Tutorial
State of the Art in Modeling and Deployment of Electronic Contracts

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International Conference on Conceptual Modeling (ER 2006)
Tucson, Arizona, USA
Agenda

- Contracts
- E-contracts
- Examples
- Challenges
- Exercise
- Q & A
- Break !! (10.00 – 10.30 AM)
- E-contract Systems
- Open Research Problems
- Q & A
Contracts

Contract is an agreement between two or more parties, especially one that is written and enforceable by law.

- dictionary.com

Contract is a "promise" or an "agreement" made of a set of promises, the breach of which is recognized by the law and for which legal remedies can be provided.

- wikipedia.org
Many definitions ....

- A contract is a legally enforceable agreement, in which two or more parties commit to certain obligations in return for certain rights [Rei89].
- A contract is a statement of intent that regulates behaviour among organizations and individuals. An electronic contract is its reification in software that can be instantiated as a set of obligations that are fulfilled between parties, refused or waived as future events occur.

(“Towards the Electronic contract” M. Morciniec, C. Bartolini, B. Monahan, M. Salle, HP Labs)
Some Statistics

• In the USA, the federal government spends about USD$200 billion annually buying goods and services from over 300,000 vendors [1997]

• A typical supermarket chain requires negotiating annually contracts of over 50,000 product items.

• Source: Chiu et al, Decision Support Systems 40 (2005) 51-69
Number of contracts awarded each year by the Canada Firearms Centre from 1997 to 2006.

Source: Office of the Auditor General of Canada

**Number of Contracts Awarded**

<table>
<thead>
<tr>
<th></th>
<th>Jul-06</th>
<th>Jul-05</th>
<th>% Change</th>
<th>YTD 2006</th>
<th>YTD 2005</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport</td>
<td>121</td>
<td>140</td>
<td>-13.6%</td>
<td>476</td>
<td>521</td>
<td>-8.6%</td>
</tr>
<tr>
<td>Bridges &amp; Tunnels</td>
<td>443</td>
<td>367</td>
<td>20.7%</td>
<td>2,869</td>
<td>2,601</td>
<td>10.3%</td>
</tr>
<tr>
<td>Docks, Piers &amp; Wharves</td>
<td>38</td>
<td>30</td>
<td>26.7%</td>
<td>235</td>
<td>181</td>
<td>29.8%</td>
</tr>
<tr>
<td>Highways</td>
<td>2,396</td>
<td>2,640</td>
<td>-9.2%</td>
<td>15,222</td>
<td>14,238</td>
<td>6.9%</td>
</tr>
<tr>
<td>Railways</td>
<td>7</td>
<td>11</td>
<td>-36.4%</td>
<td>94</td>
<td>80</td>
<td>17.5%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>3,005</td>
<td>3,188</td>
<td>-5.7%</td>
<td>18,896</td>
<td>17,621</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

Source: McGraw-Hill F.W. Dodge Data

**Value of Contracts Awarded (in thousands $)**

<table>
<thead>
<tr>
<th></th>
<th>Jul-06</th>
<th>Jul-05</th>
<th>% Change</th>
<th>YTD 2006</th>
<th>YTD 2005</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airport</td>
<td>204,588</td>
<td>248,334</td>
<td>-17.6%</td>
<td>1,286,372</td>
<td>1,137,845</td>
<td>13.1%</td>
</tr>
<tr>
<td>Bridges &amp; Tunnels</td>
<td>933,384</td>
<td>934,350</td>
<td>-0.1%</td>
<td>6,998,245</td>
<td>6,836,938</td>
<td>2.4%</td>
</tr>
<tr>
<td>Docks, Piers &amp; Wharves</td>
<td>69,380</td>
<td>38,499</td>
<td>80.2%</td>
<td>376,955</td>
<td>570,145</td>
<td>-33.9%</td>
</tr>
<tr>
<td>Highways</td>
<td>3,247,530</td>
<td>3,275,679</td>
<td>-0.9%</td>
<td>23,023,855</td>
<td>19,801,114</td>
<td>16.3%</td>
</tr>
<tr>
<td>Railways</td>
<td>18,903</td>
<td>62,651</td>
<td>-69.8%</td>
<td>533,323</td>
<td>1,247,725</td>
<td>-57.3%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4,473,785</td>
<td>4,559,513</td>
<td>-1.9%</td>
<td>32,218,750</td>
<td>29,593,767</td>
<td>8.9%</td>
</tr>
</tbody>
</table>

Source: American Road and Transportation Builders Association (ATBA)

<table>
<thead>
<tr>
<th>State</th>
<th>Value (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>$2,472.8</td>
</tr>
<tr>
<td>California</td>
<td>$2,170.9</td>
</tr>
<tr>
<td>Florida</td>
<td>$1,334.4</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>$1,257.5</td>
</tr>
<tr>
<td>Illinois</td>
<td>$1,158.8</td>
</tr>
</tbody>
</table>

Source: American Road and Transportation Builders Association (ATBA)
UNSECURED REDEEMABLE BOND(S) IN THE NATURE OF DEBENTURE(S)

TAX SAVING BOND-022002-TSB- ONE

<table>
<thead>
<tr>
<th>OPTION</th>
<th>FACE VALUE PER BOND (Rs.)</th>
<th>ISSUE PRICE PER BOND (Rs.)</th>
<th>DEEMED DATE OF ALLOTMENT</th>
<th>REDEMPTION DATE</th>
<th>INTEREST RATE</th>
<th>TAX BENEFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>U/S</td>
</tr>
</tbody>
</table>

Issue of Unsecured Redeemable Tax Saving Bonds in the nature of Debentures as face value as indicated above (the "Bond(s)") out of the total issue of Unsecured Redeemable Bonds in the nature of Debentures aggregating Rs. 600 crore with a right to retain oversubscription up to Rs. 600 crore comprising Tax Saving Bonds, Encash Bonds, Monthly Income Bond, Regular Income Bonds, Money Multiplier Bonds and Children Growth Bonds (the "Issue") made under the authority of the Memorandum and Articles of Association of the Company. Resolutions passed by the Board of Directors at their meeting held on July 28, 1997 and January 29, 1999 and in terms of the Prospectus dated January 29, 2002.

The proceeds from these Bonds shall be deployed towards infrastructure projects in accordance with the income-tax rules. In case of Option I and II, interest on the Face Value of Bond(s) will be paid at the rate mentioned herein above, on May 1 each year (subject to deduction of tax at source at the rates prevailing from time to time under the provisions of the Income tax Act, 1961 or any statutory notification or re-enactment thereof), and on redemption thereof, provided that, the first interest payment will be made on May 1, 2003 for the period commencing from the Deemed Date of Allotment and the last interest payment will be made at the time of Redemption of the Bond on a pro-rata basis.

The Bond(s) is/are subject to the terms and conditions and the benefits herein in the Prospectus dated January 29, 2002 and the Trustee Agreement to be entered into between the Company and the Western India Trustee and Executor Company as Trustees (the "Trustees") which shall be binding on the Company, holders of the Bond(s) (the "Bondholder(s)"), the Trustees and all persons claiming by, through or under any of them. All rights and remedies of the Bondholder(s) against the Company in respect of, arising out of or incidental to the Bond(s) shall be exercisable by the Bondholder(s) only through the Trustees.

This is to certify that the person(s) named below or the last Transfer(s) whose name(s) is/are duly recorded in the Memorandum of Transfer on the reverse hereof is/are the holder(s) of the said Bond(s) subject to the Memorandum and Articles of Association of the Company and the terms and conditions set out herein, which are deemed to be forming a part hereof for all purposes and to all intents.

** Bondholder No.  
Certificate No.  
No. of Bond(s) ONE  
Distinctive No(s).**

Given at Mumbai this  
DEPOSITORY ISIN:  
CONSOLIDATED STAMP DUTY PAID VIDE ORDER DATED I ISSUED  
BY GOVT. OF INDIA, MINISTRY OF FINANCE, DEPARTMENT OF REVENUE.  
For and on behalf of  
ICICI LIMITED  
SCORP CODE  
BSE :  
NSE :  

Bondholders should confirm the scrip codes of the bonds with the brokers before dealing in them.

7/19/2023
Translating a paper contract into an e-contract not an trivial process.
Financial Messaging Solution contract

Taxes&Payments

“Subject to any deductions of tax at source, if applicable, from the contract price as per clause A of schedule A of the Contract, the CONTRACTOR shall be entitled to receive the Contract Price in the following manner:

1) All the payments shall be released directly by the PURCHASER to the CONTRACTOR

2) The initial advance payment and payments against the delivery certificates and final Acceptance Certificates as referred to in Para B of schedule A of the contract, shall be released on completion of each milestone as indicated in the table of payment in schedule B.

3) All the payments will be made by the purchaser only after satisfying about the satisfactory completion of each milestone as stipulated in Systems Requirements Specifications (SRS) Document referred to in Schedule B, of the Contract by the PURCHASER.

4) …
“Either Purchaser or Contractor can identify the need for change on the accepted deliverables. If the Purchaser identifies the change requirement, then Purchaser will raise Request for Change (RFC) by filling the Change Management Request form. Its format will be provided by the Contractor. It will essentially cover Change Request Description, Requested Date, Priority of the request (i.e. Very Urgent, Urgent, Normal etc.). The priority will be assigned by the Purchaser Project Manager.

On receiving this request Contractor will allocate a CMR number to the request and will notify it to the Purchaser. The contractor will then evaluate the need of this change with respect to Priority, Feasibility of the change, and Impact on time frame and cost. The contractor might ask for relevant clarifications regarding the change request. It is the responsibility of the purchaser to provide the clarification in time. The Contractor will place the results of evaluation to Purchaser. The Purchaser can approve/disapprove the change requests after seeking the relevant clarifications on the evaluation from the contractor. In case the change is approved then the Contractor will schedule the changes based on priority. The contractor will then make the necessary changes and release them to Purchaser for acceptance. The purchaser will carry out the acceptance and provide the acceptance certificate. The Change Management Form will be recorded with the result raised change request, who has incorporated the change, date of release to Purchaser.

___ __________  ___ ___ ___
Terms of Payment: 100% payment will be made against delivery by cheque after inspection and acceptance of the material at our stores.

“When the material is ready for dispatch”, before supplying the material, please arrange to send three copies of Performa invoice indicating D.C. No. & Date in order to keep the demand draft ready.

Liquidated Damages:
A) Failure to supply the goods by the time specified on the order will make the supplier liable to an unconditional liquidated damage of ½% (half percent) per week subject to a maximum of 10% (Ten Percent) of the price of the goods in arrears at the discretion of the STC.[Clause CL-b]
B) The purchaser shall have the right to cancel either wholly or in part the portion of the contract which is yet to be executed by supplier in case the delivery is not in accordance with the time specified in the order.

Jurisdiction: All questions, disputes of differences arising under, out of or in connection with the contract shall be subject to the exclusive jurisdiction of the court within the local limits of whose jurisdiction the place from which the purchase order is issued, is situated.

Quality: All goods and works must conform to the specifications quoted on the order and are to be strictly in accordance with approved samples of designs. Goods supplied are subject to inspection by our authorized representatives and the inspector has right to reject the goods of conforming to our specifications.

Inspection: All goods and works are subject to our inspection. Inspection, either at your works or delivery as agreed will be carried out. The decision of our officer nominated/authorized by the GM, Materials is final. Rejected goods will be returned to the suppliers at his cost including freight on original shipment.
UNIMPROVED PROPERTY CONTRACT
NOTICE: Not For Use For Condominium Transactions

1. PARTIES:
   (Seller) agrees to sell and convey to
   (Buyer) and Buyer agrees to buy from Seller the Property described below.

2. PROPERTY:
   Lot ______, Block ______, ________________ Addition, County of ____________
   Texas, known as
   (address/zip code), or as described on attached exhibit together with all rights, privileges and
   appurtenances pertaining thereto, including but not limited to: water rights, claims, permits,
   strips and gores, easements, and cooperative or association memberships (the Property).

3. SALES PRICE:
   A. Cash portion of Sales Price payable by Buyer at closing____________________ $__________
   B. Sum of all financing described below (excluding any loan funding
      fee or mortgage insurance premium) __________________________________________ $__________
   C. Sales Price (Sum of A and B) ______________________________________________ $__________

4. FINANCING: The portion of Sales Price not payable in cash will be paid as follows: (Check applicable boxes below)
   □ A. THIRD PARTY FINANCING: One or more third party mortgage loans in the total amount of
       (excluding any loan funding fee or mortgage insurance premium).
           (1) Property Approval: If the Property does not satisfy the lenders' underwriting
               requirements for the loan(s), this contract will terminate and the earnest money will be
               refunded to Buyer.
           (2) Financing Approval: (Check one box only)
               □ (a) This contract is subject to Buyer being approved for the financing described in the
                   attached Third Party Financing Condition Addendum.
               □ (b) This contract is not subject to Buyer being approved for financing and does not
                   involve FHA or VA financing.
           □ B. ASSUMPTION: The assumption of the unpaid principal balance of one or more promissory
               notes described in the attached TREC Loan Assumption Addendum.
           □ C. SELLER FINANCING: A promissory note from Buyer to Seller of
               (secured by vendor's and deed of trust liens, and containing the terms and conditions
               described in the attached TREC Seller Financing Addendum. If an owner policy of title
               insurance is furnished, Buyer shall furnish Seller with a mortgagee policy of title insurance.

5. EARNEST MONEY: Upon execution of this contract by both parties, Buyer shall deposit
   $____________________ as earnest money with ______________________, as escrow agent, at
   (address). Buyer shall deposit additional earnest money of $____________________ with escrow
   agent within ______ days after the effective date of this contract. If Buyer fails to deposit the
   earnest money as required by this contract, Buyer will be in default.

6. TITLE POLICY AND SURVEY:
   □ A. TITLE POLICY: Seller shall furnish to Buyer at __________ Seller's __________ Buyer's expense an owner policy of
       title insurance (Title Policy) issued by
       (Title Company), in the amount of the Sales Price, dated at or after closing, insuring Buyer
       against loss under the provisions of the Title Policy, subject to the promulgated exclusions
       (including existing building and zoning ordinances) and the following exceptions:
           (1) Restrictive covenants common to the platted subdivision in which the Property is located.
           (2) Liens created as part of the financing described in Paragraph 4.
           (3) Utility easements created by the dedication deed or plat of the subdivision in which the
               Property is located.
           (5) Reservations or exceptions otherwise permitted by this contract or as may be approved by
               Buyer in writing.
           (6) The standard printed exception as to marital rights.
           (7) The standard printed exception as to waters, tidelands, beaches, streams, and related
               matters.
           (8) The standard printed exception as to discrepancies, conflicts, shortages in area or boundary
               lines, encroachments or protrusions, or overlapping improvements. Buyer, at Buyer's expense,
               may have the exception amended to read, "shortages in area".
   □ B. COMMITMENT: Within 20 days after the Title Company receives a copy of this contract, Seller
       shall furnish to Buyer a commitment for title insurance (Commitment) and, at Buyer's
AMAZON RETURNS POLICY
Contract lifecycle

- Business information exchange
- Contract negotiation
- Contract preparation
- Contract enactment
- Contract monitoring & management
Contract Dimensions

• Based on the Applications
  – C2C; B2C; B2B

• Based on the Structure
  – Sequential contracts (executes sequentially in a step-by-step manner and ends after certain period of time)
  – Turnkey contracts (has a specific goal that needs to be accomplished within certain time and with a certain budget, and is a special case of sequential contract)
  – Cyclic contracts (exists even after the completion of one cycle of the contract, irrespective of the number of times the contract is fulfilled)

• Based on the Complexity
  – Bilateral contracts (Ex., buyer-seller contract)
  – Multiparty contracts (Ex. House Building contract)
  – Composite contracts (consists of several contracts, for ex., Textile value chain contract)
Contracts

Have

• Parties – Organizations/people involved in a business process
• Activities – representing tasks/e-services to be executed during process enactment
• Clauses – describing restrictions on the execution of activities.

Contracts have some structure.

Also contracts have Negotiation, commitment, Transactions, Exclusions, Authorization, Arbitration and Jurisdiction.
Contracts - clauses

Three types of clauses:

• Obligations – what parties should do
• Permissions – what parties are allowed to do
• Prohibitions – what parties should not do
E-Contracts: Background

- Voluminous documents
- Ambiguity and fuzziness of natural languages
- Managing/monitoring is human intensive
- Autonomous nature of individual organizations/parties
- Cross-checking for payments
- Bookkeeping for legal aspects
- Standard formats
- Computer supported contracts
- Transactional and commitment
- Authorization aspects

Handling all these aspects is a challenge
E-contracts

An E-contract is a contract modeled, specified, executed, controlled, and monitored by a software system.
All (or a number of) activities carried out by software system.

Simplified Versions...

An e-contract is an electronic version of a conventional contract, which stipulates that the signing entities (two or more) agree to observe clauses stipulated in the document.

An e-contract is a contract in electronic format, regulating cross-organizational business processes over the Internet.
E-Contracts: Background

- Voluminous documents
- Ambiguity and fuzziness of natural languages
- Managing/monitoring is human intensive
- Autonomous nature of individual organizations/parties
- Cross-checking for payments
- Bookkeeping for legal aspects
- Standard formats
- Computer supported contracts
- Transactional and commitment
- Authorization aspects

Handling all these aspects is a challenge

An E-contract is a contract modeled, specified, executed, controlled, and monitored by a software system.

All (or a number of) activities carried out by software system.
Electronic Contracts

• An Electronic Contract...
  – is a well-structured document
    • From the perspective of formatting
    • Semantically
  – is edited/viewed in different contexts
    • Composition, Printing, Visualisation, Signing
  – consists of standard elements plus individual extensions
  – needs to be exchanged
  – may be manipulated in a collaborative session
  – is signed by attaching signatures in a standardized way

Source: Griffel et al, 1998
UNIMPROVED PROPERTY CONTRACT
NOTICE: Not For Use For Condominium Transactions

1. PARTIES:
   (Seller) agrees to sell and convey to
   (Buyer) and Buyer agrees to buy from Seller the Property described below.

2. PROPERTY:
   Lot _______, Block _______, ________, Addition, City of ________, County of ________, Texas, known as
   (address/zip code), or as described on attached exhibit together with all rights, privileges and
   appurtenances pertaining thereto, including but not limited to: water rights, claims, permits,
   strips and gores, easements, and cooperative or association memberships (the Property).

3. SALES PRICE:
   A. Cash portion of Sales Price payable by Buyer at closing......................... $________
   B. Sum of all financing described below (excluding any loan funding fee or mortgage insurance premium) $________
   C. Sales Price (Sum of A and B) ................................................................. $________

4. FINANCING: The portion of Sales Price not payable in cash will be paid as follows: (Check applicable boxes below)
   □ A. THIRD PARTY FINANCING: One or more third party mortgage loans in the total amount of
      $________ (excluding any loan funding fee or mortgage insurance premium).
      (1) Property Approval: If the Property does not satisfy the lenders’ underwriting requirements for the loan(s), this contract will terminate and the earnest money will be refunded to Buyer.
      (2) Financing Approval: (Check one box only)
         (a) This contract is subject to Buyer being approved for the financing described in the attached Third Party Financing Condition Addendum.
         (b) This contract is not subject to Buyer being approved for financing and does not involve FHA or VA financing.
   □ B. ASSUMPTION: The assumption of the unpaid principal balance of one or more promissory notes described in the attached TREC Loan Assumption Addendum.
   □ C. SELLER FINANCING: A promissory note from Buyer to Seller of $________, secured by vendor’s and deed of trust liens, and containing the terms and conditions described in the attached TREC Seller Financing Addendum. If an owner policy of title insurance is furnished, Buyer shall furnish Seller with a mortgagee policy of title insurance.

5. EARNEST MONEY: Upon execution of this contract by both parties, Buyer shall deposit $________ as earnest money with
   as escrow agent, at (address). Buyer shall deposit additional earnest money of $________ with escrow agent within ________ days after the effective date of this contract. If Buyer fails to deposit the earnest money as required by this contract, Buyer will be in default.

6. TITLE POLICY AND SURVEY:
   A. TITLE POLICY: Seller shall furnish to Buyer at □ Seller’s □ Buyer’s expense an owner policy of
      title insurance (Title Policy) issued by
      (Title Company) in the amount of the Sales Price, dated at or after closing, insuring Buyer
      against loss under the provisions of the Title Policy, subject to the promulgated exclusions
      (including existing building and zoning ordinances) and the following exceptions:
      (1) Restrictive covenants common to the platted subdivision in which the Property is located.
      (2) Liens created as part of the financing described in Paragraph 4.
      (3) Utility easements created by the dedication deed or plat of the subdivision in which the
         Property is located.
      (4) Reservations or exceptions otherwise permitted by this contract or as may be approved by
         Buyer in writing.
      (5) The standard printed exception as to marital rights.
      (6) The standard printed exception as to discrepancies, conflicts, shortages in area or boundary
         lines, encroachments or protrusions, or overlapping improvements. Buyer, at Buyer’s expense,
         may have the exception amended to read, “shortages in area”.
   B. COMMITMENT: Within 20 days after the Title Company receives a copy of this contract, Seller
      shall furnish to Buyer a commitment for title insurance (Commitment) and, at Buyer’s
E-contract Requirements [Grefen et al]

- Structured and complete
- Flexibility
- Heterogeneity
- Encapsulation
- Fine-grained control
- Legality
E-Contracts

Characterized by
- parties
- activities
- clauses

Can have
- sub-contracts
- payments
- budget

needs synchronization
and has a duration

Metadata
Exclusion
Authorization
Arbitration
Jurisdiction

7/19/2023
Why e-contract systems?

• Conventional software is not feasible because of loss of semantic form of contracts during the translation.
• It is human assisted task
• Multiple modules with different technologies may be required, which has to loosely adapted and integrated
Potential Advantages of e-contracts

• Improved productivity and security
• Effectively aggregated contract information
• Accelerated contract lifecycle processes
• Reduced contractual errors and risk
• Enabled revenue forecast and profit optimization
• Better compliance enforcement

Source: T. Kwok and T. Nguyen, EEE’06
Steps in Modeling e-contracts

• Identify business entities (parties) and the relations between them
• List the roles to be played by various parties
• List events or actions that take place in different parts of the business processes
• Exceptions that may arise
• Realize and enact using available technologies (such as EJB and Web services)
• Workflows
• Exclusions, Authorizations, Arbitration, Jurisdiction
Challenges

• Formal Representation languages
  – Contract representation: verbose text documents, semi-structured or structured format

• Contract Modeling

• Developing e-contract systems
  – Frameworks, Architectures
  – Integration

• Contract Enactment

• Contract Monitoring and Management
Some Questions-1

- How to represent contracts? what approach is employed to provide semantics?
- Contracts can be viewed in different perspectives. For example, a contract can be seen as a collection of data elements (data perspective). A specific representation may cover more than one modeling perspective. Which perspectives does the e-contract system cover?
- The subject of the contract (the exchanged values) imposes different requirements to contract modeling. What is the subject of the contracts?

Few questions are based on the survey conducted by Kostas Kafentzis, ECE, NTUA
Some Questions-2

• What is the number of actors (ex. Parties, mediators) that participate in the contracting situations? In case that multiple contracts are signed for one situation, does the system support the emerging contract inter-dependencies?

• What kind of relationships between the contracting parties does the system support? Closed relationships (e.g. open EDI) usually correspond to long-term agreements whereas open, one-off relationships usually correspond to short-term agreements.
Some Questions-3

- Is there any domain-specific modeling?
- How to handle exceptions (both expected and unexpected)
- Is there any Business or IT standards for e-contract system?
- Which of the functionalities or processes are needed to support by the system?
- Does the system treat any of the security issues such as automation, scalability, heterogeneity, vertical integration, market integration?
Some Questions-4

• In the contract execution phase, is there a direct co-operation of execution infrastructures of the parties (e.g. two workflows are connected directly) or the interaction takes place at a contract level (e.g. interfaces translate the contract information into concepts that can be interpreted by parties’ execution infrastructures).

• What deployment model the contracting systems follows: a distributed or a centralized one? The distributed model allows two enterprises to connect their contracting frameworks directly. The centralized model pre-supposes a market maker or a single enterprise that provide the contracting environment.
E-contract systems - Summary

• There are 20 Commercially available software products for electronic contract management (Source: International Association of Contract and Commercial Managers)

• Currently, most of these models are human and system driven prototypes (some of them in the process of developing tool-kits) to popularize e-contracts. These systems reduce the time to learn and deploy new e-contracts and manage workflows for e-contract enactment.
E-contracts: State of the Art

- Electronic contract creation or representation language
- Negotiation
- Management
- Collaboration
- Execution
- Fulfillment
- Enforcement
- Performance
- Digital signature
- Data Mining
Doctoral Work…
Available through web

- Lai Xu, Monitoring Multi-Party Contracts for E-Business, Tilburg University, 2004
Types of e-contracting: Deep and Shallow

Samuil Angelov and Paul Grefen

**Shallow e-contracting** is contracting in which:

1. *Information technologies are used to support the contracting process*;
2. *Contracts have digital representation*;
3. *The level of automation introduced by the use of information technologies does not lead to new business processes in a company (or to significant changes of the existing ones)*.

**Deep e-contracting** is contracting in which:

1..., 2..., 3 *The level of automation introduced by the use of information technologies leads to new business processes in a company (or to significant changes in the existing ones)*.
Examples

- **Example 1** (for shallow e-contracting) - e-mail contracting

- **Example 2** (for deep e-contracting) - a fully automated e-contracting system (no human intervention)
Languages to represent e-contracts

- XML
- ebXML
- ECML (E-Contract Markup Language)
- tpaML
- RuleML
- XPDL
- ......

Open Problem: Comparison and Evaluation to recommend a standard language for e-contracts
E-contract Modeling
Modeling e-contracts

- Contract Net Protocol [Smith, 1980]
  - Old model
  - Focus on low-level transaction aspects
- CrossFlow model [Grefen et al, 2000]
- ……..
e-Contract Modeling

Meta Level

Conceptual Level

Logical Level

Implementation Level

Conceptual Level

Logical Level

Implementation Level

Implementation Level
Need for Meta-Model

- Most of the contracts have similar structure (like clauses related to payments)
- Guided approach to conceptual modeling
- Templates can be designed for specific domains
- Provides generality and flexibility
- Allows reusability and extensibility
Meta-models and Templates

- **Template** is an instance of a meta-model for a specific application domain (with certain constraints)
- Templates guide the modeling and enactment processes
- Specific business interactions not covered by the clauses in standard contract templates can be provided as contract variations or contact escalations [Chiu et al]
- A contract clause contains a set of template variables.
- For example
  
  “The Purchaser shall send a Letter of Credit (LC) for the Goods to the Supplier in the currency of { } within { } days of the invoice date. The Supplier shall on receipt of the LC ships the goods to the Purchaser within { } days and provides the Purchaser with shipment details”.

__ ________ __ __ ______
Meta – Model for e-Contract template

[Chiu et al, 2005]
A sales e-Contract template as an instance of the meta-model

Chiu et al, 2005

Purchaser :Party

Supplier :Party

Sales :e-Contract Template

Shipping & Insurance :Contract Clause

Deposit Payment :Contract Clause

Pricing :Contract Clause

Delivery :Contract Clause

Freight :Templ. Variable

Deposit :Templ. Variable

Quantity :Templ. Variable

Delivery date :Templ. Variable

Insurance premium :Template Variable

Unit price :Templ Variable

Return policy :Templ: Variable
Meta-Model for ECA rule: *On event if condition then action*

- **Condition**
  - +precondition
  - +action

- **Workflow**
  - uses
  - based on

- **Business Entity**
  - *owns

- **Party**
  - plays
  - involves

- **Role**
  - exploits

- **Rule**
  - *triggers

- **Event**
  - +internal event
  - carries out
  - +external event
  - +publisher
  - +subscriber

- **Temporal Event**
  - *triggers
  - 1..*

- **Exception**
  - *+action

CHIU et al, 2003
ER^EC Meta-Model

Rule-1: Reject Request of New Parties

Rule-2: Role changes
- Allowed
- Not Allowed

Rule-3: Stop Work

- Has
- Activities
- Must Have
- Synchronization
- Lists
- Can have
- Budget
- Payments
- ISA
- Sub Contract

Budget Over

Role changes

Has Clauses refer

Addition of New Parties

Contract

7/19/2023
Most of these are parametric driven template based meta-models
Open Issue:

How to integrate domain-specific modeling with Generic modeling?
E-contract Specification
Logics and Theories for e-contract

- Predicate Logic, first-order logic and speech act theory
- Deontic Logic
- Model Action Logic
- Temporal Logic
- Subjective Logic
- Petri net and finite state machines
- Event Calculus
Current State of the Art in Logic & theory for e-contracts

• Horn Logic
  – Derivation rules (rule changing), Negation as failure, Procedural attachments, external data integration.

• ECA Rules
  – Active behaviour (events, actions)

• Event Calculus
  – Temporal reasoning over effects of events on fluents (contract tracking)

• Defeasible logic
  – Conflict resolution, default rules and priority relations of rules

• Deontic logic
  – Rights and obligations with violations an exceptions of norms

• Description logic
  – Contract vocabularies, domain-specific concepts

(Source: Adrian Paschke, Rule based service level agreement language, IAWTIC 2005, Austria)
Examples of e-contract models with logic

• Declarative approach to business rules in e-commerce contracts by combining Courteous Logic Program and XML [Grosof, 1999]

• Deontic logic for contract clauses [Marjanovic and Milosevic, 2001]

• Logic formalism to represent the content of business contracts based on the Formal Language for Business Communication [Tan and Thoen, 2002]
Examples of e-contract models with logic contd...

- Finite State Machines are used to attempt to assess contract status and implication of eventualities [Daskalopulu et al, 2001]

  - extension of the classical first-order logic,
  - Suitable for both static and dynamic aspects of contracting
  - designed to model this adversarial situation through its novel model theory, which incorporates certain game-theoretic concepts.
• Too much language driven solutions may not provide flexible e-contract solutions
• Solutions should be language independent
• **Modeling provides language independent solutions**
E-contract Deployment: Enactment, Monitoring and Management
E-contract Framework

- Framework for legal e-contracts [Gisler et al, 2000]
- 4W Framework
- ER$^{EC}$ Framework
- .....
B2B e-contracts: 4W Framework

(Angelov and Grefen, 2001)

- The participation of “two or more parties” leads to “Who” concept.
- An agreement that is “legally enforceable” shows that there is a context for every contract i.e., a “Where” concept.
- The “obligations in return for certain rights” relates to a “What” concept.
- The parties’ commitment illustrates the existence of “How” concept.
WHO...

• A contract has a number of actors associated with it. They participate in the contract establishment and enactment.

• Under the WHO concept, three sub-concepts are identified: a party, a mediator and an auxiliary implementer.
  
  - The companies that participate in the established contract and exchange values are called parties.
  
  - A mediator is a company or a public institution that facilitates the contract establishment and contract enactment.
  
  - During contract execution, parties perform processes that are in accordance to the negotiated terms. A party may outsource a part of a process to an auxiliary implementer.
Where ...

• A contract is established and enacted in a certain context.

• Three context dimensions are identified under WHERE concept: legal, geographical and business.
What...

- A contract has a *content* that describes the exchanged values, the processes that will take place for the exchanges and the accompanying provisions.
- Depending on the contract context, contracts are classified as complete or incomplete.
  - Complete contracts contain exhaustive specifications of the exchanged values and the provisions that accompany them.
  - Incomplete contracts allow parties unspecified behavior, which requires a higher level of trust among them.
- In electronic contracting, where parties are unknown and business relations are short, complete contracts will play a dominant role.
How …

• A contract has a set of concepts related to the contracting processes.

• Under the HOW concept, three sub-concepts are identified: contract representation and standards, contracting phases and contract structure.

• Contract representation is defined by a standard. On the other hand, to achieve interoperability between the contracting parties and processes to be speeded up, standards are set.

• A contract passes through four phases in a standard situation: informational, pre-contractual, creation and enactment.

• For the faster creation of a contract offer, a party can use a partially or completely predefined contract structure.
4Ws: Relations

• Relations between the 4Ws show the tight coupling among them and the complexity of the contracting process.
• Contracting models and software solutions for e-contracting should consider these relations.
• Relations of WHO to
  – WHERE: the participating actors define the contract context
  – WHAT: contracting parties are recorded in the contract content
  – HOW: an actor plays a certain role in the contracting processes.
• Relations of WHERE to
  – WHO, WHAT, HOW: the contract context affects the contract actors, the contract content and contract process.
• Relations of WHAT to
  – HOW: the contract content specifies the contract enactment process
• Relations of HOW to
  – WHAT: the contract content results from the contract creation process.
4W E-contract Model

**Who**
- Actor
- Party
- Contact data
- Mediator
- Person
- E-notary
- Other

**Where**
- Context
  - Business
  - Legal
  - Other

**How**
- Communication
- Standards
- Contracting

**What**
- Exchange value provisions
  - Financial reward
  - Service
  - Product
- Exchanged value

 Defines

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Cross-Flow Project [Grefen et al]

• Models virtual enterprises based on a service provider-consumer paradigm

• Organizations (service consumers) may delegate tasks in their workflows to other organizations (service providers)

• Virtual organizations are dynamically formed by contract-based matching between service providers and consumers
Cross-Flow Project [Grefen et al] contd..

• No sophisticated mechanism such as workflow views for information and control exchange between workflows of different organizations

• Contract enforcement is not straightforward (like E-ADOME workflow views equipped ECA-Rule mechanisms based on cross-organizational events)
COSMOS Project

- Stands for Common Open Service Market for SMEs
- Internet based electronic contracting service to facilitate business transaction process
- Developed based on Contract Object Model to describe an e-contract as a combination of objects, which can be exchanged between different parties and stored in XML format
- COSMOS workflow engine invokes functions in accordance with temporal constraints extracted from contracts
- Developed a CORBA-based system to implement the contracting service

http://vsys-www.informatik.uni-hamburg.de/projects/cosmos/index.phtml
COSMOS Architecture

Offer Database

Contract Template Database

Offer / Inquiry

Offer Selection

Process Description

Negotiation Signing

Market Participant

Market Participant

M. Merz & P. Hamburg
W3C Dsig Workshop

7/19/2023
The COSMOS Contract Model
COSMOS Project contd...

• It assumes conflict-free specifications and can reason neither about conflicting obligations, not about powers of parties

• It ignores the possibility of deviation from expected behavior

• Does not provide reason about the consequences of violation
SweetDeal system
(Benjamin and Poon)

- Rule-based e-contracts (SweetRules)
- Allows software agents to create, evaluate, negotiate and execute e-contracts with substantial automation and modularity.
- Represents contracts in RuleML and incorporates process knowledge descriptions based on the ontologies.
- Semantic Rich system
- Facilitates Monitoring and Exception handling
<table>
<thead>
<tr>
<th></th>
<th>Crossflow</th>
<th>COSMOS</th>
<th>Sweetdeal</th>
<th>$\text{ER}^{\text{EC}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Information Exchange</td>
<td></td>
<td></td>
<td>√</td>
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<tr>
<td>Negotiation</td>
<td></td>
<td>√</td>
<td>√</td>
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<tr>
<td>Modeling</td>
<td>√</td>
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<tr>
<td>Monitoring</td>
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<tr>
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</tr>
<tr>
<td>Management</td>
<td></td>
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</tr>
</tbody>
</table>
Three-Layer Framework by Chiu et. al. (2003)

• An e-contract enactment system has been based on three-layer framework.
  – Business Layer
  – Structural Layer
  – Implementation Layer

• E-contracts are modeled in UML

• Implementation architecture is based on cross-organizational workflows using Enterprise Java Bean and Web services.
Three- Layer Framework by Chiu et. al. (2003)

• Business Layer:
  – E-contracts are defined through analyzing the contract clauses to business rules and business entities based on ECA paradigm
  – Business parties, business rules, business entities

• Structural Layer:
  – Requirements for the e-contract enactment workflow are elucidated through requirement analysis
  – Cover both static and dynamic aspects
  – User case diagrams, activity diagrams

• Implementation Layer:
  – Consists of components of contract activities, workflows among these activities and web services
  – Cross-organizational workflows and interfaces are implemented using Enterprise Java Bean and Web services.
Motivated by the *active database paradigm*

- Event - occurrence of something interesting to the system itself or to user applications
- Event driven execution of rules in event-condition-action (ECA) form
- ECA (active) rules: *On event if condition then action*
- *Exceptions and alerts* are events too (*action = handler*)
- Ensure efficiency and timeliness - monitor becomes only active when an interesting event occurs
The architecture is inspired by the system architecture of the DR-DEVICE family of applications.

The main differences between DR CONTRACT and the DR-DEVICE is in the use of an extended variant of Defeasible Logic.

The extensions are in the use of modal operator and a non classical operator for violations.

The same difference applies for the SweetDeal approach by B. Grosof.
Other e-contract projects/Systems

• SeCo Project [Runge et al]
  – Secure Electronic Contracts
  – Described a SeCo Container which has three layers – logic, information and communication layers

• Coyote Project [Dan et al, 1998]
  – Cover Yourself Transaction Environment
  – Focus on multi-party e-commerce framework

• SORM Model [Ludwig and Stozle, 2003]
  – Simple Obligation and Right Model
  – Runtime management of electronic service contracts
Other e-contract projects/Systems contd...

• Business Contract Architecture (BCA) [Milosevic et al, 1995]
  – Assumes contracts are provided a priori
  – Supports static e-contracts - not suitable for dynamically changing business and regulatory environments

• HP Labs [Morciniec, 2001]
  – Work-in-progress
  – A high-level architecture for regulating electronic marketplaces using contracts embodied in XML

• EDEE contract enforcement system [Bacon and Moody, 2003]
  – Prototype
  – Based on persistent occurrence histories and incremental continuous query evaluation for monitoring of e-contracts
Monitoring e-contracts

- Event based monitoring
  - Event types: temporal, database, external etc.
  - Contract events are mutually exclusive
  - Specifying and detecting events play an important role in the process of analyzing, monitoring and visualizing the behavior of each party involved in the e-contract
  - Rouached et al presented event-based framework associated with a semantic definition of the commitments expressed in the event calculus, to model and monitor multi-party contracts
  - Farrell et al (2004) presented automated performance monitoring of e-contracts, in terms of tracking contract state by defining an XML formalization of the event calculus, ecXML
Monitoring e-contracts contd...

- Pro-Active monitoring
  - Xu and Jeusfeld, 2003
  - Handles the following questions
    - Given the current state of contract execution, which actions are expected from a partner in the future
    - Is a contract violation imminent, i.e., likely to happen within short time? Which partner have to remind to fulfill her obligation?
    - Which partner is responsible for a contract violation?
  - Proposed a framework for monitoring e-contracts during the contract execution.
  - Temporal logic has been used to represent the e-contract, which enables the pro-active monitoring of e-contracts.
Main elements of an e_contract

\[ R = \{ R_1^{ME1}, R_2^{ME1}, \ldots, R_m^{ME1}, R_1^{ME2}, R_2^{ME2}, \ldots, R_n^{ME2} \} \]

\[ O = \{ O_1^{ME1}, O_2^{ME1}, \ldots, O_p^{ME1}, O_1^{ME2}, O_2^{ME2}, \ldots, O_q^{ME2} \} \]

E-signatures

Manager E1
Alice

Manager E2
Bob

E1, E2—Enterprises, \( R \)—Right, \( O \)—Obligation
ME1—Manager of E1, ME2—Manager of E2
Mapping of events, conditions and operations of an e-contract into a FSM state

Business Contract Language

The Contract monitoring domain language
Contract Management

• Managing contract effectively requires a powerful semantic model and a generic management framework. If contracts are to be enforced automatically then the representation must capture the relevant semantics in full. [Bacon and Moody, 2003]
ER² Process Model

- Requirements Collection (subcontracts, parties, activities, clauses, relationships, events, exceptions, etc.)
  - Contract Document
  - Contract Model requirements
    - Structural validation
      - Conceptual schema (ER² data model)
        - Workflow Mapping (Logical Design)
      - Logical Schema
        - Transactions
        - Physical Design (Relations, Workflow Instances, Applications)
        - Internal Schema
      - Conceptual e-contract specification
        - XML-tagged e-contract specification
          - A P C Constructs
          - A C D
          - ECA Rules
            - Application Design
              - Log records specification
                - Log Records
          - Behavior validation
    - Functional Validation
      - A P C Constructs
      - A C D
      - ECA Rules
      - Log records specification
      - Log Records

# APC Specifications

| Party | <Party>
|-------|---
|       | <Party Number> ..<Party Name >.. + </Party>

| Activity | <Activity>
|----------|---
|          | <Activity Number> ...<Description> .... <Start Date >... <End Date> .... < Previous Activity>... <Next Activity>.... <Parties Responsible>..</Parties Responsible> + <Clauses>...</Clauses> + <Exceptions>...</Exceptions> + </Activity>

| Clauses | <Clauses>
|---------|---
|         | <Clause Number> <Description>
|         | <Activity Number>....<Party Number> + </Clauses>
ACD for fund transfer activity

And-Or Graph of Event level Specification of Fund Transfer Activity
Implementation Architecture for \( \text{ER}^{EC} \) Framework

[Diagram of the architecture]
Investment E-Contract: Contracts

1. FI and Banks/agencies for accepting the Application Form and initial amount from Investors and sending the Application Forms to FI and collected amount to the account of FI (with FI’s own bank).

2. FI and Banks (in some cases may be different from 1) for periodic payment of interest/warrant/dividend.

3. Among banks for inter bank funds transfer

4. Bank and investor – investor being the account holder of the bank

5. FI and Investors

6. Among the investors for the transfer of ownership

7. Agencies and banks for transfer of funds

___ _______ ___ ___ ___
Investment E-Contract: Clauses

1. Who can invest (like say citizen of the country and or institutions), how they can invest (like say singly, jointly etc.)
2. Minimum Amount, Maximum Amount and Other restrictions Maturity Period
3. Promise of return, mode and periodicity of interest payment etc.
4. Other conditions like whether Transfer of ownership allowed, Pre-mature withdrawal allowed or not, reinvestment in other schemes allowed or not etc. and penal clauses like payment of additional penal interest in case the interest is not paid in time.
### Investment E-Contract: Activities

<table>
<thead>
<tr>
<th>Activity FI</th>
<th>Activity Investors</th>
<th>Activity Bank</th>
</tr>
</thead>
</table>
| 1. Issuing notification for bonds/security  
2. Entering into an agreement with banks/agencies for acceptance of application forms and amount.  
3. Receive Application forms and funds, scrutinize applications, pass accounting entries, allot bonds/securities to investors, return the amounts for rejected applications and unallotted amount, issue bonds and certificates, send acceptance notifications to holding agencies and investors, periodically pay the promised interest, repay or reinvest in new scheme, etc. | 1. Submit the signed and completed application and pay the amount.  
2. Get notification  
3. Hold the Bond/Security till maturity or carry out allowed operations like Transfer, premature withdrawal etc  
4. Tally the periodic interest received | 1. Receive Application Form and Amount  
2. Send Applications to FI and collected Amount to FI’s Bank  
3. FI’s bank will credit the amount collected to FI’s Account  
4. FI’s Account will be debited for periodic interest and repayment, the amount to be transferred to different bank accounts.  
5. Transfer the interest and amount received to the investor’s account. |
Rule 1

**Rule_Name** : Allot_Bonds_To_Investors  
**Triggering_event** : Amount_Received and Application_Scrutiny_Successful  
**Condition** : Decide upon the Bond Allocation policy.  
**Action** : Return the remaining Amount if the Face_Value of Bonds allotted is less than paid amount.  
**Resultant_Event** : {Allot Bonds, Return Amount, Inform_Depository}  
Suppose that investor has applied for Bonds of face value say X and he has paid amount Y (>X) then the amount (Y-X) is returned. The information is sent to the depository.

Rule 2

**Rule_Name** : Pay_Interest  
**Triggering_event** : Due_Date  
**Condition** : There should not be any hold on interest payment  
**Action** : Calculate the interest payable and credit it to the investor’s Account  
**Resultant Event** : {Calculate Interest Due, Amount_Transfer, Bank_Transfer}  
The interest will be calculated and the amount will be transferred to the Account of the Customer  
**Exception** : Not able to credit — Incorrect_Account_Info, Interest cannot be paid
FMS Contract

• Financial Messaging Solution – standard for financial messages among banks and between banks.

• A contract between software developer, service provider, and the participating banks.
FMS Contract

- A modularized Web enabled software enabling financial messaging among the participating banks with flexible architecture.
- Template Builder to support flexible definition of messages in the standard format.
- Directory services for maintenance of branch directory, network configuration, etc.
- Secured messaging and routing based on store and forward principles governed by push technology providing Smart Card based access. Messages will be secured via standard encryption and authentication services conforming to ISO standards.
- Messages can be clubbed and exchanged as a batch of files.
- Complete auditing, logging, time-stamping and warehousing of messages and periodic computation of charges and billing of the services offered to the participating banks.
FMS Contract

The contract document is 200 pages
Involves executing number of activities in synchronized manner

**Typical Activities**

1. Identify the deliverables of the contract. It will involve a subcontract between the participating banks and software and hardware vendors.
2. The work completed is required to be monitored – Progress Monitoring
3. It has to be inspected for correctness – Testing Activity
4. Depending upon the successful completion, the payments instructions to the banks are generated. – Payments
Either Purchaser or Contractor can identify the need for change on the accepted deliverables.

[Clause CL-a]
If the Purchaser identifies the change requirement, then Purchaser will raise Request for Change (RFC) by filling the Change Management Request form. Its format will be provided by the Contractor. It will essentially cover Change Request Description, Requested Date, Priority of the request (i.e. Very Urgent, Urgent, Normal etc.). The priority will be assigned by the Purchaser Project Manager. [Clause CL-b]
On receiving this request Contractor will allocate a CMR number to the request and will notify it to the Purchaser. The contractor will then evaluate the need of this change with respect to Priority, Feasibility of the change, and Impact on time frame and cost. The contractor might ask for relevant clarifications regarding the change request. It is the responsibility of the purchaser to provide the clarification in time. The Contractor will place the results of evaluation to Purchaser. [Clause CL-c]
The Purchaser can approve/disapprove the change requests after seeking the relevant clarifications on the evaluation from the contractor. In case the change is approved then the Contractor will schedule the changes based on priority. The contractor will then make the necessary changes and release them to Purchaser for acceptance. The purchaser will carry out the acceptance and provide the acceptance certificate. The Change Management Form will be recorded with the result raised change request, who has incorporated the change, date of release to Purchaser. [Clause CL-d]”
“Subject to any deductions of tax at source, if applicable, from the contract price as per clause A of schedule A of the Contract, the CONTRACTOR shall be entitled to receive the Contract Price in the following manner:

(1) All the payments shall be released directly by the PURCHASER to the CONTRACTOR.

(2) The initial advance payment and payments against the delivery certificates and final Acceptance Certificates as referred to in Para B of schedule A of the contract, shall be released on completion of each milestone as indicated in the table of payment in schedule B.

(3) All the payments will be made by the purchaser only after satisfying about the satisfactory completion of each milestone as stipulated in Systems Requirements Specifications (SRS) Document referred to in Schedule B, of the Contract by the PURCHASER.

(4) ...
### Activities of each party for the Change Management

#### A: Application Software Developer
- **[A-1]** Examine the Request. Seek clarifications and replies
- **[A-2]** Assign Change Management Request (CMR) Number
- **[A-3]** Accept or Reject the change
- **[A-4]** Carry out changes
- **[A-5]** Receive Payments

#### B: Banks
- **[B-1]** Identify the Change Management Request
- **[B-2]** Clarifications and Replies about changes
- **[B-3]** Examine the impact of acceptance of change
- **[B-4]** Upgrade Hardware/Software, if necessary
- **[B-5]** Acceptance of Upgrades
- **[B-6]** Acceptance of the changes
- **[B-7]** Payments to different parties like Vendors/Service Provider/Application

#### C: Service Provider
- **[C-1]** Identify the Change Management Request
- **[C-2]** Clarifications and Replies about changes
- **[C-3]** Examine the impact of acceptance of change
- **[C-4]** Upgrade Hardware/Software, if necessary
- **[C-5]** Acceptance of Upgrade
- **[C-6]** Acceptance for the changes
- **[C-7]** Receive Payments

#### D: Vendors
- **[D-1]** Receive request for Hardware/Software
- **[D-2]** Supply Hardware/Software
- **[D-3]** Installation
- **[D-4]** Receive Payments
(a) Parametric workflows for ‘payments’ (b) Workflow views for ‘Receive Payments’ (c) Dynamic workflows for ‘carryout changes’
Textile Value Chain Contract

(1) STC and Mills
(2) STC and Weavers
(3) STC and Printers
(4) STC and Showrooms
(5) STC and Institutes/organizations
(6) Interbank
(7) Bank Customership
STC

Mills

Weavers

Showrooms

Printers
Terms of Payment: 100% payment will be made against delivery by cheque after inspection and acceptance of the material at our stores.

“When the material is ready for dispatch”, before supplying the material, please arrange to send three copies of Performa invoice indicating D.C. No. & Date in order to keep the demand draft ready. [Clause CL-a]

Liquidated Damages:
A) Failure to supply the goods by the time specified on the order will make the supplier liable to an unconditional liquidated damage of ½% (half percent) per week subject to a maximum of 10% (Ten Percent) of the price of the goods in arrears at the discretion of the STC. [Clause CL-b]
B) The purchaser shall have the right to cancel either wholly or in part the portion of the contract which is yet to be executed by supplier in case the delivery is not in accordance with the time specified in the order. [Clause CL-c]

Jurisdiction: All questions, disputes of differences arising under, out of or in connection with the contract shall be subject to the exclusive jurisdiction of the court within the local limits of whose jurisdiction the place from which the purchase order is issued, is situated. [Clause CL-d]

Quality: All goods and works must conform to the specifications quoted on the order and are to be strictly in accordance with approved samples of designs. Goods supplied are subject to inspection by our authorized representatives and the inspector has right to reject the goods of conforming to our specifications. [Clause CL-e]

Inspection: All goods and works are subject to our inspection. Inspection, either at your works or delivery as agreed will be carried out. The decision of our officer nominated/authorized by the GM, Materials is final. Rejected goods will be returned to the suppliers at his cost including freight on original shipment. [Clause CL-f]
<table>
<thead>
<tr>
<th>A: STC</th>
<th>C: Weavers</th>
</tr>
</thead>
<tbody>
<tr>
<td>[A-1]. Requirement analysis,</td>
<td>[C-1] Receive the raw material,</td>
</tr>
<tr>
<td>[A-2] Inventory management</td>
<td>[C-2] Process material</td>
</tr>
<tr>
<td>[A-3] Estimation of raw material (yarn)</td>
<td>[C-3] Supplying the weaved material/gray cloth to STC/Printers</td>
</tr>
<tr>
<td>[A-4] Purchase order to Mills</td>
<td></td>
</tr>
<tr>
<td>[A-5] Shipment of raw material to weavers</td>
<td></td>
</tr>
<tr>
<td>[A-6] Shipment of weaved material/gray cloth to</td>
<td></td>
</tr>
<tr>
<td>Printers along with required design specifications.</td>
<td></td>
</tr>
<tr>
<td>[A-7] Shipment of finished goods to showrooms/Institutions/Organizations</td>
<td></td>
</tr>
<tr>
<td>[A-8] Training to weavers on modernization of new machinery/tools</td>
<td></td>
</tr>
</tbody>
</table>

| B: Mills                                        | F: Banks                                                                    |
|-------------------------------------------------|                                                                            |
| [B-1] Receive the invoice                       | [F-1] Account Subscription (customership)                                  |

D: Printers
[D-1] Receive the weaved material
[D-2] Process (dying and printing) the material
[D-3] Shipment of finished goods to STC

E: Showrooms/Organizations
[E-1] Send the request for material (cloths)
[E-2] Receive the material
[E-3] Sell the material
[E-4] Inventory management in case of showrooms
Design not up to the mark
- Reject
- No Stock
- Time Limit Crossed
- No Sufficient Balance
- Invalid Account Details
- Hold
- Resend Again

Relations between entity types

Contract Events

Activities

A-1
A-2
A-3
A-4
A-5
A-6
A-7
A-8
B-1
B-2
C-1
C-3
D-1
D-2
D-3
E-1
E-2
E-3
E-4
F-1
F-2

Sub Contracts

STC&Mills
STC&Weaver
STC&Printers
STC&ShowRooms
Bank Customership
Inter-Bank

Clauses

CL-a
CL-b
CL-c
CL-d
CL-e
CL-f

Textile

have

Clubs

has

Parties

have

Payments

Weavers

STC

Mill

Bank

Printer

Showroom/organization

Exceptions

Invalid Account Details

Send Clarification

Wait

No Sufficient Balance

Design not up to the mark

No Stock

Time Limit Crossed

Reject

Hold

Resend Again

7/19/2023
Workflow for e-contract 'Textile Value chain'
Contract Monitoring using Rules

➢ Carefully look into all the statements in the contract document, especially the clauses.
➢ Extract statements with phrases such as “if then else”, “but”, “contract violates” and other user specified phrases.
➢ Prepare groups of statements in such a way that each activity/task is associated with a particular group.
➢ Identify the set of events and actions for each group of statements, and translate them into “Event-Condition-Action (ECA)” Rules.
➢ List the exceptions associated with each ECA Rules.
➢ Show the rules using parallelograms in the ER<sup>EC</sup> model.
➢ Link the related entity instances of activities, clauses and exceptions entities in the ER<sup>EC</sup> schema.

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E-contracts: Commercial Products
Some e-contracts Commercial Products

• LaDorn Systems Corporation's e-Contracts software
  – complete solution for automating the entire procurement process
  – Features
    • Centrally track and manage contracts
    • Route contracts through approval cycle with e-mail notifications
    • Easily add modifications to existing contracts
    • Track contract compliance
    • Create solicitations using templates and pre-existing documents
    • Manage vendor information, history and status
    • Search for vendors by commodity code, business size, classification or LSDBE
    • Evaluate vendor and subcontract performance
    • Customized reports that can be exported, faxed or emailed
    • Built-in multi-level security
    • Interface with other financial and administrative systems

Some e-contracts Commercial Products contd...

- **Contract Management Track Software (CMTS)**
  - designed to simplify entire contract management process

- **ContractWeb**
  - enterprise contract management tracking solution
  - designed to streamline entire contract workflow process--from creation to completion
Open Problems

• Moving from existing voluminous contract to e-contract
• Developing a generic meta-model or templates, which instantiate domain specific e-contract instances
• Integrated solution from meta-model to deployment
• Evolving adaptive e-contracts (Spatio-Temporal)
• Developing e-contract Standards including standards for Conceptual modeling, architecture and deployment
E-contracts is a good area where applicability of Active Learning for conceptual modeling can be studied.
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Q & A

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Thank You