper adopts a neuroscience-based framework composed of three dimensions, each grounded in well-documented strategies: Team skill development; Neurobehavioral Management; and NeuroArchitecture for preparing productive environments.

2.3.1 Team Skill Development: The SUPERA Method. Cognitive and emotional skills are essential for collaboration, innovation, and adaptability in complex environments. The SUPERA Method is a structured brain training program based on the principles of neuroplasticity, variety, and progressive challenge [4]. It fosters a combination of hard, soft, and "mad" skills [7], promoting both technical excellence and emotional resilience.

Created in 2006, it was the first Brazilian program dedicated to stimulating cognitive abilities, aiming to promote mental health, education, and, more recently, playing an important role in promoting quality of life. The Method is based on: Howard Gardner's Theory of Multiple Intelligences, and on theories by other scholars such as Jean Piaget, Lev Vygotsky, Kurt Lewin, David Ausubel, Reuven Feuerstein, Edgar Morin, Philippe Perrenoud, Henry Wallon, Larry Katz; the four pillars of UNESCO education; the WHO's health and well-being promoting skills; and on the concepts of Brain Neuroplasticity and Metacognition.

The SUPERA methodology demonstrates that it is possible to stimulate not only cognitive functions (which promote agility in decision-making, strategic vision, self-control, concentration, attention, focus, creativity) but also emotional resilience, a sense of belonging, improved self-esteem, and human interactions, the ability to deal with challenges, and frustration tolerance. These approaches develop skills that directly increase individual and team productivity and work quality.

It is important to highlight that the SUPERA Method was recently subjected to a study with researchers from the School of Medicine, the School of Arts, Sciences and Humanities, at the University of São Paulo (USP), validating its effectiveness in a multifactorial cognitive stimulation program on cognitive performance and psychosocial variables in older adults [4].

Keys tools of SUPERA Method include:

- Abacus: Stimulates multifaceted reasoning, attention, and working memory [21];
- Cognitive Exercises and neurobics: Strengthen executive functions through novelty and variety [11];
- Games and group dynamics: Enhance logical reasoning, creativity, teamwork, and belonging [6];

- Digital Platform: Provide accessible, personalized stimulation for memory, attention, and metacognition.

The business-oriented version (SUPERA in Company – Brain Evolution) is incorporated in the proposed model to enhance team preparation prior to hackathon execution.

2.3.2 Neurobehavioral Management. Decision-making in software projects is affected by behavioral patterns and cognitive biases. NeuralPlan is a neurobehavioral management methodology that recognizes how stress, time pressure, and cognitive dissonance influence planning, prioritization, and collaboration [17].

By identifying "Cognitive Moderators", filters that distort or block information, this approach enables project workflows to be redesigned in alignment with human mental functioning [17]. The result is increased performance, improved engagement, and reduced conflict. In the proposed model, these practices support team alignment, facilitator training, and conflict mediation throughout the hackathon.

2.3.3 NeuroArchitecture for Innovation Environments. The physical environment significantly influences human behavior and cognition. Studies in NeuroArchitecture show that elements such as natural lighting, biophilic design, color schemes, acoustic control, and visual organization directly affect stress regulation, focus, and creativity [13].

In the hackathon context, typical environmental issues (noise, overcrowding, visual clutter) undermine team performance. By applying neuro architectural principles, the proposed model creates spaces that reduce cognitive load and sensory fatigue, promote relaxation, and sustain performance throughout the event.

3 The Proposed Neuroscientific Model

Grounded in the theoretical principles discussed in Section 2, the proposed model integrates neuroscience-based strategies to design hackathons that not only drive innovation but also protect and promote participants' mental well-being. It is structured into three interdependent dimensions: Sustainable Cognitive Activation, Emotional Security and Interpersonal Relationships, and Regenerative Architecture. Together, these dimensions foster environments that are cognitively, emotionally, and physically optimized for high performance and well-being under pressure.

3.1 Sustainable Cognitive Activation

This dimension, based on neuroplasticity, focuses on maintaining participants' brains at their optimal performance level while preventing exhaustion and promoting recovery. It enhances executive functions such as decision-making, focus, and problem-solving—key for navigating the demands of hackathon environments. The following techniques are included and will be applied in this dimension:

- Supera in Company – Brain Evolution: a structured three-month cycle of brain training activities aimed at improving cognitive and emotional regulation;
- Optimized Nutrition and Hydration: nutrient-rich and easily digestible foods (e.g., fruits, nuts, smoothies) combined with hydration and optional aromatic herbs to sustain energy levels and concentration.
- Time and Schedule Management: discouraging all-nighters and promoting 6–8 hours of overnight rest with dedicated rest spaces.
  - Structured Breaks: mandatory breaks every 2–3 hours, lasting 15–30 minutes to reduce cognitive fatigue;
  - Adequate Sleep Periods: discouraging all-nighters and promoting 6–8 hours of overnight rest with dedicated rest spaces;
  - Clear Expectation Setting: establishing goals that value collaboration and learning over mere delivery speed.

3.2 Emotional Security and Interpersonal Relationships

This dimension ensures a psychologically safe environment in which participants feel supported, respected, and empowered to collaborate. It directly mitigates stress responses and supports emotional resilience, both essential for sustained performance in high-pressure events:

- Empathetic Leadership and Trained Facilitators: mentors and facilitators trained in neuroscience-informed techniques to recognize stress signs, mediate tensions, and promote inclusion;
- Regular Emotional Check-ins: brief, structured moments for individuals and teams to express emotional states and seek support;
- Trust Pacts and Non-Violent Communication: team agreements on respectful dialogue, mutual support, and conflict prevention;
- Recognition and Celebration Practices: recognition of individual and collective efforts through rituals that reinforce motivation, inclusion, and belonging.

3.3 Regenerative Architecture

This dimension applies NeuroArchitecture principles to create environments that reduce sensory stress, increase focus, and support sustained cognitive function. The physical space becomes a facilitator of productivity and mental health, such as:

- Lighting and Visual Comfort: natural light or circadian-simulated lighting, reduced glare, and high-quality screens;
- Ergonomics and Mobility: ergonomic furniture and flexible workstations that encourage posture variation and physical movement;
- Biophilia and Natural Elements: integration of greenery, outdoor views, and calming sensory inputs to lower stress levels [13];
- Visual Organization and Noise Reduction: clean and structured environments with acoustic adjustments (e.g., panels, headphones);
- Decompression Zones: edicated rest areas with calming colors, comfortable seating, and aromatherapy options. Short breathing or meditation exercises may be included to activate parasympathetic responses.

These practices align with the psychosocial risk management strategies promoted by Brazil's NR-1/2025 and offer a scalable path to sustainable high-performance innovation environments.

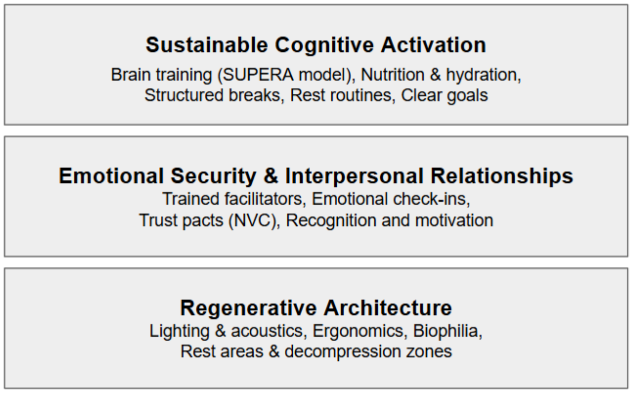

Figure 1: Conceptual representation of the proposed neuroscientific model

As shown in Figure 1, the model integrates cognitive, emotional, and environmental dimensions. Each axis outlines strategic interventions designed to promote mental well-being and software quality in hackathon environments.

4 Model Application in Hackatons and Research Methodology

To assess the feasibility and impact of the proposed neuroscientific model, a structured research design will be implemented across three distinct phases: Preparation, Execution, and Evaluation. The study adopts a randomized controlled trial (RCT) approach, adapted to the hackathon environment, and employs a mixed-methods strategy combining quantitative and qualitative data.

4.1 Model Implementation Phases

4.1.1 Preparation (Pre-Hackathon).

- Identification of participating institutions and definition of challenges to be addressed;
- Customization of digital platforms for project and knowledge management, enabling effective team collaboration;
- Selection and adaptation of the venue according to NeuroArchitecture principles (lighting, acoustics, ergonomics, biophilia);
- Creation of a detailed, neuro-optimized schedule including mandatory breaks and overnight rest periods;
- Training of mentors and facilitators in neuroscience-informed techniques, neurobehavioral strategies, and stress management;
- Formation of multidisciplinary teams and participant assessment of skills (hard, soft, mad), cognitive and psychosocial variables, and health conditions;
- Participant briefing on the benefits of neuroscientific practices to improve both well-being and performance.

4.1.2 Execution (During the Hackathon).

- Implementation of interventions from each dimension of the model: active breaks, cognitive stimulation, emotional check-ins, recognition practices, and continuous environment optimization;
- Management of cognitive load using digital tools and real-time facilitator support;
- Promotion of collaboration and teamwork, while monitoring team dynamics and minimizing potential conflicts.

4.1.3 Evaluation (Post-Hackathon).

- Application of validated questionnaires to measure perceived well-being, fatigue, stress, and sleep quality (e.g., DASS-21);
- Technical evaluation of software solutions based on quality metrics such as functionality, robustness, usability, and defect count;
- Collection of qualitative feedback through interviews and focus groups regarding the hackathon experience and model impact;
- Comparative analysis between experimental and control groups to assess the model's effectiveness in improving well-being and software quality.

4.2 Research Proposal

This study aims to validate the proposed neuroscientific model in hackathon environments, while deriving evidence-based guidelines to promote mental health and sustainable software development practices in the IT industry.

4.2.1 Research Objectives. The general objective is to validate the impact of the proposed model on participant well-being and software quality during hackathons. Thus, the following specific objectives are:

- Compare well-being indicators (stress, fatigue, anxiety, sleep quality) between experimental and control groups;
- Evaluate software quality outcomes across groups;
- Identify which components of the model contribute most significantly to well-being and productivity;
- Develop guidelines for broader implementation in the IT sector.

4.2.2 Detailed Methodology. This study will adopt a randomized controlled trial (RCT) design with a mixed-methods approach, combining quantitative and qualitative data to assess the effectiveness of the proposed neuroscientific model. Participants will be assigned to one of three groups: (1) the Training Group (TG), which will fully implement the model's components; (2) the Active Control Group (ACG), which will engage in standard hackathon practices along with general physical or cognitive activities not based on neuroscience; and (3) the Passive Control Group (PCG), which will follow a traditional hackathon format with no structured interventions.

The study aims to test the following hypotheses:

- H1: participants in the experimental group will exhibit significantly lower stress and fatigue levels after the hackathon;
- H2: the software produced by this group will demonstrate superior usability, robustness, and innovation; and
- H3: interventions focused on emotional security will have a greater impact on perceived productivity than environmental changes alone.

Dependent variables will include measures of well-being (e.g., DASS-21 for stress, anxiety, and depression), software quality (e.g., test coverage, defect count), and productivity (e.g., task completion and delivery rate). Independent variables will comprise the application or non-application of the model's neuroscientific components, including environmental design, nutritional support, behavioral management strategies, and cognitive stimulation interventions.

4.2.3 Data Collection. The data collection process will occur in three main phases: before, during, and after the hackathon. In the pre-event (baseline) phase, participants will complete questionnaires covering sociodemographic information, well-being indicators (such as stress, anxiety, and sleep quality), and their expectations regarding the event.

During the hackathon, data will be gathered through the monitoring of adherence to the proposed interventions, direct observation of participants' behavior and interactions, and, when feasible and ethical, the digital tracking of behavioral metrics.

In the post-event phase, well-being instruments will be reapplied to assess the impact of the interventions, and the software solutions developed by the teams will be evaluated by an independent panel of experts using established quality criteria. In addition, qualitative data will be collected through semi-structured interviews and focus groups with participants and facilitators, focusing on the perceived influence of the model on team dynamics, productivity, and mental well-being.

4.2.4 Data Analysis. The analysis will employ both quantitative and qualitative methods to ensure a comprehensive understanding of the model's impact. Quantitative data will be examined using descriptive and inferential statistical techniques, including t-tests, ANOVA, and regression analyses, to compare outcomes across the experimental and control groups.

This will allow for the identification of statistically significant differences in well-being and software quality metrics. Complementing this, qualitative data derived from interviews and focus groups will be analyzed through thematic content analysis.

This approach will help identify patterns and insights that enrich the interpretation of the quantitative results and offer a deeper understanding of participants' experiences and perceptions.

4.2.5 Implementation Considerations and Limitations. While the model was designed for ideal, resource-rich environments, it is adaptable to different contexts with varying levels of support. Key interventions such as scheduled breaks, facilitator training, and emotional check-ins can be implemented even with limited infrastructure. Potential limitations include logistical constraints, participant resistance, variable adherence to the protocol, and difficulty in measuring physiological data ethically.

Together, these methodological elements aim to validate the model's effectiveness and guide its adaptation for broader use in the IT industry, contributing to healthier, high-performance software development environments.

5 Contributions and Expected Impacts

This work aims to offer significant contributions to the field of software engineering and occupational health, with an emphasis on mental health.

5.1 Theoretical Contributions

This work offers several theoretical contributions to the fields of software engineering and applied neuroscience.

First, it establishes a clear and innovative bridge between neuroscientific knowledge and software engineering practices, addressing a gap in the literature and opening new pathways for interdisciplinary research. Second, it presents a replicable and adaptable framework for organizing human-centered hackathons, which is aligned with the NR-1/2025 regulatory guidelines and holds potential for broader application in workplace settings and continuous mental health programs across various sectors.

Finally, the study aims to provide empirical evidence that developer well-being is not merely a social concern but a measurable and critical factor that directly impacts innovation, productivity, and the quality of software produced.

5.2 Practical Contributions

The proposed model also offers significant practical contributions. By mitigating the negative effects of stress and pressure, it promotes better mental health and overall well-being among hackathon participants and, by extension, IT professionals more broadly. This directly contributes to addressing the high incidence of burnout, anxiety, and depression that characterizes much of the tech industry.

In addition, improved well-being is expected to enhance team collaboration, creativity, and decision-making, ultimately leading to the development of higher-quality and more innovative software solutions, with fewer defects and greater adherence to project goals. The model further assists organizations in complying with the requirements of NR-1/2025 by fostering work environments that reduce psychosocial risks while promoting safety, health, and performance.

Finally, the research aims to generate practical, evidence-based guidelines for implementing mental health initiatives in IT workplaces—such as decompression areas, cognitive training programs, workload regulation strategies, and the promotion of a culture that values work-life balance.

5.3 Innovative and Disruptive Nature

This proposal introduces a paradigm shift by approaching mental health not as a secondary HR concern, but as a strategic axis for productivity and quality in software engineering. Integrating neuroscience into hackathon design and software team management offers a proactive, preventive approach to well-being based on how the brain functions under pressure. Rather than responding to mental health crises, this model anticipates them, fostering sustainable high performance.

Beyond proposing a new framework for hackathons, this research serves as a springboard for broader investigations into how neuroscientific principles can improve the quality of life and performance of IT professionals in diverse contexts. By the end of the study, the goal is to deliver a robust set of tools and guidelines to support innovation environments that respect and elevate human well-being.

6 Concluding Remarks and Future Work

The growing mental health crisis in the IT sector, evidenced by rising rates of psychological disorders and leave of absence, calls for innovative responses from the field of software engineering. Hackathons, while effective for stimulating innovation, often replicate the stressful and unsustainable conditions found in real-world development environments.

This paper presented a neuroscience-informed model for hackathons that rethinks how such events are structured. By incorporating principles of environmental design, behavioral management, and cognitive stimulation, the model fosters well-being and aims to improve software quality under pressure. The proposed study intends to validate this model and extract insights applicable to broader workplace settings in alignment with NR-1/2025.

Ultimately, the model aspires to redefine innovation culture in IT by demonstrating that high performance and mental health are not conflicting goals. Hackathons, and by extension, software development environments—can become spaces of creativity, collaboration, and well-being. Future work will focus on adapting the model to diverse organizational contexts and exploring its scalability, sustainability, and long-term impact.

REFERENCES

[1] J. Ali. 2021. *Study to Understand the Impact of COVID-19 on Software Engineers – Full Report.* Technical Report. Haystack. https://haystack-books.s3.amazonaws.com/Haystack_SoftwareEngineerResearch_charts_Survation_29062021.pdf Accessed: 2025-07-11.

[2] J. Cable. 2021. Combining Behavioral Science with Project Management: The Road to Improvement. *PM World Journal* (2021). https://pmworldjournal.com/article/combining-behavioral-science-with-project-management.

[3] N. L. Cabrera and M. P. P. M. Almeida. 2018. Contribuições da neurociência para a gestão de pessoas. *Psicologia.PT. O Portal dos psicólogos* (2018).

[4] T. B. L. da Silva, G. S. Santos, M. G. Zumkeller, M. E. de C. Barbosa, A. P. B. Moreira, T. N. Ordonez, P. P. Lessa, B. B. Perpétuo, N. P. Cardoso, L. C. de Moraes, and A. C. G. Perpetuo. 2021. Intervenção cognitiva de longa duração com componentes multifatoriais: um estudo de descrição do Método Supera. *Revista Kairós Gerontologia* 24, Especial29 (2021), 117–140. doi:10.23925/2176-901X.2021v24iEspecial29p117-140

[5] M. E. M. G. dos Reis Aires. 2023. Saúde mental e satisfação no trabalho: um olhar sobre a inclusão de pessoas na engenharia de software. Trabalho de Conclusão de Curso (Bacharelado em Ciência da Computação), Centro de Informática, Universidade Federal de Pernambuco.

[6] M. L. Foltran and N. Oliveira. 2020. O lúdico na velhice: uma revisão integrativa. *Revista Brasileira de Geriatria e Gerontologia* 23, 1 (2020), e200002.

[7] Forbes Brasil. 2023. Mad skills: Como seus hobbies podem te ajudar a conseguir um emprego. https://forbes.com.br/carreira/2023/10/mad-skills-como-seus-hobbies-podem-te-ajudar-a-conseguir-um-emprego/.

[8] K. Gama. 2017. Hackathon: Uma Estratégia de Inovação Aberta. In *Anais do Congresso Brasileiro de Engenharia de Software.*

[9] P. Guenes, M. Kalinowski, and M. T. Baldassarre. 2024. Impostor phenomenon in software engineers. In *Anais do XV Concurso de Teses e Dissertações em Engenharia de Software (Mestrado) – Congresso Brasileiro de Software: Teoria e Prática (CBSoft 2024).* Sociedade Brasileira de Computação, Curitiba, PR, Brazil, 5–6. doi:10.5753/cbsoft_estendido.2024.4132

[10] A. Adorni Junior. 2021. Neurociência aplicada à gestão de pessoas: Estudo do desenvolvimento humano organizacional. Trabalho de Conclusão de Curso, Faculdade de Tecnologia Dep. Júlio Julinho Marcondes de Moura, Garça.

[11] L. C. Katz, M. Rubin, and C. Lemos. 2000. *Mantenha seu cérebro vivo: 83 exercícios de neuróbica para prevenir o declínio mental.* Sextante.

[12] Ministério do Trabalho e Emprego. 2025. NR 01 - Disposições Gerais e Gerenciamento de Riscos Ocupacionais. Portaria MTE nº 765, de 15 de maio de 2025.

[13] J. Pallasmaa, H. F. Mallgrave, and M. Arbib. 2013. Architecture and Neuroscience. In *A Tapio Wirkkala-Rut Bryk Design Reader.*

[14] Philos Org. 2023. Anuário Saúde Mental nas Empresas 2023. https://philosorg.com.br/anuario-saude-mental-nas-empresas-2023/. Instituto Philos Org, PDF.

[15] Philos Org. 2024. Anuário Saúde Mental nas Empresas 2024. https://philosorg.com.br/tag/anuario/.

[16] Radar de Sinais - StartSe. 2025. IA, crise de saúde mental e robôs. Accessed: Mar. 14, 2025.

[17] J. Ramirez. 2024. The neural DNA of bad-performing projects. https://medium.com/@drjoshramirez/the-neural-dna-of-bad-performing-projects-9c9da8371bef.

[18] M. Ribeiro. 2014. *Neuróbica: Exercícios para o cérebro.* Vozes.

[19] D. J. Siegel. 2012. *The Developing Mind: How Relationships and the Brain Interact to Shape Who We Are.* Guilford Press.

[20] D. Silva, G. Aragão, K. Hognon, and L. Soares. 2024. SAÚDE MENTAL NA ERA DA TECNOCIÊNCIA. *Revista ft* 21–22 (2024). doi:10.69849/revistaft/ar10202410030721

[21] S. Weng, C. Xie, H. Wang, and Y. Chen. 2017. The effect of abacus mental arithmetic training on the functional network structure of young adults' brains: A resting-state fMRI study. *Frontiers in Human Neuroscience* 11 (2017), 280.

[22] N. Wong et al. 2023. Mental wellbeing at work: perspectives of software engineers. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23).* ACM, New York, NY, USA.