Collaboration behavior enhancement in co-development networks

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Samenvatting

Organisaties komen steeds vaker veranderingen en uitdagende situaties tegen waar ze geen invloed op hebben, en individueel lukt het ze niet om businesskansen in de markt te benutten. Daarom verschuiven de traditionele organisatiestructuren langzaam naar samenwerkingsnetwerken van organisaties (Engels: collaborative networks of organizations), waaronder Virtuele Organisaties (VO). VOs zijn voor korte termijn en doelgericht. VOs moeten op dynamische en vloeiende wijze opgericht en gevestigd kunnen worden, om in te spelen op een ontstane kans in de markt en te concurreren met grote organisaties. Het bestaan van een strategische alliantie van organisaties in een sector, die de noodzakelijke basiscondities en -mechanismen verzorgt, is een bewezen voorwaarde voor het faciliteren van dynamische creatie en succesvolle werking van VOs. Dergelijke langetermijnsamenwerkingsnetwerken, ook wel VO Breeding Environments (VBE) genoemd, zijn al in veel industriële sectoren zichtbaar.

Geanalyseerde gegevens verzameld bij samenwerkende organisaties in VOs tonen aan dat het meeste VO-falen veroorzaakt worden door gedrag van organisaties. Hieruit volgt dat naast het begrijpen en ontwerpen van welgegronde modellen voor gedrag van organisaties, er mechanismen nodig zijn om gedrag te monitoren en controle over gedrag uit te oefenen. Als een hoofdcontribution van dit proefschrift berekent onze VO Supervisory Assisting Tool (VOSAT) twee metrieken voor elke partnerorganisatie in een VBE: het historisch samenwerkingsgedrag van de partner, hoofdzakelijk berekend op basis van langetermijngedrag dat is gemonitord tijdens voorgaande VOs, en het huidig samenwerkingsgedrag van de partner, berekend op basis van gedrag ten opzichte van de vastgelegde normen in de actuele VO.

Om het historisch gedrag van een organisatie in een VBE te meten worden vier kwalitatieve gedragsdimensies meegenomen: de organisaties integriteit (Engels: integrity), moed (Engels: courage), aangenaamheid (Engels: agreeableness), en openheid (Engels: openness). Elk van deze kwaliteiten wordt gemodelleerd met een verzameling kenmerken (Engels: traits). Een kwantitatieve oorzakelijke be-
nadering is vervolgens gedefinieerd om een aantal bekende omgevingsfactoren te
relateren aan de kenmerken van deze vier gedragsdimensies. Uit de oorzakelijke
verbanden zijn een aantal formules afgeleid, die voor elke organisatie de mate
van individueel samenwerkingsgedrag (Engels: Individual Collaborative Behavior,
ICB) berekenen. In onze aanpak vormt deze metriek een maatstaf in de evaluatie
van de samenwerkingsbetrouwbaarheid (Engels: collaborative trustworthiness)
avan elke partnerorganisatie, welke nodig is tijdens de VO operation phase.

Om de kwaliteit van het huidige gedrag van een partner in een VO te behandelen,
stellen we een nieuw normatief multiagentmodel voor VOs voor, waarin vier
soorten gedragsnormen worden onderscheiden: (i) socio-regulatory normen, (ii) co-
working normen, (iii) committing normen, en (iv) controlling normen. Ons model
heet daarom het S3C model voor de behandeling van normen. Onze aanpak voor
committing normen en co-working normen leidt tot de introductie van nieuwe
formalisaties en mechanismen, gebaseerd op individuele en gezamenlijke beloften
tussen VO-partners. Dus, VO-partners leggen zich toe op het uitvoeren van taken
op een bottom-up manier, in tegenstelling tot een VO-cordinator die taken toekent
aan partners op een top-down manier. De bottom-up aanpak past veel beter bij
de samenwerkingsaard van VOs, vergelijkbaar met federatieve partnerschappen
tussen organisaties. Daarnaast wordt het vertrouwensniveau (Engels: trust level)
van elke partner berekend op basis van de resultaten van het monitoren van
socio-regulatory normen, co-working normen, en committing normen, alsmede de
partners ICB. Dit wordt gedaan door middel van de AHP-fuzzy comprehensive
evaluation method. De controlling normen passen drie metrieken toe gericht op
het karakteriseren van VO-partners, namelijk hun vertrouwensniveau, werkdruk,
en communicatienniveau. Als een van de controlling normen wordt overtreden door
een VO-partner, dan wordt dat door VOSAT herkend en waarschuwt VOSAT de
VO-cordinator. Een dergelijke overtreding is een risico voor het bereiken van de
VO-doelen. Met deze metrieken is een Bayesiaans netwerk gecreëerd om de kans
op falen te meten voor elk van de geplande deeltaken, taken, deeldoelen, en het
algemene doel van de VO.

Daarnaast geeft VOSAT suggesties ter ondersteuning van het maken van
beslissingen omtrent mogelijke interventies in geplande taken, om VO-falen te
voorkomen, samenwerking in VOs te bevorderen, en daardoor de succeskansen van
VOs enorm te verbeteren. Om een voorbeeld te geven, VOSAT kan een VO-
cordinator ondersteunen tijdens de operation phase, door een suggestie te maken
voor geschikte alternatieve partners onder hen die zich aanbieden om een riskante
deeltaak over te nemen. Een tweede voorbeeld van hoe VOSAT de VO-cordinator
tijdens de operation phase kan ondersteunen bij het verbeteren van samenwerkingsgedrag, en daarmee de succeskansen van een VO te vergroten, is door het op-
nemen en rangschikken van de prestaties en het samenwerkingsgedrag van VO-
partners, om op basis hiervan indirect beloningen te verdelen binnen de VO. Een
derde voorbeeld van hoe VOSAT de taken van de VO-cordinator faciliteert, is
bij de selectie van de meest geschikte partners tijdens de formatie/creatiefase van
een VO. In dit proefschrift staat een voorbeeld van dit geval voor de VOs in de services-industrie. In dit voorbeeld wordt gedemonstreerd hoe het historisch en huidig gedrag van kandidaatpartners hun mogelijke selectie voor deelname in een nieuwe VO kan ben invloeden. Dit proefschrift ontwerpt en ontwikkelt dus hulp- mechanismen, -tools, en -systemen ter ondersteuning van VO-cordinators, met een toename van zowel veerkracht als succeskans van VOs als resultaat.
I would like to extend my sincere gratitude and appreciation to my promoter Prof. Dr. Hamideh Afsarmanesh for her great support and guidance during my PhD study, and being a friend for me. Her patience, and immense knowledge make me confident for doing my research and writing of this thesis.

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I dedicate this thesis to my little angel, Sarina, for the joyful sense of life that she gives me.
Abbreviations

2OPL Organization Oriented Programming Language
A Availability
AG Agreeableness
AHP Analytic Hierarchy Process
ANP Analytic Network Process
ARCON A Reference model for Collaborative Networks
BDI Beliefs, Desires and Intentions
BN Bayesian Network
BS Business Success
C3Q Capability, Cost, Conspicuity, and the Quality specification criteria
CA Creativity
CB Current Responsibility
CCCI Correlation, Commitment, Clarity, and Influence
CG Courage
CI Consistency Index
CM Competence
CMR Communication Rate
CN Collaborative Network
CNOD Committing Norms Obedience Degree
CO Cooperativeness
CoQ Co-work Quality
CP Capability
CPS Cooperative Problem Solving
CPT Conditional Probability Tables
CR Conflict Resolution
CT Cooperative Traits
DAG Directed Acyclic Graph
DoW Description of Work
Endo-E Endogenous Elements
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ES</td>
<td>Employee Size</td>
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<tr>
<td>ETA</td>
<td>Event Tree Analysis</td>
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<td>Exo-I</td>
<td>Exogenous Interaction</td>
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<td>FA</td>
<td>Fairness</td>
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<td>FB</td>
<td>Failures in Behavior</td>
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<td>FC</td>
<td>Others’ fault Compensation</td>
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<td>FL</td>
<td>Flexibility</td>
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<td>FQ</td>
<td>Fulfilment of QSC</td>
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<td>FT</td>
<td>Flexibility Ability</td>
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<tr>
<td>FTA</td>
<td>Fault Tree Analysis</td>
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<tr>
<td>GTIT</td>
<td>Goal-Task-Interdependency-Template</td>
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<td>GTM</td>
<td>Goal-oriented Trust Model</td>
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<tr>
<td>HCL</td>
<td>Hybrid Causal Logic</td>
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<td>HMDT</td>
<td>Hierarchical Multi-attribute Decision-support-based Trust estimation</td>
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<td>HN</td>
<td>Honesty</td>
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<td>HW</td>
<td>Heavy Workload</td>
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<td>ICB</td>
<td>Individual Collaborative Behavior</td>
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<td>ICT</td>
<td>Information and Communication Technologies</td>
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<td>II</td>
<td>Inventiveness</td>
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<td>IN</td>
<td>Integrity</td>
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<td>IQ</td>
<td>Influence of QSC</td>
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<td>IR</td>
<td>Interaction Rate</td>
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<td>IRN</td>
<td>Institutional Reality and Norms in VOs</td>
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<td>IS</td>
<td>Intolerance to Stress</td>
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<td>LA</td>
<td>Leadership Ability</td>
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<td>LC</td>
<td>Lack of Communication</td>
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<td>LT</td>
<td>Lack of Trust</td>
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<td>MBTI</td>
<td>Myers-Briggs Type Indicator</td>
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<td>NAC</td>
<td>Norm Abidance Component</td>
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<td>NBO</td>
<td>Not Being Opportunistic</td>
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<td>NF</td>
<td>Not Fulfilling</td>
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<td>NMAS</td>
<td>Normative Multi-agent System</td>
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<td>NMC</td>
<td>Norm Monitoring Component</td>
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<td>NMR</td>
<td>Norm Manipulating Rules</td>
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<td>OCI</td>
<td>Organizational Character Index</td>
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<td>OE</td>
<td>Openness to new Experience</td>
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<td>OLA</td>
<td>Operational Level Agreement</td>
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<td>OWL</td>
<td>Web Ontology Language</td>
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<td>PA</td>
<td>Problem Avoidance</td>
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<td>PF</td>
<td>Promise Fulfilment</td>
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<td>PI</td>
<td>Promise Importance</td>
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<td>PN</td>
<td>Punctuality</td>
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<td>Abbreviation</td>
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<td>PO</td>
<td>Pro-activity</td>
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<td>PR</td>
<td>Past Responsibilities</td>
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<td>PRIT</td>
<td>Partner-Responsibility-Interdependency-Tree</td>
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<td>PSC</td>
<td>Partner Selecting Component</td>
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<td>PT</td>
<td>Pro-activity Ability</td>
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<td>QF</td>
<td>Q-Factor</td>
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<td>QoS</td>
<td>Quality of Service</td>
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<td>QSC</td>
<td>Quality Specification Criterion</td>
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<td>R</td>
<td>Reliability</td>
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<td>RFC</td>
<td>Ratio of Failure in Communication</td>
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<td>RI</td>
<td>Random consistency Index</td>
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<td>ROC</td>
<td>Ratio of work Overload Commitment</td>
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<td>RPC</td>
<td>Risk Predicting Component</td>
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<td>RR</td>
<td>Reaction Rule</td>
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<td>RT</td>
<td>Response Time</td>
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<td>RS</td>
<td>Resource Size</td>
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<td>S3C</td>
<td>Socio-regulatory, Committing, Co-working and Controlling norms</td>
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<td>SCM</td>
<td>Supply Chain Management</td>
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<td>SLA</td>
<td>Service Level Agreements</td>
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<td>SMEs</td>
<td>Small and Medium Enterprises</td>
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<td>SNOD</td>
<td>Socio-regulatory norms obedience degree</td>
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<td>SOA</td>
<td>Service Oriented Architecture</td>
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<td>SOAP</td>
<td>Simple Object Access Protocol</td>
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<td>SOC</td>
<td>Service Oriented Computing</td>
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<td>SP</td>
<td>Proactively Supportive</td>
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<td>SRA</td>
<td>Scientific Research on the Agriculture</td>
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<td>T</td>
<td>Throughput</td>
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<td>TEC</td>
<td>Trust Evaluating Component</td>
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<td>TOC</td>
<td>Table Of Content</td>
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<td>TR</td>
<td>Truthfulness</td>
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<td>TT</td>
<td>Trustworthiness</td>
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<td>VBE</td>
<td>Virtual organizations Breeding Environment</td>
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<td>VE</td>
<td>Volunteering</td>
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<td>VO</td>
<td>Virtual Organization</td>
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<td>VOSAT</td>
<td>VO Supervisory Assisting Tool</td>
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<td>WOL</td>
<td>Work OverLoad</td>
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<td>WP</td>
<td>Work Package</td>
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<td>WSDL</td>
<td>Web Service Description Language</td>
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<td>WSMO</td>
<td>Web Service Modeling Ontology</td>
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