Ecological Cognition for Measuring Psi-Hit and Psi-Miss Online: Using K-Scores to Understand Anomalistic Psychology in Project Management Teams

Jonathan Bishop, Piet A. M. Kommers, and Kamal Bechkoum

***Abstract*— The human-side of project management is a topic that has been explored in project management, but not to the extent that it should be. Health and safety is of paramount importance in project management, particularly construction project management. What is often overlooked is the mental health side of health and safety and how anomalistic psychological experiences can have an adverse impact on project success. This paper proposes using 'k-scores' to measure psi-hit and psi-miss, or in other words the extent to which a person thinks they have had an anomalistic experience or that they have not. The measure of k-scores are derived from combining the ecological cognition framework with a parametric user model. The benefit of this is that it allows the collection of data online, such as through Microsoft Teams, Skype or Zoom.**

***Index Terms*—Ecological cognition, project management, psi-hit, psi-miss, health and safety.**

I. Introduction

The human-side of project management is a topic that has been explored in project management [1]. Getting the best out of one's project team should be seen as a key objective to project success.

Fig. 1. The psychic continuum for anomalistic psychology in projects.

In project management, psychoticism is associated with it is associated with "the potential to have a psychotic episode and aggression" and is "rooted in the characteristics of tough-mindedness, non-conformity, inconsideration, anger and impulsiveness" [2]. See Fig. 1 for the psychic continuum.

II. Ecological Cognition

Ecological cognition has existed as a concept within information science since the start of the 21st century [3]-[9]. It has developed as an informatics discipline, being built upon by many researchers [10]-[16]. It has evolved from being based around a 3-base structure [17] to the 6-base version [18], which can be seen in Fig. 2. The aim of this paper is to show how the ecological cognition framework (Fig. 2) and its associated parametric user model (Equ. 1) can be used as a means to determine psi-hit and psi-miss. That is; whether a person has, or believes they have, experienced a paranormal experience [19]. Equ 1. is used to compute the k-score or knol for an activity (i.e. k_a). The k-score can be produced by running every event's transition (E_S) of the ecological cognition framework (Fig. 1) or by using primary or secondary data to fit it in a single instance (E_S). In this case of this study the latter is done. The term knol on the other hand represents the k-score at any point in time, whether computed in a single instance or at any point along the ecological cognition framework (Fig. 1). One could program a statistical package to produce the k-score for each participant but it would only be truly a k-score if a sample of knol was taken at each transition of the ecological cognition framework (Fig. 2).

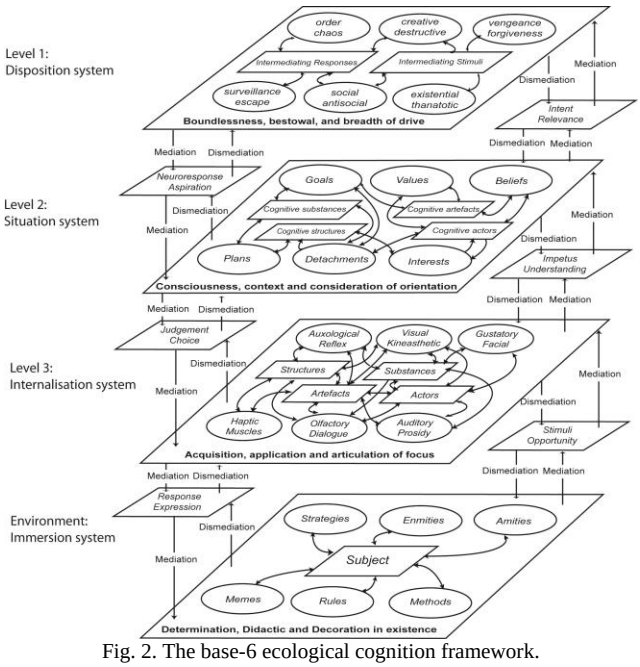

Fig. 2. The base-6 ecological cognition framework.

It can be seen from Fig. 1 (above) that k-score (k_a) is linked to psychological states that people with a range of psychiatric conditions and personality disorders are likely to experience, as well as people with neuropsychological conditions or no apparent impairment.

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$$k_a = \left\{ \begin{array}{l} C_{\min} \\ E_S \\ C_{\max} \end{array} \frac{\left(\frac{\sum_{e=0}^{M} \left(\frac{((x_{GS2} + \widetilde{ca_{eS}}) * (y_{GS2} + \widetilde{cb_{eS}}) - \widetilde{cc_{eS}})/(i_S + j_S))_e}{c_{eS}} \right)}{5} \right) + F}{\left(\frac{\sum_{d=0}^{D} \left(\frac{\left((x_{GS2} + \widetilde{ca_{dS}}) + \left(z_{GS4} + \widetilde{cb_{dS}} \right) - \widetilde{cc_{dS}} \right) * 2n_S)_d}{2c_{dS}} \right)}{2.5} \right) + Ob} \right\}$$

A parametric user model for computing k-scores (1)

TABLE I: THRESHOLDS FOR BRAIN/BODY INDICATORS

Threshold	BMI	BVI	BEI
Delusion	-622.25	-250	-125
Superstition	-30.12	-121	-60.5
Suspicion	-27.83	-111.8	-55.89
Apprehension	**-24.9**	**-100**	**-50**
Concern	-24.4	-98	-49
Deindividuation	-12.45	-50	-25
Neutral**	**0**	**0**	**0**
Deindividuation	12.45	50	25
Feel-Good	18.5	74.1	37.1
Optimal	**21.7**	**81**	**43.75**
Serendipity	24.4	98	49
Self-Actualisation	**24.9**	**100**	**50**
Persuasion	27.83	111.8	55.89
Seduction	30.12	121	60.5
Addiction	622.5*	250	125

B=Brain/Body; * BMI of heaviest man, Jon Minnoch = 117,815.92; ** Produces error to catch

TABLE II: THRESHOLDS FOR K-SCORE, FORCE AND OBJECT

Threshold	k_a	F	Ob
Delusion	-2.5	48	-120
Superstition	-1.21	48	-58.08
Suspicion	-1.118	48	-53.66
Apprehension	-1	48	-48
Concern	-0.98	48	-47.04
Deindividuation	-0.5	48	-24
Neutral**	0	48	0
Deindividuation	0.5	48	24
Feel-Good	0.741	48	35.61
Optimal	0.81	48	42
Serendipity	0.98	48	47.04
Self-Actualisation	1	48	48
Persuasion	1.118	48	53.66
Seduction	1.21	48	58.08
Addiction	2.5	48	120

B=Brain/Body; * BMI of heaviest man, Jon Minnoch = 117,815.92; ** Produces error to catch

TABLE III: THRESHOLDS FOR JOINDER, INTERCEDENT AND NUTRITION

Threshold	j	i	n
Delusion	-2.5	3.5	-1.25
Superstition	-1.21	2.21	-0.605
Suspicion	-1.118	2.118	-0.5589
Apprehension	-1	2	-0.5
Concern	-0.98	1.98	-0.49
Deindividuation	-0.5	1.5	-0.25
Neutral**	0	1	0
Deindividuation	0.5	0.5	0.25
Feel-Good	0.741	0.259	0.371
Optimal	0.81	0.19	0.4375
Serendipity	0.98	0.02	0.49
Self-Actualisation	1	0	0.5
Persuasion	1.118	-0.118	0.5589
Seduction	1.21	-0.21	0.605
Addiction	2.5	-1.5	1.25

** Produces error to catch

TABLE IV: THRESHOLDS FOR K-SCORE AND CORRESPONDING PKE CLASS

Threshold	k-score	PKE Class	Description
Delusion	-2.5	VII	The delusion threshold is reached when serotonin levels are very high and dopamine levels very high. A person is detached from reality.
Superstition	-1.21	VI	The superstition threshold is reached when a person is starting to lose sense of reality. Dopamine and serotonin are becoming high.
Suspicion	-1.118	V	The suspicion threshold is reached when serotonin is moderate and dopamine levels are moderate.
Neutral**	0	I	The neutral threshold is reached when a person experiences the Hawthorne effect through dopamine and serotonin levels being neutral and other neurotransmitters taking over. A person feels a sense of self-actualisation.
Deindividuation	0.5	VI	The deindividuation threshold is where an actor has such high serotonin levels and dopamine levels that they detach from the external environment to concentrate solely on their internal thought processes.
Optimal	0.81	II	The optimal threshold is where an actor's dopamine and serotonin levels are in equilibrium to the point that they can optimally engage with their external environment at the same time as being able engage with their own internal needs and wants.
Serendipity	0.98	III	The serendipity threshold is where an actor's dopamine levels are so high and their serotonin levels so low that they engage with their internal and mental states with so little effort that they have reached their optimal experience.
Elation	1	IV	The elation threshold is where an actor's dopamine and serotonin thresholds in equilibrium to the point they feel they can achieve anything.
Depression	1.118	V	The depression threshold is reached when a person is starting to exceed their limits. Dopamine and serotonin are rising.
Maniacal	1.21	VI	The maniacal threshold is reached when a person's dopamine are very high and their serotonin levels are moderate.
Derangement	2.5	VII	The derangement threshold is reached when a person's serotonin levels are very low, and their dopamine levels are very high. A person is detached from reality.

B=Brain/Body; * BMI of heaviest man, Jon Minnoch = 117,815.92; ** Produces error to catch

III. Methods

Data was drawn from a study into whether the physical environment can affect human emotions [20]. This focussed on two personality types – autistic and empathic. Data was drawn from three sources – concept-mapping, questionnaires and location metrics. See Table III.

TABLE V: Thresholds for k-Score and Corresponding PKE Class

Dataset	Concept-mapping	Questionnaire	Location Metrics
Autistic (M k)	1.00911262018	0.837611750	0.96572379
Empathic (M k)	1.02080942295	0.865500000	0.98758705
Primary	22	8	18
Secondary	0	0	30
Computed	22	8	0

This generated not only the entities associated with the 6-Base ecological cognition framework [21], but variables associated with online culture that could be used to engage the same EEG patterns online might see in psychic experiences to those one might see in people with the aforementioned personality types depending on their participation in an online community, such as whether they want to engage with person (i.e. befriend), an online community (i.e. delurk) or be friendly in general (i.e. give kudos). Table VI shows that the autistic group has a higher knol for delurking, kudos and befriending compared to the empathic group.

TABLE VI: Online Behaviours Selected for Analysis

Dataset	Concept-mapping	Questionnaire	Location Metrics
Autistic (M k)	1.00911262018	0.837611750	0.96572379
Empathic (M k)	1.02080942295	0.865500000	0.98758705
Primary	22	8	18
Secondary	0	0	30
Computed	22	8	0

IV. Results

As can be seen from Table VII the majority of external representations (N=42) were structures (n=22), followed by artefacts (n=10), then actors (n=8), then substances (n=2) based on a concept mapping study (20).

TABLE VII: External Representations Featured in the Concept-Mapping Study

Cognition	Count	Percent
Actor	8	19.0
Artefact	10	23.8
Structure	22	52.4
Substance	2	4.8
Total	42	100.0

Table VIII shows that in terms of focus on external representations, the autistic group had a lower know than the empathic group.

TABLE VIII: Thresholds for k-Score and Corresponding PKE Class

External Representations	Low Mean k_a (N)	High Mean k_a (N)	t-score	p-score
Methods	0.94690217 (21)	1.00384705 (27)	14.80	0.000
Rules	0.95219918 (16)	0.99230091 (32)	5.199	0.000
Enmities	0.97263726 (36)	0.99782289 (12)	2.542	0.002
Amities	0.96584786 (32)	1.00510527 (16)	5.028	0.000
Memes	0.95684197 (21)	0.99611610 (27)	5.459	0.000
Strategies	0.96749623 (36)	1.01324598 (12)	5.612	0.000

In terms of focus on internal representations, as can be seen from Table IX, the data showed that the autistic group has a higher k-score than the empathic group across all cognitions.

TABLE IX: Cognitions Selected for Analysis

Cognition	Autistic M k_a	Empathic M k_a	Computed
Plan	0.82403416	0.79851466	8
Belief	0.82215837	0.79796759	8
Interest	0.83781928	0.81170525	8

V. Discussion

This paper has shown the k-score (k_a) to be very versatile in measuring personality types that can be measured through EEG [22], [23] like psychic experiences can be [24]. This would therefore suggest k-score could be effective at measuring psi-hit and psi-miss. The paper has equally shown that k-score is capable of measuring variance around the various elements of the ecological cognition framework that fit into the equation used to compute it. This suggests both a quantitative and qualitative approach to measuring psi-hit and psi-miss is possible as the ecological cognition framework provides an effective corpus for qualitative research.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Jonathan Bishop wrote the paper, including literature review, research design, data collection and data analysis; Piet A.M. Kommers and Kamal Bechkoum supervised the research; all authors had approved the final version.

REFERENCES

[1] R. S. House, *The Human Side of Project Management*, Reading, MA: Addison-Wesley Publishing Company, 1988.

[2] Systematic analysis on the relationship between personality and injury record of construction workers, in *Proc. HKU-HKHA International Conference 2013*, 2012.

[3] M. J. Falck, "From ecological cognition to language: When and why do speakers use words metaphorically?" *Metaphor and Symbol*, 2018, vol. 33, no. 2, pp. 61-84.

[4] T. W. Jensen, "Doing metaphor: An ecological perspective on metaphoricity in discourse," *Metaphor: Embodied Cognition and Discourse 2017*, p. 257.

[5] T. W. Jensen and L. Greve, "Ecological cognition and metaphor," *Metaphor and Symbol*, 2019, vol. 34, no. 1, pp. 1-16.

[6] Ecological cognition and cognitive ecology, in *Proc. the Human Factors and Ergonomics Society Annual Meeting*, SAGE Publications Sage CA: Los Angeles, 2000.

[7] J. Bishop, "Enhancing the understanding of genres of web-based communities: The role of the ecological cognition framework," *International Journal of Web Based Communities*, 2009, vol. 5, no. 1, pp. 4-17.

[8] J. Bishop, "Ecological cognition: A new dynamic for human-computer interaction," *The Mind, the Body and the World: Psychology after Cognitivism Exeter*, GB: Imprint Academic, 2007, pp. 327-345.

[9] J. Bishop, "Increasing participation in online communities: A framework for human–computer interaction," *Comput Hum Behav*, 2007, vol. 23, no. 4, pp. 1881-1893.

[10] R. Eul, *Design for Contribution Theoretical and Practical Approaches to Motivate Contribution in Online Communities*, 2008.

[11] P. B. Brandtzaeg and J. Heim, "Explaining participation in online communities," *Handbook of Research on Socio-Technical Design and Social Networking Systems London*, UK: Information Science Publishing, 2009, pp. 167-181.

[12] P. B. Brandtzaeg andJ. Heim, "Why people use social networking sites," *Online Communities and Social Computing*, Berlin, DE: Springer-Verlag, 2009, pp. 143-152.

[13] H. Busher and N. James, "In cyberspace: Qualitative methods for educational research," *Handbook of Qualitative Research*, Aldershot, GB: Edward Elgar Publishing, 2012, pp. 223-237.

[14] H. Busher and N. James, "The ethical framework of research practice," *Research Methods in Educational Leadership and Management*, 2012, p. 90.

[15] N. James and H. Busher, *Online Interviewing*, London, GB: Sage Publications, 2009.

[16] J. Preece, "An event-driven community in Washington, DC: Forces that influence participation," *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City Hershey*, PA: IGI Global, 2008.

[17] J. Bishop, *Analyzing and Influencing Behaviour in a Virtual Marketplace Using a Parametric User Model*, 2002.

[18] J. Bishop, "Conceptualizing digital addiction as glutamine inhibition and glutamate acceleration (GIGA): Considering the links between productivity slow-down, wakefulness, and workfulness," *Multifaceted Approach to Digital Addiction and Its Treatment Hershey*, PA: IGI Global, 2019, pp. 73-99.

[19] J. L. Taddonio, "The relationship of experimenter expectancy to performance on ESP tasks," *The Journal of Parapsychology*, 1976, vol. 40, no. 2, p. 107.

[20] The impact of physical and virtual environments on human emotions: A pilot study in an adult and community education setting, presented at the 14th International Conference on Scientific Computing, July 28 2016.

[21] J. Bishop, "Increasing participation in large-scale virtual environments: Rethinking the ecological cognition frameworks for the augmented, mixed, and virtual reality," *Multimedia and Sensory Input for Augmented, Mixed, and Virtual Reality*, 2021.

[22] Taming the Chatroom Bob: The role of brain-computer interfaces that manipulate prefrontal cortex optimization for increasing participation of victims of traumatic sex and other abuse online, in *Proc. the 13th International Conference on Bioinformatics and Computational Biology (BIOCOMP'12)*, Las Vegas, NV: WORLDCOMP, July 19 2012.

[23] The role of the prefrontal cortex in social orientation construction: A pilot study. Poster presented to the BPS Welsh Conference on Wellbeing Leicester, GB: British Psychological Society; September 10 2011.

[24] Anomalous anticipatory event-related EEG activity in a face recognition task, in *Proc. the 54th conference of the Parapsychological Association*, August 21, 2011.

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