APPENDIX I

Fuzzy Inference System and Adaptive Neuro Fuzzy Inference System
Experiment Configuration and Snapshot

[System]
Name = SOAReliability
Type = mamdani
NumInputs = 3
InLabels =
  AdhocRqmt
  ChangeMgmt
  BICollaboration
NumOutputs = 1
OutLabels = ReliabilityImpact
NumRules = 27
AndMethod = min
OrMethod = max
ImpMethod = min
AggMethod = max
DefuzzMethod = centroid

Input Parameters

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<thead>
<tr>
<th>[Input1]</th>
<th>[Input2]</th>
<th>[Input3]</th>
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<tbody>
<tr>
<td>Name = AdhocRqmt</td>
<td>Name = ChangeMgmt</td>
<td>Name = BICollaboration</td>
</tr>
<tr>
<td>NumMFs = 3</td>
<td>NumMFs = 3</td>
<td>NumMFs = 3</td>
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<tr>
<td>MFLabels =</td>
<td>MFLabels =</td>
<td>MFLabels =</td>
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<tr>
<td>ARLow</td>
<td>CMLow</td>
<td>BILow</td>
</tr>
<tr>
<td>ARMedium</td>
<td>CMMedium</td>
<td>BIMedium</td>
</tr>
<tr>
<td>ARHigh</td>
<td>CMHigh</td>
<td>BIHigh</td>
</tr>
<tr>
<td>Range = [0 10]</td>
<td>Range = [0 10]</td>
<td>Range = [0 10]</td>
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[Output]
Name = ReliabilityImpact
NumMFs = 5
MFLabels =
RI_VLow
RI_Low
RI_VHigh
RI_Medium
RI_High
Range = [0 10]
Appendices...

Screen-Shots of various Configurations During Experiments using MATLAB Fuzzy Toolbox

Membership Function for Input Parameter ‘AR’

![Membership Function for Input Parameter ‘AR’](image1)

Membership Function for Input Parameter ‘MG’

![Membership Function for Input Parameter ‘MG’](image2)
Appendices...

Membership Function for Input Parameter ‘BI’

Membership Function for Output Parameter ‘ReliabilityImpact’
Input parameters are configured using FIS Editor
System Representation Surface Viewer

Created Rule Base using Rule Editor
Configure Sugeno Type using ANFIS Editor
Survey Questionnaire
Title: Service Oriented Architecture: A design and Implementation Model

General Information for conduct of survey
This survey objective is to gather general information about level of system integration used and the role of the middleware software play within organizations. The questionnaire contains questions of varying formats, with intention of gathering data on the following:

- To identify the present systems used in companies to manage customers, suppliers, and business processes
- Level of system integration used in the companies and their views about the importance & benefit of system integration
- Their knowledge and perception of Service Oriented Methodology on integrating ERP, SCM and CRM systems
- To analyze the feasibility of building the integrated SOA based system

Target Respondents
This survey is mainly targeted on respondents from small and medium enterprises where more than one computerized systems is implemented. In case respondent is not in IT domain but holding a key position in company he was asked to share his experiences.

Time required
Require approximate 20 to 30 minutestime.

Declaration
The information provided in the survey is purely kept confidential and no information from this survey will be sold. Particulars of respondent will not appear in any publication and will not be shared with any other companies, departments, colleges, or universities. The objective of this survey is purely for an academic purpose.
Mode of Conduct:

- Meet personally
- Through email

Online questionnaire are available on google docs at following link

- [https://docs.google.com/forms/d/1k_p34EmXrbPfN-LKA0VrMyn3r-gTumfDrRvRx2tFrAU/viewform](https://docs.google.com/forms/d/1k_p34EmXrbPfN-LKA0VrMyn3r-gTumfDrRvRx2tFrAU/viewform)
- [https://docs.google.com/forms/d/1V0jYsQi0HtFmE184MR7W3NncWpwm0w80fusLQmLGpqc/viewform](https://docs.google.com/forms/d/1V0jYsQi0HtFmE184MR7W3NncWpwm0w80fusLQmLGpqc/viewform)
- [https://docs.google.com/forms/d/1BnaCVbayplcFDmXZITvL_S543OieDmYEb950TsXEldo/viewform](https://docs.google.com/forms/d/1BnaCVbayplcFDmXZITvL_S543OieDmYEb950TsXEldo/viewform)
GENERAL QUESTIONNAIRE
FEASIBILITY OF SOA BASED INTEGRATED MODEL

Section A: Personal Particulars

Please your answer where applicable.

Name : ____________________________________

Gender : Male               Female

Job Title : ____________________________________

Company Name : ____________________________________

Company URL : ____________________________________

Contact No. :( Office) __________________ (Mobile) __________

Email Address : ____________________________________

Section B: General Questions

1. Scale of employees in your organization?
   Small - Less than 50 employees
   Medium - 50 to 500 employees
   Large - More than 500 employees

2. Primary business area of your company? (Education/Manufacturing/IT Services etc.)
   ____________________________

3. Does your company have an accounting based computerized system that mainly use for
   identifying and planning resources within the organization? (Yes/ No / Don’t know)

4. Does your company use any SCM software system? (Yes /No)
   If yes, please specify _____________________

5. Does your company use any CRM software system services? (Yes / No)
If yes, please specify _____________________

6. Does your company use any ERP software system services? (Yes No)
   If yes, please specify _____________________

Section C: Your Company’s Level of System Integration

1. Current enterprise systems used at your company? (Check all that apply)
   Customer Relationship Management (CRM)
   Enterprise Asset Management (EAM)
   Enterprise Resource Planning (ERP)
   Financial Management System (FMS)
   Human Capital Management (HCM)
   Performance Management (PM)
   Product Lifecycle Management (PLM)
   Supply Chain Management (SCM)
   Other (Please specify) ______________________________________________

2. Does existing enterprise systems share information among each of the system for business purposes? (Yes/ No / Don’t know )

3. Does your company facing any problem to integrate different systems component inorder to fulfill specific business processes? (Yes/ No / Don’t know )

4. Does your company currently utilize any middleware suites or programs to integrate current enterprise applications to achieve certain business purposes?
Section D: Analyzing the idea of systems integration using Service Oriented Methodology

Proposal: to develop an integrated SOA model to integrate the business values chain activities particularly modules of ERP, SCM and CRM subsystems as a system.

1. Do you think ERP, SCM and CRM are most suitable group of enterprise systems to be integrated functionally in order to achieve business purposes? (Yes / No)
   If No, please suggest other systems. _________________________________
   ________________________________________________________________

2. Do you think setting up the service oriented middleware software as mentioned above will be a good idea to integrate different applications as a whole to automate business processes? (Yes / No)
   If No, why? _____________________________________________________
   ________________________________________________________________

3. What are the limitations and weaknesses of the current computerize systems in your company?
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

4. Please elaborate the problems your company is facing in integrating different systems to achieve particular purposes?
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
QUESTIONNAIRE- 1
SOA DESIGN & IMPLEMENTATION - RISK & HINDRANCE FACTORS

NOTE: Following is the list of questions that cover the factors or parameter for the SOA implementation risk and hindrance factors in an organization. Please, indicate assessment of the importance that you may associate with each factor by giving personal rating on a scale of 1 to 5 against each factor.

<table>
<thead>
<tr>
<th>Rating 1</th>
<th>Very low</th>
<th>If parameter is not necessary and its impact on the company performance is minimal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating 2</td>
<td>Low</td>
<td>If the parameter is desirable but impact is minimal.</td>
</tr>
<tr>
<td>Rating 3</td>
<td>Moderate</td>
<td>If parameter is necessary and it’s impact is marginal.</td>
</tr>
<tr>
<td>Rating 4</td>
<td>High</td>
<td>If parameter is necessary and it’s impact is significant.</td>
</tr>
<tr>
<td>Rating 5</td>
<td>Very High</td>
<td>If parameter is absolute essential and it’s impact is critical.</td>
</tr>
</tbody>
</table>

RISK OR RESISTANT FACTORS FROM VARIOUS PERSPECTIVES
(Rate these factors by putting tick on appropriate box of your choice)

<table>
<thead>
<tr>
<th>RATING</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

Risk factors in SOA System implementation.

- Users are not adequately involved in design.
- Users are not adequately trained to use the SOA system.
- Process reengineering is required.
- Poorly designed ESB, did not adequately mirror required processes.
- Optimal service integration may not be achieved for each value chain activities.
- Difficulty in executing new processes.
<table>
<thead>
<tr>
<th>Risk factors encountered with migration to SOA system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Time needed for implementation.</td>
</tr>
<tr>
<td>➢ Technical problems with new version.</td>
</tr>
<tr>
<td>➢ Bad estimates with migration partners.</td>
</tr>
<tr>
<td>➢ Cost involved.</td>
</tr>
<tr>
<td>➢ Quality of migration support.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk factors from users involved in various phases of SOA system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Inattention to work with the new system.</td>
</tr>
<tr>
<td>➢ Inadequate training or failure to follow procedures of new system.</td>
</tr>
<tr>
<td>➢ Not smart enough to understand the system advantages.</td>
</tr>
<tr>
<td>➢ Are lazy and want to continue working with traditional procedures.</td>
</tr>
<tr>
<td>➢ Overly perfectionist in their experience.</td>
</tr>
<tr>
<td>➢ Lack of internal expertise and skillset.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk factors in Planning and Requirement analysis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Lack of proper top management support</td>
</tr>
<tr>
<td>➢ Lack of Champion and proper project management structure.</td>
</tr>
<tr>
<td>➢ Failure to redesign business processes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk factors in System Design of SOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ System is expensive.</td>
</tr>
<tr>
<td>➢ Network capacity to allow proper implementation to centralized SOA system.</td>
</tr>
<tr>
<td>➢ Every new service versions changes processes.</td>
</tr>
<tr>
<td>➢ Linking services in adhoc manner increases</td>
</tr>
</tbody>
</table>
In Operation & Security implementation of SOA system.

- Too little effort goes into supporting effective use.
- System is ad-hoc and readily adaptable as business needs change.
- Failure to perform all business chain activities using defined ESB.
- Theft by entering fraudulent transaction data as accessed through network only

Other risk factors.

- Extensive reliance on computer and internet connectivity.
- Large R&D effort as percentage of revenues.
- National / International media profile.
- Operator error while executing transaction.
- Software bugs or data errors
QUESTIONNAIRE- 2
SOA SYSTEM IMPLEMENTATION FACTORS

NOTE: Following is the list of questions that cover the factors or parameter for the SOA implementation factors in an organization. Please, indicate assessment of the importance that you may associate with each factor by giving personal rating on a scale of 1 to 5 against each factor.

| Rating 1 | Very low | If parameter is not necessary and its impact on the company performance is minimal. |
| Rating 2 | Low      | If the parameter is desirable but impact is minimal. |
| Rating 3 | Moderate | If parameter is necessary and it’s impact is marginal. |
| Rating 4 | High     | If parameter is necessary and it’s impact is significant. |
| Rating 5 | Very High| If parameter is absolute essential and it’s impact is critical. |

SOA SYSTEM IMPLEMENTATION FACTORS
(Rate these factors by putting tick on appropriate box of your choice)

| G RADES | 1 | 2 | 3 | 4 | 5 |
| Factors for SOA system implementation failures. |

- Lack of vision from the top management. |
- Poor project management. |
- Inadequate education and training in the SOA domain |
- A bad myth. |
- Inaccurate mapping of actual requirements |
- Significant technical difficulties. |
- SOA implementation is viewed as an huge IT project. |

Rate the following Planning phase factors for SOA system implementation.

- Understanding basic SOA architecture |
- Understanding the role of service model in context of SOA systems.
- Identifying functional heads / project leader.
- Appoint an outside SOA BPR consultant
- Set BPR objectives and responsibilities.
- Assembly of steering committee.
- Determination of high level project scope and broad implementation approach
- Selection of a project team manager.
- SOA implementation services determination.
- Organizations commitment.
- Clear communications of strategic goals.
- View SOA based applications as enterprise wide venture.

**Rate the following Project phase factors for SOA system implementation.**

- Identification of service modules for business value chain activities.
- Project team is selected and structured with appropriate mix of technical and business expertise.
- Analysis of current business processes.
- Determine level of service modularity required.
- Determine ESB architecture for interaction and communication of services
- Apply high level design and detailed design subject to user acceptance
- Apply interactive prototyping method in design
- Population of test instances with real data.
- Building and testing the ESB and effectiveness of service integration.
Map the services with business value chain activities

Factors representing training to new methodology implementation:

- Training on methodology approach, phases, tasks and deliverables.
- Training on tools supporting the methodology.
- Training on benefits of reusability, agility and adaptability

Prospective problems during implementation.

- Financial constraints.
- Training problems.
- Management commitment.
- Vendor performance.
- Consultant performance.

Critical success factors (CSF) in SOA implementation.

- Top management’s advocacy.
- Provision for adequate resources.
- Steering committee / member of project core team are independent of taking decisions.
- Set realistic milestones and delivery dates.
- Minimal customization and uncomplicated option selection.
- Fewer modules and less functionality implemented
- Smaller user groups and fewer sites.
- The old systems, including all informal system are eliminated.

What provisions are made if particular module or system fails to work properly.
- Legacy system is working in parallel.
- Totally dependent on new system.
- Some scheme to traverse back to legacy system.

**What provisions if budget becomes short.**

- Postpones implementation.
- Feature reduction.
- New budget allocated.

**Factors related to steering committee.**

- Steering committee members are permanent.
- Member changes according to module.
- Committee is independent of taking decisions.
- In developing an internal training plan.
- Training at the beginning and returning at later date to ensure proper changes during implementation.
- Provide evidence of the value of new methodology.
- Hosting seminars to share ideas with personnel from other organization.
- Hosting training seminars to explore participants to the methodology.

**Rate the impact of following factor in context of an SOA based system**

- Governance issues
- Migration issues
- Legacy system integration
- Change management
- Adhoc requirement
- Resource competences
- Security risk
<table>
<thead>
<tr>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk management</td>
</tr>
<tr>
<td>Return on investment</td>
</tr>
<tr>
<td>BPM and business agility</td>
</tr>
<tr>
<td>Teaching and training</td>
</tr>
<tr>
<td>Organization culture</td>
</tr>
<tr>
<td>Team cooperation</td>
</tr>
</tbody>
</table>
QUESTIONNAIRE- 3
IMPACT OF SOA SYSTEM IMPLEMENTATION ON BUSINESS

NOTE: Following is the list of questions that cover the factors or parameter for the impact of SOA based application implementation in an organization. Please, indicate assessment of the importance that you may associate with each factor by giving personal rating on a scale of 1 to 5 against each factor.

| Rating 1 | Very low | If parameter is not necessary and its impact on the company performance is minimal. |
| Rating 2 | Low      | If the parameter is desirable but impact is minimal.          |
| Rating 3 | Moderate | If parameter is necessary and its impact is marginal.          |
| Rating 4 | High     | If parameter is necessary and its impact is significant.       |
| Rating 5 | Very High| If parameter is absolute essential and its impact is critical.  |

<table>
<thead>
<tr>
<th>RATINGS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
</table>

**Tangible benefits after Implementation of SOA System**

- Inventory Reduction
- Personal reduction
- Productivity improvement
- Order management improvement
- Technology cost reduction
- Procurement cost reduction
- Revenue/profit improvement
- Transportation/logistics cost reduction
- Maintenance reduction
- On time delivery improvement

**Intangible benefits after Implementation of SOA System**

- New/improved business processes
- Customer responsiveness
- Cost reduction
- Integration
- Standardization
- Flexibility
- Globalization
- Business performance
- Supply/demand chain
- Information/visibility
- Governance
- Information processing cost
- Communication cost

**Business Performance factor**
- Has reduced organizations business risks
- Enhanced organizations regulatory compliance
- Has facilitated improved services to customer and Suppliers
- Has allowed new services to customer and suppliers
- Has increased institutional accountability
- Has increased shareholders confidence in Organization
- Has enhanced support to organizational activities
- Has enhanced organization business performance
- Has decreased workload in central department
- SOA application is less costly to maintain and operate as compared to legacy systems
- SOA application is less costly to enhance/upgrade as compared to legacy system
- SOA application is less costly to integrate as compared to legacy system
- SOA application made it easier to take advantage of new technology
### Mapping of Objectives Covered in Paper Published During Current Research Work

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Paper Title</th>
<th>Journal</th>
<th>Obj. No</th>
<th>Chap No.</th>
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<tbody>
<tr>
<td>2</td>
<td>Techniques for Evaluating Service Oriented Systems: A Comparative Study</td>
<td>Journal of Industrial and Intelligent Information. (JIII), USA</td>
<td>4</td>
<td>3</td>
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<tr>
<td>3</td>
<td>Critical Success Factors for Service Oriented Model</td>
<td>International Conference on “Emerging Research in Computing, Information, Communication and Applications”, ERCICA 2013, Bangalore, India.</td>
<td>3</td>
<td>5</td>
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<tr>
<td>6</td>
<td>Unified Modeling Language for Describing Business Value Chain Activities</td>
<td>International Journal of Computer Applications (IJCA)), USA.</td>
<td>5</td>
<td>4</td>
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<tr>
<td>7</td>
<td>Integrating SOA and Cloud Computing for SME Business Objective</td>
<td>WSEAS Transactions on Computers, USA.</td>
<td>2</td>
<td>4</td>
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<tr>
<td>8</td>
<td>Service Oriented Architecture Adoption Trends: A Critical Survey</td>
<td>Fifth International Conference on Contemporary Computing (IC3-2012), JUIT, Noida (Published in CCIS, Springer)</td>
<td>1, 3</td>
<td>2</td>
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<tr>
<td></td>
<td>Designing a SOA Based Model</td>
<td>ACM SIGSOFT Software Engineering Notes, ACM, USA</td>
<td>2</td>
<td>4</td>
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<td>--------------------------------------------------</td>
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</tr>
<tr>
<td>10</td>
<td>Evolution of Technology through Procedural, Object Oriented and Component Based to Service Oriented</td>
<td>JCT - Journal for Computing Teachers, USA.</td>
<td>1, 2</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Issues of service oriented architecture - A survey</td>
<td>Oriental Journal of Computer Science &amp; Technology,</td>
<td>1, 3</td>
<td>2,5</td>
</tr>
<tr>
<td>13</td>
<td>Future Business Architecture Challenges</td>
<td>International Conference on Innovative Practices in Management and Information Technology for Excellence - held at MAIMT, Jagadhri (Yamuna agar), May 8, 2010.</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
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