VISUALIZATION OF TEXT DATA IN ENGINEERING PROJECTS

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Participation in an engineering project is becoming a new trend for students majoring in engineering. Engineering programmes around the world have begun to include multidisciplinary projects and courses in their curriculum (Tien & Hajibeigy, 2015). The project team they will work with is usually interdisciplinary and multicultural. There is a need for effective and collaborative project management.

Human language technology (HLT) can help collect, analyse, produce, and respond to engineering texts of different genres. In case of engineering projects, it can also be used to improve and speed up the communication within the project team.

Working with language technology for managing engineering projects requires broad knowledge of linguistics and computer science. Engineering texts related to projects can be very heterogeneous and interdisciplinary. Communication for the project can occur via different formats such as paper/electronic/oral/face-to-face. Nowadays there are technical opportunities to retrieve the text of any format of communication and process it.

Communication is an essential part of project management. However, "it has been found that most projects experience a breakdown in communications" (Rajkumar, 2010). Visualization is suggested in this thesis as a way of improving project communication, overcoming obstacles in communication, and processing information, resulting in saving time for students involved in the projects. Computational linguistics can assist in processing written and spoken language. As a result, new tools are being developed for creating effective visuals that will be easier to interpret and that will require less time for understanding.

Visual representations can have a disadvantage such as the loss of information. But there are more advantages. For example, effective visuals can reduce the cognitive load on the receiver (Jones, Payne, Hicks & Watts, 2013). A lot of other useful benefits

of visual presentations used for projects were mentioned by Jones, Payne, Hicks and Watts (2013). According to them, visualization can help to monitor the progress of the engineering project. “For example as a visual map of an engineered product’s status, which can be compared against the intended product specification, or as a timeline of activities and events that have occurred, showing slippages or alignments with the anticipated project schedule” (Jones, Payne, Hicks & Watts, 2013). All this information can be made visible at any time and in any place by the project team.

Another benefit is that project visuals can help find a logical basis for a decision making process. They can help to quickly see the justification of the decisions made during the project, show dependencies, for example, how some issues may affect others. De Lucia, Fasano, Grieco, and Tortora (2009) had an idea of automatic rationale identification from email repositories. It is useful “when a specification has to be re-examined, e.g. for reuse, for validation, or to satisfy stakeholders that a decision is warranted” (Jones, Payne, Hicks & Watts, 2013). Decision-making templates such as decision trees simplify the project workflows, help to see the outcomes of decisions and track all possible solutions.

Time tracking visuals are useful for controlling work hours across students’ engineering projects. Visuals showing history of the project, time of the important phases of the project can improve team interaction and quickly update students.

Moreover, visual representation can track feedback and demonstrate the style and politeness of communication. Visuals with different colours identifying different tones (positive, negative, neutral) of messages/emails of the sender and receiver can be used. They can help to track pressure points and the times at which supervisor intervention is needed. Besides, visual representations can depict the feedback of the customer as positive, negative or neutral and mark it with different colours.

Project visuals are helpful for solving project problems. They can identify important issues of the projects and show the connections between them.

Additional benefits are project information classification and task prioritisations. For example, some visuals can depict classification of emails according to these groups: information, management, problem solving (Jones, Payne, Hicks & Watts,

2013). Besides, visuals can group emails according to tasks and the priority they are given (Jones, Payne, Hicks & Watts, 2013). This way, the most important emails will be answered first.

Visuals are beneficial for team management, particularly, to gather team ideas and to check the efficiency of the team. For example: visuals showing anonymous polls of the team can help identify the person with a lack of awareness about the project, bad communication with the team or to 86oncorda the one who is considered to be the expert on the project or a leader and innovator. These visuals can be very important because some of the major communication obstacles in the way of project implementation can appear between student teams involved in the project.

To check team loading issues, diagrams showing which people are receiving the biggest number of emails are useful. Last but not least is that visuals help keep analytics of an engineering project accessible and easily visible whenever needed.

To conclude, automated visualization design processes can help to process linguistic information and manage an engineering project efficiently. The era of visual project management has replaced the era of multi-page, text-based project communication (Williams, 2015). Visualisation of the project helps to plan, monitor and analyse the work of the project team. Real-time collaborative visual creation opportunities open new perspectives for effective engineering project work by students.

References

De Lucia, A., Fasano, F., Grieco, C., Tortora, G. (2009). Recovering Design Rationale from Email Repositories. *Proceedings of 25th IEEE International Conference on Software Maintenance* (pp. 543-546). IEEE Press. https://doi.org/10.1109/ICSM.2009.5306388

Jones, S., Payne, S., Hicks, B., & Watts, L. (2013). Visualization of heterogeneous text data in collaborative engineering projects. *The 3rd IEEE Workshop on Interactive Visual Text Analytics*. University of Bath. Retrieved from: https://cpb-eu-w2.wpmucdn.com/blogs.bristol.ac.uk/dist/e/351/files/2018/09/jones-2013-text data-1o1 zch4.pdf

Rajkumar, S. (2010). Art of communication in project management. *PMI® Research Conference: Defining the Future of Project Management.* Project Management Institute. Retrieved from: https://www.pmi.org/learning/library/effective-communication-better-project-management-6480

Tien, D. T. K., & Hajibeigy, M. T. (2015). The multidisciplinary engineering project's contribution towards holistic education: A case study. In *Taylor's 7th Teaching and Learning Conference 2014 Proceedings* (pp. 269-278). Springer, Singapore. https://doi.org/10.1007/978-981-287-399-6_25

Williams, P. R. (2015). Visual project management. *PMI® Global Congress 2015 – EMEA*, London, England. Newtown Square, PA: Project Management Institute. Retrieved from: https://www.pmi.org/learning/library/visual-project-management-visual-elements-9862