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Computational Team Dynamics and Interaction Patterns in New Product Development Teams

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Abstract : New Product Development (NPD) is invariably a team effort and involves effective teamwork. NPD team has members from different disciplines coming together and working through the different phases all the way from conceptual design phase till the production and product roll out. Creativity and Innovation are some of the key factors of successful NPD. Team members going through the different phases of NPD interact and work closely yet challenge each other during the design phases to brainstorm on ideas and later converge to work together. These two traits require the teams to have a divergent and a convergent thinking simultaneously. There needs to be a good balance. The team dynamics invariably result in conflicts among team members. While some amount of conflict (ideational conflict) is desirable in NPD teams to be creative as a group, relational conflicts (or discords among members) could be detrimental to teamwork. Team communication truly reflect these tensions and team dynamics. In this research, team communication (emails) between the members of the NPD teams is considered for analysis. The email communication is processed through a semantic analysis algorithm (LSA) to analyze the content of communication and a semantic similarity analysis to arrive at a social network graph that depicts the communication amongst team members based on the content of communication. The amount of communication (content and not frequency of communication) defines the interaction strength between the members. Social network adjacency matrix is thus obtained for the team. Standard social network analysis techniques based on the Adjacency Matrix (AM) and Dichotomized Adjacency Matrix (DAM) based on network density yield network graphs and network metrics like centrality. The social network graphs are then rendered for visual representation using a Metric Multi-Dimensional Scaling (MMDS) algorithm for node placements and arcs connecting the nodes (representing team members) are drawn. The distance of the nodes in the placement represents the tie-strength between the members. Stronger tie-strengths render nodes closer. Overall visual representation of the social network graph provides a clear picture of the team's interactions. This research reveals four distinct patterns of team interaction that are clearly identifiable in the visual representation of the social network graph and have a clearly defined computational scheme. The four computational patterns of team interaction defined are Central Member Pattern (CMP), Subgroup and Aloof member Pattern (SAP), Isolate Member Pattern (IMP), and Pendant Member Pattern (PMP). Each of these patterns has a team dynamics implication in terms of the conflict level in the team. For instance, Isolate member pattern, clearly points to a near break-down in communication with the member and hence a possible high conflict level, whereas the subgroup or aloof member pattern points to a non-uniform information flow in the team and some moderate level of conflict. These pattern classifications of teams are then compared and correlated to the real level of conflict in the teams as indicated by the team members through an elaborate self-evaluation, team reflection, feedback form and results show a good correlation.

Keywords : team dynamics, team communication, team interactions, social network analysis, sna, new product development, latent semantic analysis, LSA, NPD teams
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