The Virtual Team Maturity Model (VTMM) for real Virtual Project Team Performance

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ABSTRACT

This paper proposes a process-oriented maturity model for virtual teams called VTMM – Virtual Team Maturity Model. The model is composed of 11 processes; all described with inputs, methods, outputs and key performance indicators (KPI’s). VTMM was validated through three rounds of Delphi research method with an expert panel of over 80 participants. The high-level results of the Delphi validation and the shortfalls of application of virtual team processes are discussed in this paper.

Keywords: Virtual Team, Maturity Model, Performance, Improvement, Work Processes, Culture, Key Performance Indicators.

VIRTUAL TEAMS

Projects are getting more complex as more work is distributed globally in an environment, where technology advances rapidly and customer expectations grow [1, 2]. With these changes new ways of organizing work are being established: virtual teams. A common type of virtual team is a project team which is distributed geographically and is mainly focused on producing deliverables for stakeholders and has the added ability to make decisions [3]. For example in so-called onsite/offshore organizations some team members are located in Europe while other team members work from their location in low cost countries [4]. Several studies highlight the growing application of virtual teams globally [5, 6].

CHALLENGES WITHIN VIRTUAL TEAMWORK

However, despite the rise of interest in virtual teams there are considerable challenges that need to be addressed. Early researchers note that virtual teamwork practices require different competencies and skills from team members [7, 8, 9].

It has been observed by Nemiro et al. [10] that a virtual team has to manage external factors (distance, time and technology) and actively address internal ones (culture, trust and leadership).

Teams are established in organizations to achieve specific tasks which cannot be carried out by individuals alone. The tasks need to be completed within budget, meet stakeholder’s expectations and frequently have tough deadlines to meet. Normally experts are located in many different spaces [11]. Business needs require these experts working together through computer-mediated communication. Organizations expect that these experts perform effectively and efficiently on virtual teams to achieve task completion as described above. However, research shows that working in a virtual team is different than working in a traditional co-located team. Piccoli and Ives [12] showed evidence that management principles successfully applied in co-located teams lead to negative results regarding trust in virtual teams and that leaders are facing a dilemma, when applying behavior control in virtual teams.

As all these challenges cannot be captured in a single function and as the challenges address completely different elements and disciplines, Nemiro suggests a process model as a promising approach to successful virtual team performance. We follow up these finding by developing a maturity model to guide organizations on best practices, as recommended by our research methodology outlined below, which includes validation in a comprehensive industry based assessment.

The focus of the research was on practitioners in the IT-industry. IT-practitioners think in processes and models as these are core
tools in this industry. In industry-standards, a process is defined as an activity with inputs, tools & techniques and outputs (see PMI’s *PMBOK Guide*, [13]). This is a similar definition of a process used by organizational psychologists [14, 15, 11, 16], which also describe processes. VTM extends Nemiro’s [10] and Marks et al. [14] proposal to integrate the different elements and disciplines challenging virtual teamwork into a proven framework of organizational processes and transferring it into virtual teamwork. VTM is also influenced by the work of Jehle [17] and Zofi [18].

**VTMM HAS THREE KEY COMPONENTS**

1) A process model with 11 processes (organize get-to-know-each-other, set goals, agree rules, perform task management, give & receive feedback, organize decision-making, conduct, meeting management, engage in trust-building, define information management, give rewards & recognitions, arrange ramping-down), defined in terms of inputs, methods and outputs.

2) Key Performance Indicators for each of the 11 processes.

3) Four defined maturity levels (undefined, basic, advance, mastery) as described by Friedrich [19].

Maturity Models provide a set of best practices that address productivity, performance, costs, and stakeholder satisfaction [20]. They provide a valuable analysis framework to assess team performance [21]. Assessments on team performance are vital to predicting successful virtual team collaboration [22]. The VTM is designed to assess the current maturity of a virtual team and proposes clear steps to improve the virtual team performance quickly.

Starting with an extensive literature review, followed with structured interviews with experts a set of two requirements of a virtual team process model leading to virtual team performance improvements was proposed:

R1: *The model shall be prescriptive so that it can be applied by non-specialists without an understanding of organizational psychology.*

R2: *The model shall be robust within the dynamics of the virtual team processes. This means, if there are influences from the environment of the team or within the team, the model should show variances so that the team leader can initiate improvement activities.*

**VTMM DEVELOPMENT PHASES**

1) A literature review on virtual teams and virtual team performance.

2) A validation of the model developed from the literature review through a Delphi process with an expert panel of over 80 participants coming from the field of IT project management mainly.

3) A pilot implementation of VTMM on a permanent virtual work team [23].

Within the development of VTMM, an expert panel of 80 members was established. In three Delphi rounds, the results were refined; inputs, methods and outputs optimized as well as the KPIs and maturity levels. The Delphi method has already proved to be a very effective tool during the development of the Organizational Project Management Maturity Model, OPM3®, an internationally acknowledged best-practice standard for assessing and developing competences in different areas of Project Management [24].

The 11 processes have been validated by several authors for virtual teamwork performance improvement [24, 25, 26, 27, 28], but have not yet been incorporated into a maturity model.

A first pilot field study provided a positive feedback of VTMM [23].

**VTMM PROCESS MODEL**

The table below shows the VTMM process model:

<table>
<thead>
<tr>
<th>Process</th>
<th>Inputs</th>
<th>Methods</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organize Get-to-know-each-other</td>
<td>Team members local environment</td>
<td>Personal introductions, Expert knowledge</td>
<td>Initial Team Culture</td>
</tr>
<tr>
<td>Agree Rules</td>
<td>Team members local environment, Cultural Orientations</td>
<td>Collaboration meeting, Signing process</td>
<td>Team charter, Leadership charter, Team constitution</td>
</tr>
<tr>
<td>Set Goals</td>
<td>Task briefing, Task descriptions, Project briefing</td>
<td>Decomposition, Creative techniques, Commitment rituals, Expert judgement</td>
<td>Agreed team goals, Committed team members</td>
</tr>
<tr>
<td>Give and receive Feedback</td>
<td>Motivational measurements, Written comments, Verbal comments, Cultural orientations</td>
<td>Feedback meeting, Written Feedback Surveys</td>
<td>Improved Team Performance, Resolved conflicts, Increased personal satisfaction</td>
</tr>
<tr>
<td>Organize Decision-Making</td>
<td>Open decisions, Decision-making rules, Cultural orientations</td>
<td>Decision-making meeting</td>
<td>Team decisions, Postponed decisions, Escalated Decisions</td>
</tr>
</tbody>
</table>
When agreement from round 2 on other KPIs, this remained the same for round 3. The Delphi panel was composed of over 80 experts and practitioners in the field. The objective of the Delphi was to have different qualities and are mapped to the four maturity levels of VTMM. Table 1 below: Consent on the importance of the 11 processes was high from the first round on (see Table 2). When agreement from round 2 on the statement “extremely and very important process for performance of a virtual team” was tested in a simple Yes or No question, it ranged between 95% and 100% agreement for all the 11 processes of VTMM. This remained the same for round 3 except for the process of Rules. Interestingly 98% of the participants agreed to the high importance of the process in round 2, but only 85% of the participants confirmed its high importance in round 3, making it the least important process in this round. As a possible explanation might be that the process of rules seemed to have been clear to most participants from the beginning. No adjustments to the definition, input, methods or outputs were suggested after the first round, while other processes components have been redefined and discussed. Possibly the clear definitions of the process of rules was diminishing while the focus of the survey was shifted to other processes.

This phenomenon can also be a factor for the slight decline in agreement on the processes of Meeting Management, Information Management and Reward and Recognition. Never-the-less, except for the process of Rules, 95% to 100% of the participants agreed to the importance of the processes after the third round of questioning. Therefore consensus has been reached regarding 10 out of 11 processes of VTMM as important for the success of virtual teams.

After the convincing approval of the 11 processes in round 1, it was investigated how much the processes were present in practice and corresponding questions were added to each process in round 2. Among the findings of round 2, it becomes obvious, that while the importance of the 11 different processes were commonly agreed upon, ranging between 100% and 95%, there is not much evidence of their implementation in actual projects, ranging between 18% and 59% (see Figure 1).

Also no significant correlation could be found regarding the importance of a process and its implementation in practice.

<table>
<thead>
<tr>
<th>Process</th>
<th>Inputs</th>
<th>Methods</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct Meeting-Management</td>
<td>- Agenda and invitations</td>
<td>- Virtual collaboration tools</td>
<td>- Meeting minutes</td>
</tr>
<tr>
<td></td>
<td>- Minutes of previous meetings</td>
<td>- Specific Meetings</td>
<td>- Update of Related Documents</td>
</tr>
<tr>
<td></td>
<td>- Meeting rules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engage in Trust-Building</td>
<td>- Personal Information</td>
<td>- Social media and networks</td>
<td>- Improved team performance</td>
</tr>
<tr>
<td></td>
<td>- Informal Communication Skills</td>
<td>- Virtual Teambuilding</td>
<td>- Higher Team Maturity</td>
</tr>
<tr>
<td></td>
<td>- Cultural Orientations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define Information-Management</td>
<td>- Documents</td>
<td>- File management systems</td>
<td>- Structured information</td>
</tr>
<tr>
<td></td>
<td>- Rules of document management</td>
<td>- Document management systems</td>
<td>- Maintained documents</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Virtual team information system</td>
<td></td>
</tr>
<tr>
<td>Give Rewards &amp; Recognitions</td>
<td>- Nominations</td>
<td>- Appraisal Meetings</td>
<td>- Increased Team Performance</td>
</tr>
<tr>
<td></td>
<td>- Rules of reward &amp; recognition</td>
<td>- Awards</td>
<td>- Increased Personal Performance</td>
</tr>
<tr>
<td></td>
<td>- Cultural Orientations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrange Ramping Down</td>
<td>- Team charter</td>
<td>- Lessons learned meeting</td>
<td>- Lessons learned report</td>
</tr>
<tr>
<td></td>
<td>- Leadership charter</td>
<td>- Good-bye meeting</td>
<td>- „Dissolved“ Teams</td>
</tr>
<tr>
<td></td>
<td>- Personal contributions</td>
<td></td>
<td>- Improved Virtual Team Skills</td>
</tr>
<tr>
<td></td>
<td>- Team Success</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Agreement to extreme or high importance of VTMM processes in % in all three rounds

<table>
<thead>
<tr>
<th>Process</th>
<th># 1</th>
<th># 2</th>
<th># 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organize</td>
<td>0.95</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Get-to-know-each-other</td>
<td>0.90</td>
<td>0.98</td>
<td>0.85</td>
</tr>
<tr>
<td>Agree Rules</td>
<td>0.95</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Table 1: VTMM Process Model

The processes have Key Performance Indicators (KPIs). These KPIs have different qualities and are mapped to the four maturity levels of VTMM [23].

THE DELPHI VALIDATION OF VTMM

VTMM was validated over three rounds of Delphi validation. The Delphi expert panel was composed of over 80 experts and practitioners in the field. The objective of the Delphi was to validate the relevance of the processes, inputs, methods, outputs, KPIs and level descriptions of VTMM. The result of the validation is shown in Table 2 below:
Only instrumental organizational processes such as Task Management, Decision Management, Meeting Management and Information Management were implemented in 50% of the survey’s participants’ actual projects.

When asked for an explanation for not implementing the processes of VTMM that were considered important, team leaders came up with different reasons (see Figure 2).

Interestingly the most frequent explanation for not having implemented an acknowledged process in the actual project was the declared lack of a formal process and corresponding leadership (63%), showing a clear need for a formally structured model. Next to this reasons for not engaging in virtual team performance improvements were lack of personal and communication skills (51%) and process not understood (52%).

Less than half of all participants (49%) held time pressure, very likely to be present in all projects and teamwork situations, responsible for the lack of a process. This means 51% of the participants would make time for improvements in virtual teamwork available, if other restricting obstacles could be overcome. Also, the budget restrictions as a strong determining factor in many work situations was blamed for not implementing a process by only 23%.

Special challenges of a virtual working environment, like technology and cultural diversity were held responsible for the absence of a process by less than 40% of the participants. These results give evidence to the declared need and appetite for a model that would provide a guideline for virtual teams regarding structured processes and leadership, while addressing personal, communication skills and cultural issues.

Special attention was put on the processes of Socializing and Ramping Down after the results of round 1 showed a clear difference in its importance (70% and 60% of agreement) compared to the other processes (see Figure 2).

For both processes the rating of importance was increased in round 2, when the results of the previous round, the average rating on this statement, were made known to all participants. This influenced consensus on these processes within the panel of experts. The rating for Ramping Down increased from 60% to 95% and the rating for the process of Socializing increased from 70% to 97%. Also, a correlation was found between the number of years of experience in virtual teamwork and the rating of the process of Socializing as important. This correlation was found applying Kendall-Tau (0.53) and Spearman Rho (0.58) before the Bonferroni adjustment. With the Bonferroni method for correction reducing this correlation in observed data below (0.5), it was still considered significant, taking into account the rather conservative approach of Bonferroni correction [29] and its ability to reduce statistical power [30].

CONCLUSION

The following requirements have been validated:

R1: The model shall be prescriptive so that it can be applied without an understanding of organizational psychology. This requirement has been validated positively. The expert panel understood the model and was able to provide feedback.

R2: The model shall be robust against dynamics in the virtual team processes. This means if there are influences from the environment of the team or within the team, the model should facilitate variances so that the team leader can initiate improvement activities. This requirement is validated partly through the Delphi and will be further validated through the www.vtmm.org community, where virtual teams will be able to use the model.

Interestingly, the knowledge of virtual team processes is low in practice. This seems to be a major short-coming in virtual teamwork and a possible root cause for the poor performance of many virtual teams. To implement the processes on a virtual team, the team leader needs to understand the processes and define them together with the team members. Then the whole team needs to be trained on the communication processes. The virtual team performance can be improved through clearly defined communication processes. It is likely that virtual team performance can be close to the performance of co-located teams with the right communication processes in place.

REFERENCES


