DETECTION OF DESTRUCTIVE EMOTIONS IN PROJECTS IMPLEMENTED IN THE OPEN SOURCE FORMULA

Krzysztof S. TARGIEL

University of Economics in Katowice, Faculty of Informatics and Communication;
krzysztof.targiel@ue.katowice.pl, ORCID: 0000-0001-7815-1210

Purpose: The aim of this paper is to present findings in automatic emotion detection in project management.

Design/methodology/approach: The approach adopted involves psychological literature review in area of destructive emotions. Then, an attempt was made to detect such emotions in text communication available in Open Source projects using neural networks. The neural network was trained to recognize basic emotions in text, based on available labeled training data. Then, the network trained in this way was used to recognize situations in which anger as an example of a destructive emotion, occurs in electronic communication regarding an Open Source projects.

Findings: The paper discusses three fundamental research questions that arise in the context of using machine learning methods to analyze emotions in projects. The first of them concerned what data can be used for analysis. It was established that electronic communication in projects implemented in the open source formula is publicly available and susceptible to text analysis. The second question concerned the methods that can be used in the analysis of emotions. Here it was established that machine learning methods may be useful due to the problems described in the literature with the use of dictionary methods. The third question concerned the existence of tools for use in detecting emotions. This is a question about whether machine learning methods are actually able to recognize emotions in real communication taking place in software projects.

Research limitations/implications: In the work, the analysis of the possibilities of automatic emotion detection in project management was presented. The focus was on detecting one type of emotion, namely "anger" as the most important from the point of view of project coherence. Further research may concern the detection of other emotions and their constellations.

Originality/value: The novelty of paper is an attempt to define a framework for the use of known methods of automatic emotion detection in project management.

Keywords: project management; emotion recognition; natural language processing.

Category of the paper: Conceptual paper.

1. Introduction

The current economy's projects are facing unique challenges and opportunities. Rapid technological progress provides opportunities for innovation and efficiency improvement. Activation of stakeholders is an important element of the life of the project, and electronic communication emotion analysis and emotion analysis proposes new tools for project management.

Electronic communications based on email are especially vulnerable to automatic analyses based on natural language processing. Many computer-based natural language processing methods (NLPs) are currently being developed. These are text and speech processing methods (Speech recognition, word segmentation), morphological analysis (Memory, Steming), syntactic analysis (Pasing), semantic analysis (Sentiment Analysis with Emotional Recognition, Terminology Extraction), automatic summarization and machine translation. Emotions detections seems to be a particularly useful tool in Project Management. With such tools available, we can analyze internal sources of dangers in IT projects implemented in the open-source formula.

The aim of this study is to propose the use of automatic emotion detection in project management. It investigates the models used in psychological literature to describe destructive human emotions. Then, it proposes the use of neural networks to detect such emotions in text communication.

For the first time, Clarke's paper (2009) noted in the literature that projects are emotional. Awareness of this fact improves project management. Subsequent works, such as Whitty, S. (2010), have analyzed various artifacts related to projects and how they affect the project. However, such a fundamental element as communication has not been analyzed. Emerging new possibilities for analyzing emotions in texts (Nandwani, Verma, 2021), create new possibilities for creating new tools supporting project management. The complexity and multi-aspect nature of contemporary projects creates the need to enrich the Project Manager's instrumentation with new tools.

The work is divided into the following parts. The first section presents literature survey on topics of interest, namely open source projects, emotions models, destructive emotions, automated emotion recognition and IT tools for emotions analysis. The next part outlines the research questions. The next part describes communication data, the data for training emotions and the using neural networks in anger detection. Then we can find a discussion of the results obtained and findings. The whole paper ends with a summary.

2. Literature survey

2.1. Open source projects

Today, software development is a very complex project with many experts involved. One of the most effective methods of software development is open-source formulation. Open source software (OSS) is a computer software that is licensed by copyright holders to allow users to use, study, modify, and distribute software and its source code to anyone and for any purpose (Laurent, Andrew, 2008).

Some organizations which are follows open-source formula are the Linux Foundation, the Eclipse Foundation, home of the Eclipse software development platform, the Debian Project, creators of Debian GNU/Linux distribution; the Mozilla Foundation, home of the Firefox web browser and finally the Apache Software Foundation.

Mailing lists are the core means of project communication in open source projects, where they are used during software development and maintenance to discuss technical issues, propose changes, report bugs, or ask how-to questions about configuration or any other parts of the product (Obaidi, Klünder, 2021). The idea of using open source project mailing list communication to analysis originates from Tourani et al. (2014).

2.2. Emotions models

Clarke (2010) was probably the first who notice that projects are emotional. However, despite previous work on the significance of conflict in projects (Chen, 2006), and recognizing that conflict is a source of strong emotions (Barki, Hartwick, 2004), the topic of recognizing emotions in the project has not been considered in the literature on the subject. In mentioned paper Clark (2010) analyze how emotions affect project manager behaviors and decisions in order to better understand why projects go in very different directions to those expected within the predominant rationalist paradigm. He interviewed PMs who participated in emotional intelligence training, and they understood the importance of emotion in decision-making.

Virine et al. (2015) analyzed emotions in the context proposed by D. Goleman (Goleman, 2006) and adopted for project management by A. Mercino (Mercino, 2007) model of emotional intelligence. Proposed model analyse five domains: Self-awareness, Self-management, Social awareness, Relationship management and Team leadership. Virine et al. note that not only negative emotions may cause wrong decisions but also positive ones may cause mistakes. They propose several methods for handling emotions but their first step is always emotion recognition.

Human emotions are very complex phenomenon. For this reason, models of this phenomenon are considered in psychology. A fairly wide overview of the models can be found in (Nandwani, Verma, 2021). Most widely are used Ekman model (Ekman, 1992) and Plutchik Wheel of Emotions (Plutchik, 1980). Ekman model is categorical one, with six defined

emotions: anger, disgust, fear, joy, sadness, surprise. Plutchik considered two types of emotions. Basic ones which include Ekman six emotions supplemented by trust and anticipation and mixed emotions which are made from the combination of basic emotions. Plutchik represent his emotions on a colored wheel. Plutchik model is also categorical one. Opposite type of models are Dimensional Emotion models (Nandwani, Verma, 2021). They are based on three parameters: Valence (positive, neutral, negative), Activation or Arousal (excited, neutral, calm) and Dominance or Power (weak, neutral, strong).

2.3. Destructive emotions

In the context of project management, destructive emotions may be of particular importance. They can significantly impact team dynamics, decision-making, and consequently overall project success. A short catalog of such destructive emotions is presented below:

- **Anger:** Anger can arise from conflicts, unmet expectations, or stress. It can lead to hostility among team members, creating a toxic work environment and hindering collaboration. For these reasons, it is especially important to recognize these types of emotions (Hekkala, Stein, 2016; Wang, Chen et al., 2023).

- **Frustration:** Frustration often stems from obstacles or setbacks. It can result in decreased motivation and productivity, making it harder for teams to focus on goals. It is not that important but it affects the productivity of individual team members (Hartman, Jugdev, 1998; Jugdev et al., 2000).

- **Fear:** Fear of failure, criticism, or the unknown can inhibit creativity and risk-taking. Team members might avoid voicing ideas or addressing issues, which can stifle innovation. Such emotions reduce the creativity of the design team (Hartman, Jugdev, 1998; Jugdev et al., 2000).

- **Jealousy:** Jealousy can occur when individuals feel threatened by colleagues' success. This can damage relationships and foster competition instead of collaboration (Andiappan, Dufour, 2020).

- **Anxiety:** Anxiety about deadlines, performance, or the project's future can lead to decreased focus and increased stress levels, causing team members to struggle to perform at their best (Wang et al., 2021).

- **Despair:** A sense of hopelessness about project outcomes can lead to disengagement and lack of effort from team members, jeopardizing project timelines and quality (Potosky, Azan, 2023).

Project managers can employ several strategies to mitigate the impact of these destructive emotions on project success. Some of them are fostering open communication, setting clear goals, promoting a positive culture, encouraging reflection. In case of anger and frustration they can provide conflict resolution resources. They can equip the team with tools and techniques to resolve conflicts constructively. However, such support is based on recognizing the emotions occurring. Hence the importance of methods for recognizing destructive emotions.

2.4. Automated emotion recognition

Recent years have seen a strong development of computer natural language processing methods. After the first periods of Symbolic NLP (1950s - early 1990s), and Statistical NLP (1990s – 2010s), present NLP methods have huge potential for implementation. Natural Language Processing (NLP) refer to automated machine-driven algorithms for understanding of human language and extracting information (Dinov, 2018). Common tasks for these methods include text and speech processing, morphological analysis, syntactic analysis, lexical semantics, relational semantics, and discourse (Natural language processing, 2021). Some new applications includes: automatic summarization, machine translation, natural language generation. Very interesting directions of NLP development in the context of project management are the Sentiment Analysis (SA) and Emotion Analysis (EA) which leads to emotion recognition.

Automated emotion recognition use various methods like electroencephalogram (EEG), facial, and speech signals, text analysis. Current overview of trends and future perspectives can be found in paper (Maithri et al., 2022).

By the nature of things, emotion detection from text will be used to analyze emotions in open source projects where almost all communication takes place via mailing lists. We are talking about emotion detection here, narrowing down the area of emotion analysis. This lexical semantic approaches are founded on the belief that "it is possible to infer emotion properties from the emotion words" (D'Urso, Trentin, 1998).

Many papers have been written in recent years devoted to this topic. Worth mentioning are (Shivhareand, Khethawat, 2012) where Word Ontology was used and (Minu, Ezhilarasi, 2012) which describes an English emotion ontology based on WordNet. Batbaatar have used novel neural network architecture, called SENN (Semantic-Emotion Neural Network) which can utilize both semantic/syntactic and emotional information by adopting pre-trained word representations (Batbaatar et al., 2019). Ho et al. (2020) have used to analyse other than English language namely Vietnamese. Most recent surveys on emotion detection from text can be found in paper (Nandwani, Verma, 2021) and also in two papers which present utilization of deep learning models (Uymaz, Metin, 2022; Chen, 2022).

2.5. Tools for emotion recognition

There are two general ways for dealing with automatic emotion detection: knowledge-based techniques and statistical methods (Emotion recognition, 2023). Knowledge-based techniques are referred to as lexicon-based techniques but also contain rule-based systems. Statistical methods are based on the use of different supervised machine learning algorithms.

Emotion lexicons are dictionaries that associate words or phrases with specific emotions. Tools that can be used for emotion recognition are:

- NRC Word-Emotion Association Lexicon (Mohammad, Turney, 2010; Mohammad, Turney, 2013).
- WordNet (Princeton University, 2010).
- EmotiNet (Balahur et al., 2012).

Example of rule based system is ANEW (Affective Norms for English Words) (Bradley, Lang, 1999).

Statistical methods based on supervised machine learning algorithms use such architecture as:

- Convolutional neural network (CNN) (Wang et al., 2016).
- Bidirectional Encoder Representations from Transformers (BERT) and Bi-directional Long Short-Term Memory (BiLSTM) (Chen, 2022).

There are also effective hybrid methods, an overview of which can be found in (Alswaidan, Menai, 2020).

3. Research questions

When starting research in the selected area, one should be aware that the proposed models will have to be verified based on data from the real world. The question arises about the availability of such data, hence the first research question was formulated:

RQ1: What data from real projects can research be based?

Another problem that needs to be faced is the availability of methods and tools for detecting emotions. Their spectrum is quite extensive as discussed in the previous section. However, another research question arises in the form of:

RQ2: What methods can be used to analyze emotions in project management?

The last question that arises in the context of the considerations conducted is whether there are computer tools for automatic detection of emotions. Hence, the following research question was formulated:

RQ3: Are there any IT tools that can be used to detect emotions in electronic communications regarding Open Source projects?

This is a question about whether machine learning methods are actually able to recognize emotions in real communication taking place in software projects.

4. Materials and Methods

4.1. Communication data

Due to the specificity of projects in which teams are focused on achieving goals, it is difficult to expect that during their implementation someone will have time to answer surveys or undergo EEG tests. In this case, there is also a question about the relevance of the results of the research conducted in this way. This is especially important in the context of the use of surveys that need to be developed. We also resign from the use of facial analysis methods. It seems that at the initial stage of research it will be beneficial to focus on the analysis of texts and communication carried out in this form.

Communication in the project takes place in defined communication channels and is usually confidential. Fortunately, in IT projects implemented in the open source formula, the projects communication is based on mailing lists and by nature are publicly available.

The mailing list of the Apache OpenOffice project, implemented in the open-line formula, was selected in this work. For this, project communication is publicly available at "https://openoffice.apache.org/mailing-lists.html". Mailing list is maintained since 2011 till today. Every month, several hundred messages appear on all sub lists together.

Communication in the project is organized in 18 communication channels visible as thematic mailing lists. There are two groups of these lists: English Language Mailing Lists and Native Language (non-English) Mailing Lists. Among the last one are lists in German, Japanese, Italian and French. We will focus on English-language lists. Several of the most active lists are shown in Table 1. The last two mailing lists are not used for communication between stakeholders so they will be omitted.

Table 1.
List of the most active English Language mailing list in period 2017-2022

Description	Adress	No of posts	
		total	in year 2022
Users Mailing List (Public)	users@openoffice.apache.org	7605	667
Development Mailing List (Public)	dev@openoffice.apache.org	14301	1306
Commits Mailing List	none	17095	2009
Issues Mailing List	none	13357	839

Source: own elaboration.

OpenOffice is an open-source office suite. It was an open-sourced version of the earlier StarOffice, which Sun Microsystems acquired in 1999 for internal use. Sun open-sourced the OpenOffice suite in July 2000 as a competitor to Microsoft Office. In 2011, Oracle Corporation, then the owner of Sun, announced that it would no longer offer a commercial version of the suite and donated the project to the Apache Foundation. Apache renamed the software to Apache OpenOffice. Today the most actively developed successor projects is LibreOffice (OpenOffice.org, 2022).

4.2.   The data with emotions

In 1990s, group of psychologists all over the world collected data in the ISEAR project, directed by Klaus R. Scherer and Harald Wallbott (1994). Student respondents, were asked to report situations in which they had experienced all of 7 major emotions. In each case, the questions covered the way they had appraised the situation and how they reacted. The final data set thus contained reports on seven emotions each by close to 3000 respondents in 37 countries on all 5 continents.

The result of this project is the ISEAR Dataset, which contains a labeled set of sentences. This is a collection of 7516 sentences labeled with 7 major emotions. (joy, fear, anger, sadness, disgust, shame, and guilt). This set was used to train a neural network to recognize major emotions.

4.3.   The methods

The research was conducted based on the use of neural network methods. They were trained to classify typical emotions based on available sets describing emotions occurring in texts. Then, the network trained in this way will be used to recognize the emotion 'anger' in electronic communication in the project.

The use of neural networks will consist of the following stages:

- Defining the network architecture.
- Neural network training to classify the emotion "anger" in text based on the "ISEAR" Dataset.
- Using a Trained Neural Network to recognize "anger" emotions in mailing list communication.

Recognition of the "anger" emotion will consist in determining the similarity of the recognized text to texts from the ISEAR database that have been marked as containing the "anger" emotion. In this solution, the neural network plays the role of a binary classifier that determines the similarity of a given text, in this case an email, to a situation in which the 'anger' emotion was recognized.

When satisfactory results will be obtained, the trained network can be used to recognize the emotion of anger in communication within the OpenOffice project.

5. Discussion and findings

The use of emotion recognition in project management

In the context of the latest views on the success of a project, according to which success is considered to be meeting the expectations of and stakeholders, their emotions may be important in the correct assessment of the project. We know that some negative emotions (such as anger) as well as positive ones (such as love) can affect the way we view the situation and the decisions we make. Hence, the ability to catch particularly bad emotions can be helpful in effectively managing stakeholder engagement. As a consequence, it can also have an impact on achieving project success more effectively.

For the above reasons, it seems justified to focus primarily on the detection of bad emotions, such as anger.

It was also established that there are IT tools that allow for recognizing the emotion of anger. Based on pre-trained neural networks, it is possible to identify emotions in the texts of emails sent in the project.

6. Summary

The presented work deals with the topic of using automatic emotion recognition in projects. On the one hand, can find effective tools for emotional analysis. On the other hand, it can be used to manage team dynamics.

The available data for the analysis of emotions in projects was reviewed. It turned out that it would be beneficial to use publicly available communication in open source projects. It also implied the use of methods of emotional analysis in texts. In the course of the conducted analyses, effective methods of analyzing emotions from the text were also reviewed. Finally, an analysis of the possibility of using emotion recognition in project management was made. The most beneficial seems to be the use of the proposed methods to detect destructive emotions that disturb the project team dynamics.

The main achievement is proposing a scheme for recognizing emotions in text communication occurring in projects implemented in the 'Open source' formula. The limitations of the method result from the fact that it is only applicable to projects in which communication takes place openly, as is the case in Open Source projects.

The presented work presents the concept of using emotion recognition in project management. The initial considerations carried out led to many further questions that need to be verified in empirical research. This will be the subject of further research.

References

1. Alswaidan, N., Menai, M.E.B. (2020). A survey of state-of-the-art approaches for emotion recognition in text. *Knowledge and Information Systems, Vol. 62, Iss. 8*, pp. 2937-2987. doi:10.1007/s10115-020-01449-0

2. Andiappan, M., Dufour, L. (2020). Jealousy at work: A tripartite model. *Academy of Management Review, Vol. 45, Iss. 1*, pp. 205-229.

3. Balahur, A. Hermida, J.M., Montoyo, A. (2012). Detecting implicit expressions of emotion in text: A comparative analysis. *Decision Support Systems. Vol. 53, Iss. 4,* pp. 742-753. doi:10.1016/j.dss.2012.05.024.

4. Barki, H., Hartwick, J. (2004). Conceptualising the construct of interpersonal conflict, *International Journal of Conflict Management, Vol. 15, No. 3*, pp. 216-44.

5. Batbaatar, E., Li, M., Ryu, K.H. (2019). Semantic-Emotion Neural Network for Emotion Recognition From Text. *IEEE Access, Vol. 7*, pp. 111866-111878. doi: 10.1109/ACCESS.2019.2934529

6. Bradley, M.M., Lang, P.J. (1999). Affective norms for English words (ANEW): Instruction manual and affective ratings. *Technical Report C-1*. University of Florida: The Center for Research in Psychophysiology.

7. Chen, M.-H. (2006). Understanding the benefits and detriments of conflict on team creativity process. *Creativity and Innovation, Vol. 15, No. 1,* pp. 105-16.

8. Chen, M. (2022). Emotion Analysis Based on Deep Learning With Application to Research on Development of Western Culture. *Frontiers in Psychology, Vol. 13*, doi: 10.3389/fpsyg.2022.911686

9. Clarke, N. (2009). Projects are emotional: How project managers' emotional awareness can influence decisions and behaviours in projects, *Vol 3, Iss 4,* pp. 604-624, doi:10.1108/17538371011076073

10. D'Urso, V., Trentin, R. (1998). *Introduzione alla psicologia delle emozioni.* Laterza.

11. Dinov, I.D. (2018). Natural Language Processing/Text Mining. In: I.D. Dinov (ed.). *Data Science and Predictive Analytics: Biomedical and Health Applications Using R* (pp. 659-95). Cham: Springer International Publishing.

12. Ekman, P. (1992). An argument for basic emotions. *Cognition and Emotion, Vol. 6, Iss. 3-4*, pp. 169-200. doi:10.1080/02699939208411068.

13. *Emotion recognition* (2023). Wikipedia. Retrieved from: https://en.wikipedia.org/w/index.php?title=Emotion_recognition&oldid=1153310432, 31.05.2023.

14. Goleman, D. (2006). *Emotional Intelligence. Why It Can Matter More Than IQ*. 10th Anniversary Edition. New York: Random House Publishing Group.

15. Hartman, F., Jugdev, K. (1998). *Leadership undertow: Project manager fears and frustrations.* Proceedings of the 29th Annual Project Management Institute Seminars and Symposium. Long Beach, USA.

16. Hekkala, R., Stein, M.-K. (2016). Silences and Voices of Fear, Anger, and Rationality: Emotionologies in an Information Systems Project. *Emotions and Organizational Governance, Research on Emotion in Organizations*, *Vol. 12.* Leeds: Emerald Group Publishing Limited, pp. 381-408. doi: 10.1108/S1746-979120160000012012

17. Ho, V.A., Nguyen, D.H.-C., Nguyen, D.H., Pham, L.T.-V., Nguyen, D.-V., Nguyen, K.V., and Nguyen, N.L.-T. (2020). Emotion Recognition for Vietnamese Social Media Text. In: L.-M. Nguyen, X.-H. Phan, K. Hasida, S. Tojo (Eds.), *Computational Linguistics* (pp. 319-333). Springer. Doi: 10.1007/978-981-15-6168-9_27

18. Jugdev, K., Hartman, F., Thomas, J. (2000). Leadership fears and frustrations in project management. *Projects as Business Constituents and Guiding Motives*, pp. 183-192.

19. Maithri, M., Raghavendra, U., Gudigar, A., Samanth, J., Prabal Datta Barua, Murugappan, M., Chakole, Y., Acharya, U.R. (2022). Automated emotion recognition: Current trends and future perspectives. *Computer Methods and Programs in Biomedicine, Vol. 215*, pp. 106646. doi: 10.1016/j.cmpb.2022.106646

20. Mersino, A.C. (2007). *Emotional intelligence for project managers: The people skills you need to achieve outstanding results.* New York: American Management Association.

21. Minu, R.I., Ezhilarasi, R. (2012). Automatic Emotion Recognition and Classification. *Procedia Engineering, Vol. 38,* doi: 10.1016/j.proeng.2012.06.004

22. Mohammad, S.M., Turney, P.D. (2010). *Emotions Evoked by Common Words and Phrases: Using Mechanical Turk to Create an Emotion Lexicon*. Proceedings of the NAACL-HLT 2010 Workshop on Computational Approaches to Analysis and Generation of Emotion in Text. Los Angeles, pp. 26-34.

23. Mohammad, S., Turney, P. (2013). Crowdsourcing a Word-Emotion Association Lexicon. *Computational Intelligence, Vol. 29, Iss. 3*, pp. 436-465.

24. Nandwani, P., Verma, R. (2021). A review on sentiment analysis and emotion detection from text. *Social Network Analysis and Mining, Vol, 11, Iss. 1,* p. 81. doi:10.1007/s13278-021-00776-6

25. *Natural language processing*. Available online: https://en.wikipedia.org/wiki/Natural_language_processing, 31.05.2023.

26. Obaidi, M., Klünder, J. (2021) Development and Application of Sentiment Analysis Tools in Software Engineering: A Systematic Literature Review. *Evaluation and Assessment in Software Engineering*, pp. 80-89.

27. *OpenOffice.org*. Retrieved from: https://en.wikipedia.org/wiki/OpenOffice.org, 31.05.2023.

28. Plutchik, R. (1980). General Psychoevolutionary Theory of Emotion. In: R. Plutchik, H. Kellerman (Eds.), *Theories of Emotion* (pp. 3-33). Academic Press. doi:10.1016/B978-0-12-558701-3.50007-7

29. Potosky, D., Azan, W. (2023). Leadership behaviors and human agency in the valley of despair: A meta-framework for organizational change implementation. *Human resource management review, Vol. 33, Iss.1*, p. 100927.

30. Princeton University (2010). *About WordNet*. Princeton University. Retrieved from: https://wordnet.princeton.edu/, 31.05.2023.

31. Scherer, K.R., Wallbott, H.G. (1994). Evidence for universality and cultural variation of differential emotion response patterning: Correction. *Journal of Personality and Social Psychology, Vol. 67, Iss. 1*, p. 55. https://doi.org/10.1037/0022-3514.67.1.55

32. Shivhare, S.N., Khethawat, S. (2012). Emotion Detection from Text (arXiv:1205.4944). ArXiv. Retrieved from: https://doi.org/10.48550/arXiv.1205.4944, 17.05.2023.

33. Tourani, P., Yiang, Y., Adams, B. (2014). *Monitoring sentiment in open source mailing lists: exploratory study on the apache ecosystem*. Proceedings of 24th Annual International Conference on Computer Science and Software Engineering, CASCON'14, pp. 34-44.

34. Uymaz, A.H., Metin, K.S. (2022). Vector based sentiment and emotion analysis from text: A survey. *Engineering Applications of Artificial Intelligence, Vol. 113*, p. 104922. doi: 10.1016/j.engappai.2022.104922.

35. Virine, L., Trumper, M., Virine, E. (2015). Emotions in Project Management. *PM World Journal, Vol. 4, Iss. 8*, pp. 1-8.

36. Wang, L., Lin, H., Jiang, W. (2021). Effects of project leader workplace anxiety on project team member organizational citizenship behavior: A moderated mediation model. *Project Management Journal, Vol. 52, Iss. 4*, pp. 340-353.

37. Wang, Y., Feng, S., Wang, D., Yu, G., Zhang, Y. (2016). Multi-label chinese microblog emotion classification via convolutional neural network. In: Li, F., Shim, K., Zheng, K., Liu, G. (Eds.), *Web technologies and applications: APWeb 2016, vol. 9931*. Lecture notes in computer science. Cham: Springer, pp. 567-580.

38. Wang, W., Chen, X., Ning, G., Wang, Y., Song S. (2023). The relationship between anger and learning from failure: The moderating effect of resilience and project commitment. *Current Psychology, Vol. 42*, pp. 22726-22737. doi:10.1007/s12144-022-03330-5

39. Whitty, J.S. (2010). Project management artefacts and the emotions they evoke. *International Journal of Managing Projects in Business*, *Vol. 3, Iss. 1*, pp. 22-45.