Collaboration behavior enhancement in co-development networks
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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 langetermijn-samenwerkingsnetwerken, 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 langetermijnsgedrag 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-
Samenvatting

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) van 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-ordinator 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 communicatie niveau. Als een van de controlling normen wordt overtreden door een VO-partner, dan wordt dat door VOSAT herkend en waarschuwt VOSAT de VO-ordinator. Een dergelijke overtreding is een risico voor het bereiken van de VO-doelen. Met deze metrieken is een Bayesiaans netwerk gecreeerd 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 succeskans van VOs enorm te verbeteren. Om een voorbeeld te geven, VOSAT kan een VO-ordinator ondersteunen tijdens de operation phase, door een suggestie te maken voor geschikte alternatieve partners onder hen die zich aanbieden om een risikante deeltaak over te nemen. Een tweede voorbeeld van hoe VOSAT de VO-ordinator tijdens de operation phase kan ondersteunen bij het verbeteren van samenwerkingsgedrag, en daarmee de succeskans van een VO te vergroten, is door het opnemen 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-ordinator 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 beïnvloeden. Dit proefschrift ontwerpt en ontwikkelt dus hulpmechanismen, -tools, en -systemen ter ondersteuning van VO-coordinators, met een toename van zowel veerkracht als succeskans van VOs als resultaat.
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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>Full Form</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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<tr>
<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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<tr>
<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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<tr>
<td>HMDT</td>
<td>Hierarchical Multi-attribute Decision-support-based Trust estimation</td>
</tr>
<tr>
<td>HN</td>
<td>Honesty</td>
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<tr>
<td>HW</td>
<td>Heavy Workload</td>
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<tr>
<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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<tr>
<td>II</td>
<td>Inventiveness</td>
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<tr>
<td>IN</td>
<td>Integrity</td>
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<tr>
<td>IQ</td>
<td>Influence of QSC</td>
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<tr>
<td>IR</td>
<td>Interaction Rate</td>
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<tr>
<td>IRN</td>
<td>Institutional Reality and Norms in VOs</td>
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<tr>
<td>IS</td>
<td>Intolerance to Stress</td>
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<tr>
<td>LA</td>
<td>Leadership Ability</td>
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<tr>
<td>LC</td>
<td>Lack of Communication</td>
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<tr>
<td>LT</td>
<td>Lack of Trust</td>
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<tr>
<td>MBTI</td>
<td>Myers-Briggs Type Indicator</td>
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<tr>
<td>NAC</td>
<td>Norm Abidance Component</td>
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<tr>
<td>NBO</td>
<td>Not Being Opportunistic</td>
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<tr>
<td>NF</td>
<td>Not Fulfilling</td>
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<tr>
<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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<tr>
<td>NMR</td>
<td>Norm Manipulating Rules</td>
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<tr>
<td>OCI</td>
<td>Organizational Character Index</td>
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<tr>
<td>OE</td>
<td>Openness to new Experience</td>
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<tr>
<td>OLA</td>
<td>Operational Level Agreement</td>
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<tr>
<td>OWL</td>
<td>Web Ontology Language</td>
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<tr>
<td>PA</td>
<td>Problem Avoidance</td>
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<tr>
<td>PF</td>
<td>Promise Fulfilment</td>
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<tr>
<td>PI</td>
<td>Promise Importance</td>
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<tr>
<td>PN</td>
<td>Punctuality</td>
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</tbody>
</table>
Abbreviations

PO Pro-activity
PR Past Responsibilities
PRIT Partner-Responsibility-Interdependency-Tree
PSC Partner Selecting Component
PT Pro-activity Ability
QF Q-Factor
QoS Quality of Service
QSC Quality Specification Criterion
R Reliability
RFC Ratio of Failure in Communication
RI Random consistency Index
ROC Ratio of work Overload Commitment
RPC Risk Predicting Component
RR Reaction Rule
RT Response Time
RS Resource Size
S3C Socio-regulatory, Committing, Co-working and Controlling norms
SCM Supply Chain Management
SLA Service Level Agreements
SMEs Small and Medium Enterprises
SNOD Socio-regulatory norms obedience degree
SOA Service Oriented Architecture
SOAP Simple Object Access Protocol
SOC Service Oriented Computing
SP Proactively Supportive
SRA Scientific Research on the Agriculture
T Throughput
TEC Trust Evaluating Component
TOC Table Of Content
TR Truthfulness
TT Trustworthiness
VBE Virtual organizations Breeding Environment
VE Volunteering
VO Virtual Organization
VOSAT VO Supervisory Assisting Tool
WOL Work OverLoad
WP Work Package
WSDL Web Service Description Language
WSMO Web Service Modeling Ontology
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