A process-driven Socio-Technical approach to engineering high-performance organisations

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ABSTRACT

For organisations, achieving the transition from competence to high-performance can be an elusive goal. The transition requires a systematic, consistent improvement that is difficult to sustain over time. Process models are a recognized way to achieve consistent, repeatable results, yet such models have had limited success when applied to the so-called “soft” areas of organisational behavior. Recent work done in the Software Engineering process improvement discipline has seen a new category of process reference model come into existence, one which is designed to address soft areas of organisational performance. This paper introduces a Reference Model of Organisational Behavior for the leadership of complex virtual teams that has proved effective in industry trials. While it deals with leadership, the approach outlined can be generalized to other aspects of organisational behavior such as innovation and competencies / capabilities, creativity and resilience to adversity, to name a few.

Keywords: process, process model, Sociotechnical, organisational behavior, software engineering process improvement.

INTRODUCTION

The Reference Model of Organisational Behavior (RMOB) approach outlined in this paper is a hybrid of Sociotechnical and Software Engineering methods. RMOB’s seek to optimise the interaction between people and technology within the organisation context.

Reference Models of Organisational Behavior take a previously difficult to describe “soft” concept such as Leadership and deconstructs it so that its underlying components can be described in process-oriented terms and used for capability assessment and process improvement purposes (Tuffley, 2010). It does this by using proven process modelling techniques derived from the Software Engineering domain.

In Sociotechnical terms, this approach applies a process-derived understanding of leadership to the important matter of optimising organisational work design in a way that is sensitive to the
complex interactions between people and processes/structures in the organisation. Beyond Leadership, this approach could arguably be applied with good effect to other soft organisational issues like Culture, Innovation and Capabilities. These important concepts must be understood if we are to model and manage all of the important activities that occur within the modern Organization (Tuffley, 2010).

The outcome of the on-going research project that underlies this paper supports this conclusion. In preliminary trials, the Reference Model of Organisational Behavior appears to be an effective tool for describing organisational behavior. A model such as this defines organisational behavior that, if performed repeatedly, will result in consistently achieving the prescribed purpose.

There is no reason why a process model that describes organisational behavior should be restricted to the software engineering domain. There is nothing in the model that would restrict its scope in such a way. It is generic and applicable to a broad range of Design disciplines and domains, making it of potential interest and use to the business community at large.

In earlier software engineering-related process models the focus was on conformance to prescribed activities and tasks. The Leadership RMOB re-focuses attention from prescriptive conformance to a focus on the demonstration of desired organizational behavior.

1. CAN LEADERSHIP BE DESCRIBED AS A PROCESS?

It is reasonable to ask this question, since leadership is a difficult topic to define, much less describe in process-oriented terms (Takeda et al, 1980). Many people doubt that leadership is something that can even be learned, subscribing as they do the view that leaders are born not made.

Leadership has been observed and studied for countless generations, yet interestingly little consensus exists as to what constitutes true leadership. It has been the subject of intense and on-going controversy among psychologists, sociologists, historians, political scientists and management researchers (Yukl, 1994). It is interesting to note that no universally accepted definition of leadership has been developed. The operational definition of leadership has much to do with the purpose of the researcher (Yukl, 1994).

Yet observers like Peter Drucker (1996) and Warren Bennis (1994, 1985) are clearly of the opinion that leadership can indeed be learned by those prepared to make sufficient effort.

Can leadership be defined as a process? W. Edwards Deming (2000) famously observed that, if you cannot describe what you are doing as a process, then you don’t know what you are doing. Assuming that the leadership factors could be identified from a broad literature review, then a RMOB is a logical way for these factors to be formalized and applied in real situations.

2. COPING WITH ORGANISATIONAL COMPLEXITY

Managing complex projects across dispersed geographical locations has never been more difficult, given the rising complexity of the global economic environment and the multi-national corporate entities that now inhabit this world. There is a clear need to find improved ways of managing this often difficult process now and into the future (Herbsleb & Moitra, 2001).

RMOB’s are an implementation of the Software Engineering discipline known as Model Based Process Improvement (MBPI) which provides a suitable framework around which the definition of leadership processes can occur. This approach has not been used (to the knowledge of the author) to address leadership, though there is arguably a sound basis for thinking that it can be used in this way.

MBPI aims generally to improve the performance and maturity of an organisation’s processes (Heston & Phifer, 2009). It combines the discipline of process improvement with the several
international standards and frameworks now in use (i.e. ISO/IEC 15504, Capability Maturity Model, Integrated). Combining this awareness of process performance with internationally recognized standards is advantageous to organisations. It affords a structured and comprehensive framework as a way forward and prescribes in general terms the scope of activities required to systematically improve their process maturity.

Heston and Phifer (2009) ascribe the following organisational benefits to MBPI:

- **Improving consistency and repeatability**: consistency and repeatability assist with minimising process variation, a major source of product defects. It also allows project staff to move into and out of projects more easily by having clearly defined roles and responsibilities.
- **Improving communication**: achieved through the adoption of a common vocabulary with clearly prescribed meanings that allows project staff, clients and business partners to communicate with less ambiguity.
- **Enabling more improvement**: process improvement programs create an environment which is conducive to further improvement. Beyond consistency and repeatability comes the ability to measure and record process performance. This performance data can then be used to plan further improvements and to benchmark against best practice.
- **Providing motivation**: objective targets, for example being assessed at a certain level of maturity, become a visible motivator for project staff to maintain their efforts to improve process performance.

### 3. RMOB ARCHITECTURE & CONTENT

#### 3.1 Architecture

The format and content of Process Reference Models in Software Engineering are prescribed by certain international standards (ISO/IEC 15504-2:2003 and ISO/IEC 24774:2007) and these have been faithfully followed in this project.

A survey of the leadership and process model literature in academic library catalogues showed little research covering the specific topic of this project. The search included Biology, Life Sciences, and Environmental Science; Business, Administration, Finance, and Economics; Chemistry and Materials Science; Engineering, Computer Science, Mathematics; Medicine, Pharmacology, Veterinary Science; Physics, Astronomy, and Planetary Science; Social Sciences, Arts, and Humanities.

Leadership of complex teams in virtual environments therefore represents a largely vacant intersection between the areas of teams, virtual teams, complex teams and effective leadership. The following architecture for the Reference Model of Organisational Behavior (RMOB) was devised.

1. **Generic Leadership Skills**: There is a generic set of leadership skills/qualities that will apply in both face-to-face and virtual team environments. This generic set is identified and distilled from the wealth of leadership research over time.
2. **Specific examples of practices for integrated (complex) teams**: The integrated teaming goals and practices of CMMI-Integrated Product & Process Development extension (2011) constitute leadership criteria by default in the sense that someone has to give effect to them, and that will be the responsibility of the leader.
3. **Specific Virtual Environment Challenges for Leaders**: The virtual teaming challenges outlined by Bell & Kozlowski (2002) will be successfully met by an effective leader. These factors have been hypothesised by Bell & Kozlowski as being specific factors influencing the success of virtual team leaders.
This RMOB architecture also theoretically allows for application to virtual teams only, and integrated teams only by using the generic leadership layer plus the relevant virtual or integrated factor layer.

This RMOB architecture would also be applicable to the generic leadership capability of a conventional co-located team that is neither virtual nor integrated.

Maximum flexibility is desirable in this project to allow for the widest range of future research possibilities and practitioner applicability.

3.2 Content

Using the structure and content headings obtained from the two ISO/IEC standards mentioned above, the following sets of leadership factors, as derived from the literature are incorporated to produce the V0.1 RMOB.

The leadership factors are represented in mind-map format deliberately to imply that there is no particular order that these should be performed, rather that they comprise constellations of factors that collectively represent leadership.

Figure 1: Generic Leadership Factors
Figure 2: Integrated Leadership Factors

Integrated Team Leadership Factors

- Project/organizational shared vision
- Rules and guidelines for integrated teams
- Project's work environment
- Integrated team structure
- Balance team/home organization duties
- Establish integrated teams
- Collaboration among interfacing teams
- Empowerment mechanisms

Figure 3: Virtual Leadership Factors

Virtual Team Leadership Factors

- Team development functions in discrete life cycle projects
- Provide synchronous, information-rich communications
- Roles and tasks synchronous
- Self-regulation functions across multiple boundaries
- Recruit required expertise
- Manage team boundaries
- Stable team membership
- Performance management to compensate temporal distribution
- Operating procedures for performance regulation
- Team development functions in response to real-time requirement
The leadership characteristics, seen as elements in the cluster diagrams above are grouped according to the three categories (generic, integrated, virtual) and rendered into the prescribed Process Reference Model format, a sample of which appears below:

Create a shared vision
Purpose: to perceive a guiding principle/idea that captures the imagination of members to create a shared vision and inspire them to realise that vision. An aspect of charisma.
Outcomes: as a result of the successful implementation of creating a shared vision:
1. The leader perceives and formulates a unified vision of what is to be accomplished, ideally seen as an accomplished fact.
2. The leader develops a strong commitment to the achievement of that vision, based on a sense of rightness and timeliness, such that they have sufficient resilience to overcome goal frustrating events.
3. The leader develops a clear and unambiguous set of objectives or goals that are concrete and achievable.

Elaboration: the shared vision is a clear and unambiguous expression of an envisioned future. It is the basis for a common understanding among stakeholders of the aspirations and governing ideals of the team in the context of that desired outcome. Conditional on being effectively communicated by the leader to the team, the shared vision grounds the team’s governing ideas and principles and allows for appropriate objectives to be derived.

Highly effective groups are often convinced they are engaged in important work, sometimes nothing short of being on a ‘mission from God’. The work becomes an abiding obsession, a quest that goes well beyond mere employment. This intensely shared vision and sense of purpose endows cohesion and persistence.

After the six reviews, the Create a shared vision process was improved to become:

Vision
Purpose: The purpose of the vision process is to create and communicate a shared vision in ways that inspires people to realise that vision.
Outcomes: As a result of the successful implementation of shared vision process:
1. A vision of the goal(s) is created.
2. The vision of the goal(s) is communicated to the team.
3. Commitment by team to the shared vision is gained.

Informative Notes
Outcome 1 -- the vision of the goal is seen by the leader as achievable. The goals will still be abstract at this point. The goal(s) become concrete when translated into objective(s).
Outcome 2 -- the shared vision should be communicated in a way that creates positive expectation among the team.
Outcome 3 -- the way in which the shared vision of the abstract goal(s) is communicated should generate strong commitment to the achievement of the goal(s)

General:
The shared vision is a clear and unambiguous expression of an envisioned future. It is the basis for a common understanding among stakeholders of the aspirations and governing ideals of the team in the context of that desired outcome. Conditional on being effectively communicated by the leader to the team, the shared vision grounds the team’s governing ideas and principles and allows for appropriate objectives to be derived.

Highly effective groups are often convinced they are engaged in important work, sometimes nothing short of being on a ‘mission from God’. The work becomes an abiding obsession, a quest that goes well beyond mere employment. This intensely shared vision and sense of purpose endows cohesion and persistence.
Creating and communicating a compelling vision of the future is an aspect of charisma; inspirational motivation, optimism, individualized consideration and contingent reward all appear to optimise team performance by creative a positive affective climate.

In summary when promulgating a shared vision, the following factors should be considered:

1. the project’s objectives
2. the conditions and outcomes the project will create
3. interfaces the project needs to maintain
4. the visions created by interfacing groups
5. the constraints imposed by outside authorities (e.g., environmental regulations)

Project operation while working to achieve its objectives (both principles and behaviors)

4. DATA COLLECTION METHOD

As mentioned, a Reference Model of Organizational Behavior (RMOB) is a formal expression of a set of behaviors that if performed over time will bring about desirable outcomes. A RMOB has a statement of purpose and outcome, with the outcomes collectively achieving the purpose. V0.1 RMOB emerged from the literature review, formatted in the way shown below.

4.1 Draft Process Reference Model (V0.1 RMOB)

The draft RMOB that emerged from the literature review is developed in compliance with ISO/IEC 15504-2:2003 and ISO/IEC 24774:2007 (the two standards that collectively prescribe how RMOB’s in software engineering should look). An example is seen in the table below. In addition to the process name, purpose and outcome(s), informative material is included to provide context and clarification of the purpose and outcomes to assist the user. The V0.1 RMOB is then ready for review (data collection).

1.1 Create and communicate a shared vision

**Purpose:** to perceive and communicate a guiding principle/idea that captures the imagination of members to create a shared vision and inspire them with the enthusiasm to realise that vision. An aspect of charisma.

**Outcomes:** as a result of the successful implementation of creating a shared vision:

1. The leader perceives and formulates a unified vision of what is to be accomplished, ideally seen as an accomplished fact.
   *Activities and/or artefacts to support:*

2. Leader communicates shared unified vision with team, ideally seen as an accomplished fact.
   *Activities and/or artefacts to support:*

3. Leader develops strong commitment to achieving vision, based on a sense of rightness and timeliness, such that they have sufficient resilience to overcome goal frustrating events
   *Activities and/or artefacts to support:*

4. The leader develops a clear and unambiguous set of objectives or goals that are concrete and achievable.
   *Activities and/or artefacts to support:*

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**RAW TEXT END**
5. Leader engenders hope/optimism towards achieving the objectives.

Activities and/or artefacts to support:

*Elaboration*: the shared vision is a clear and unambiguous expression of an envisioned future. It is the basis for a common understanding among stakeholders of the aspirations and governing ideals of the team in the context of that desired outcome. Conditional on being effectively communicated by the leader to the team, the shared vision grounds the team’s governing ideas and principles and allows for appropriate objectives to be derived.

Table 1: Extract from draft RMOB to illustrate data collection method

### 6.2 Data collection

Data collection is by a series of walk-through interviews with project manager participants from organisations operating integrated virtual teams. The purpose is to investigate whether there is *objective evidence* of process performance (base practices and work products) to indicate that the outcomes are being achieved.

If an outcome can be substantiated, it remains in the RMOB. If objective evidence in the form of an activity or artefact cannot be found, then according to the normative ISO standards that outcome cannot remain in the RMOB. In this event, the outcome can be reframed or merged with another of a similar nature. Evidence of artefacts and/or activities is recorded on the space provided on the interview form.

A total of six reviews were performed:

*Stage 1 review*: four interviews with project manager participants from organisations operating virtual teams in which the V0.1 RMOB is walked-through looking for objective evidence for the performance of each outcome. These were drawn principally from the defence contracting and general commercial IT industry sectors.

*Stage 2 review*: four interviews with different project manager participants from organisations operating virtual teams in which the V0.2 RMOB is walked-through looking for anything that does not make sense. These were drawn principally from the defence contracting and general commercial IT industry sectors.

*Stage 3 review*: researcher only (performing ISO/IEC 24774 compliance analysis on the V0.3 RMOB).

*Stage 4 review*: researcher performing a Behavior Tree notation analysis on the V0.4 RMOB (Behavior Tree notation is part of a broader formal method known as Behavior Engineering, developed by Dromey (2006) to verify software requirements by imposing a formal syntax on the expression of said requirements. This method has been adapted for use as a verification tool for model developers).

*Stage 5 review*: Expert Panel review on the V0.5 RMOB.

*Stage 6 review*: researcher performing a Composition Tree notation analysis on the V0.6 RMOB producing the V1.0 RMOB at the end of the process. (Composition Tree notation is another part of the formal method Behavior Engineering, developed by Dromey (2006) to verify software requirements by developing a vocabulary of terms used in a specification to identify synonyms, redundancies and other ambiguities).

### 5. PRELIMINARY TRIALS

Subsequent to the development and baseline release (V1.0 RMOB) of the Process Reference Model, a detailed review session with four project managers of virtual teams was conducted. Substantial improvements were identified which collectively contributed to the development of
V1.1 RMOB. The consensus view of the four participants was that the RMOB was a useable tool that they could apply in their own practice. Further reviews and research will be conducted to further validate the usefulness of the V1.1 RMOB leading to further improvements and subsequent releases. These preliminary results have been encouraging and point the way to future trials.

6. CONCLUSIONS

The process reference model approach outlined in this paper is broadly consistent with the Sociotechnical perspective. It takes a previously difficult to describe “soft” concept such as Leadership and deconstructs it so that its underlying components can be described in process-oriented terms and used for capability assessment and process improvement purposes.

In Sociotechnical terms, this approach applies a process-derived understanding of leadership to the optimising of complex organisational work design in a way that is sensitive to the complex interactions between people and processes/structures in the organisation. Beyond Leadership, this approach could arguably be applied to other soft organisational issues like Culture, Innovation and Capabilities. These important concepts must be understood if we are to model and manage all of the important activities that occur within the modern Organization.

The outcomes of the research project that underlies this paper support the conclusion that a Reference Model of Organisational Behavior is an effective tool for describing organisational behavior, though this question needs further exploration. A model such as this defines organisational behavior that, if performed repeatedly, will result in consistently achieving the prescribed purpose.

There is no reason why a process model that describes organisational behavior should be restricted to the software engineering domain. There is nothing in the model that would restrict its scope in such a way. It is generic and applicable to a broad range of industries.

In earlier software engineering-related process models the focus was on conformance to prescribed activities and tasks. The Leadership RMOB re-focuses attention from prescriptive conformance to a focus on the demonstration of desired organizational behavior.

The method outlined in this paper may therefore be of considerable interest to researchers and professionals from many disciplines and domains by providing the means by which any desirable behavior may be defined in a process model and subsequently applied in the organisation. In this project, the difficult to define topic of leadership has been distilled into a generic model for leadership, and subsequently found to be useful by project managers operating virtual teams. The same model could be applied in any project environment to improve the leadership abilities of the project manager.

REFERENCES


