**What is to be done:**

**NDI/NCS alternatives, NDI/NCS evaluation & analysis results;**

**Business case (beginnings, including benefits analysis); major risks; Capability and LOS feasibility**

**evidence; 3 personas**

**FED**

**●**

**Risk vs Problem**

**●**

**Personnel cost should only focus on client (1 person)**

**●**

**Architected Agile - most risks should be related to your**

**architecture**

**●**

**NDI/NCS - should include risks involving your NDI/NCS choices**

* **Feasibility studies aim to objectively and   
  rationally uncover:**
  + **The strengths and weaknesses of an existing business or proposed venture**
  + **Opportunities and threats as presented by the environment**
  + **The resources required to carry through**
  + **And ultimately the prospects for success**
* **Cost vs. Benefits – simplest criteria to gauge feasibility**
* **Generally done *before* initiating project or technical development (usually continues towards end of SDLC)**
* **Need to look at various aspects of the “problem” to ascertain feasibility**
* **Common Factors to look at: TELOS\***
  + **Technology Feasibility – is it technically possible?**
  + **Economic Feasibility – can we afford it? Profitable?**
  + **Legal Feasibility – is it legal?**
  + **Operational Feasibility – how well is problem solved?**

**Schedule Feasibility – is it doable in given time?**

* + **Shortfalls in evidence are uncertainties and risks**
  + **Should be covered by risk mitigation plans**
  + **Stakeholders decide to commit based on risks of going forward**
* ***Evidence* provided by developer and validated by independent experts that:**

If the system is built to the specified architecture, it will

* + **Satisfy the specified operational concept and requirements** 
    - **Capability, interfaces, level of service, and evolution**
  + **Be buildable within the budgets and schedules in the plan**
  + **Generate a viable return on investment**
  + **Generate satisfactory outcomes for all of the success-critical stakeholders**
* **Shortfalls in evidence are uncertainties and risks** 
  + **Should be resolved or covered by risk management plans**
* **Assessed in increasing detail at major anchor point milestones**
  + **Serves as basis for stakeholders’ commitment to proceed**

**Serves to synchronize and stabilize concurrently engineered elements**

* **Evidence can include results of**
  + **Prototypes: of networks, robots, user interfaces, COTS interoperability**
  + **Benchmarks: for performance, scalability, accuracy**
  + **Exercises: for mission performance, interoperability, security**
  + **Models: for cost, schedule, performance, reliability; tradeoffs**
  + **Simulations: for mission scalability, performance, reliability**
  + **Early working versions: of infrastructure, data fusion, legacy compatibility**
  + **Previous experience**
  + **Combinations of the above**
* **Validated by independent experts**
  + **Realism of assumptions**
  + **Representativeness of scenarios**
  + **Thoroughness of analysis**
  + **Coverage of key off-nominal conditions**
* **---------------------------------------------------------------**

1. **Architecture Feasibility**
   * **LOS Feasibility Techniques:**
     + **Analysis**
     + **Detailed references to prototypes**
     + **Models**
     + **Simulations**
   * **Capability Feasibility: Explicitly state/show how design satisfies capability requirements**
   * **Evolutionary Feasibility: Explicitly state/show how design satisfies evolutionary requirements (if any)**
2. **NDI/NCS Interoperability**

* **Various different NDI/NCSes may be used to satisfy the operational concept**
* **Need to check if they can seamlessly interoperate**
  + ***Plug and Play* instead of *Plug and Pray***
* **Usually a manual effort by going through documentations and architecture and by prototyping to see if glue code required**

**Risk Assessment**

* **Feasibility analysis only helps put estimates on the costs/benefits to ascertain expected ROI**
* **Various environmental factors can jeopardize project execution and delivery**
  + **Risks: Things that have a possibility of occurring in the future and may negatively impact outcome of project**
  + **Problem: Risk which has occurred or something that will happen with 100% probability**
* **Necessary to identify, analyze, prioritize and come up with mitigation plans if risk occurs**

**-----------------------------------------**

* **Feasibility Analysis is NOT a one time activity**
* **The granularity of the analysis changes when progressing through the project**
* **Continually conducted as more details are uncovered during execution**
* **A previous “feasible” decision might as well become “infeasible” later *or vice versa***
* **Feasibility Evidence required at every at every anchor-point milestone in ICSM**
* **For most teams gathering user stories should be enough**
* **Persona modeling helps elicit additional stories**
* **Understand who are we building this system for**
* **Help reduce the cone of uncertainty**
* **Even more important if you are not the domain expert**
* **Scope down the technology, UI, styles, etc.**

**BUSINESS CASE: Perform Cost Analysis**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Costs include actual client costs for system development, transition, operations, and maintenance. Development team costs are zero, but participation by non-developer stakeholders does cost (salary, overhead, etc.). Transition costs can include equipment purchase, facilities preparation, COTS licenses, training, conversion, and data preparation costs. Operation costs can include COTS licenses, supplies, system administration, and database administration costs. Maintenance costs can include hardware and software maintenance. The COCOMO II maintenance estimator can be helpful in producing the cost analysis.  If you acquire an NDI component or NCS, please don't forget to consider all the related fee such as transaction fee, license fee, support fee, per GB fee, and maintenance fee.  Cost incurred should include one-time and recurring costs of personnel, hardware, software, etc.   * **Personnel Costs**   Personnel costs should be estimated in terms of effort. One – time effort includes development and transition effort by clients, users, etc; while recurring effort includes effort operational and maintenance effort.  When the project has zero budget, no hardware and software purchase, it does not mean that there is no cost. Cost can occur in terms of effort or time spent to the project. Table 1 shows example of personnel costs in terms of hours spent to the project. Basically, we do not count number of hours from student development team.  The following table shows the example of Personnel Cost calculation; you can use this as a reference or tailor it to fit your project.   |  |  | | --- | --- | | Personnel Costs of Volunteer Tracking System | | | **Activities** | **Time Spent (Hours)** | | **Development Period (24 weeks)** |  | | **Valuation and Foundations Phases: Time Invested (CS577a, 12 weeks)** |  | | Client: Meeting via email, phone, and other channels [3 hrs/week \* 12 weeks \* people] | 72 | | Client Representatives: Meeting via email, phone, and other channels [2 hrs/week \* 12 weeks \* 2 people] | 48 | | Architecture Review Boards [1.5 hrs \* 2 times \* 2 people] | 6 | | **Development and Operation Phases: Time Invested (CS577b, 12 weeks)** |  | | Client: Meeting via email, phone, and other channels [5 hrs/week \* 12 weeks \* 2 people] | 48 | | Maintainer: Meeting via email, phone, and other channels [8 hrs/week \* 12 weeks \* 2 people] | 192 | | Architecture Review Boards and Core Capability Drive-through session [1.5 hrs \* 3 times \* 2 people] | 9 | | Deployment of system in operation phase and training       - Installation & Deployment [5 hrs \* 3 times \* 2 people]       - Training & Support [5 hrs \* 2 times \* 2 people] | 50 | | **Total** | 425 | |  |  | | **Maintenance Period (1 year)** |  | | Maintenance [3 hr/week \* 52 weeks] | 156 | | **Total** | 156 |  * **Hardware and Software Costs**   The following tables shows example of cost that occurs in Volunteer Tracking System Project. The first table shows hardware and software cost required during the development period while the second shows the cost required after the transition.  If your project does not acquire any new hardware or software, you should also provide supporting rationale such as using current server, or existing software.   |  |  |  | | --- | --- | --- | | Hardware and Software Costs – Development | | | | **Type** | **Cost** | **Rationale** | | Hardware – Web Server | $1,500 | A new machine is needed to act as a web server for the system. | | Hardware – Web Hosting | $200/year | Although the CSC already has its own host, this new system requires additional cost based on the annually hosting fee. Starting from fall 2006, until the end of spring 2007, this is an amount needed to be spent. | | Software – Adobe Dreamweaver CS3 | $399 | Used in developing the system and the team website. |  |  |  |  | | --- | --- | --- | | Hardware and Software Costs – Operation | | | | **Type** | **Cost** | **Rationale** | | Hardware – Web Server | $0 | Since the development machine can be used as a operation machine, no cost is required here. | | Hardware – Web Hosting | $200/year | Although the CSC already has its own host, this new system still requires additional cost based on the annually hosting fee. | |

**[Collapse](https://greenbay.usc.edu/IICMSw/practice.mgmt.feasibility_evidence_development.base/tasks/analyze_business_case_B62462F9.html)Perform Benefit Analysis**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Possible benefits are expressed in financial terms compared to costs, such as increased sales and profits, or reduced operating costs.  Non-financial benefits and costs should also be included. For example, the reduced amount of man-hour from using the automated system as shown.  The value added may also describe non-monetary improvements, which can be critical in customer support and satisfaction. Include the non-monetary benefits and its description such as:   * Increase in organizational reputation: organization’s website will be the main resource in the public relation activities * Easier for sponsor to donate: with the online donation, sponsor will simply go to the website, which will provide convenience to the sponsor.   The following table shows example of benefit in terms of hours saved from using the developed application.   |  |  |  | | --- | --- | --- | | Benefits of California Science Center System | | | | **Current activities & resources used** | **% Reduce** | **Time Saved (Hours/Year)** | | **Application data entry** | | | | Volunteer coordinator (50 applications \* 10 mins = 500 mins) | 90% | 7.5 | | **Time sheet data entry** | | | | Volunteer coordinator (5 hrs \* 52 weeks) | 90% | 234 | | **Job request** | | | | Supervisor (7 departments) (7 \* 1 hr \* 52 weeks) | 50% | 182 | | Volunteer coordinator (1 hr \* 52 weeks) | 50% | 26 | | **Job assignment** | | | | Volunteer coordinator (10 hr \* 52 weeks) | 60% | 312 | | **Total** | | 761.5 | |

**[Collapse](https://greenbay.usc.edu/IICMSw/practice.mgmt.feasibility_evidence_development.base/tasks/analyze_business_case_B62462F9.html)Perform ROI Analysis**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Include summary or result of your Return-On-Investment (ROI) analysis and show evidence or assurance of project feasibility.  The following table shows the example of ROI analysis while the result of ROI Analysis plotted in graphical information is also indicated.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Example ROI Analysis of Volunteer Tracking System | | | | | | | **Year** | **Cost** | **Benefit (Effort Saved)** | **Cumulation Cost** | **Cumulative Benefit** | **ROI** | | 2007 | 425 | 0 | 425 | 0 | -1.00 | | 2008 | 156 | 716.5 | 581 | 761.5 | 0.31 | | 2009 | 171.6 | 716.5 | 752.6 | 1,523 | 1.02 | | 2010 | 188.76 | 716.5 | 941.36 | 2,284.5 | 1.43 |   From the above table, the first row (year 2007) refers to the development period and is yet to have any benefits. 425 hours is invested into the system and is considered as a cost. In the next three rows: 2008, 2009, and 2010, they are considered to be in an maintenance period and require some personnel costs in terms of hours needed to maintain the system. The values 156, 171.6, and 188.76 hours are 10% increased annually while 761.5 hours of effort are saved from using this automated system.  Example ROI Graph of Volunteer Tracking System  Example ROI Graph of Volunteer Tracking System  The break-even point is where the ROI value is equal to the value of 0; that means the amount of cost is equal to the amount of returned value. From the figure, it can be concluded that you will get your return-on-investment within two years, or in 2008.  There are mistakes that are often done by students regarding the ROI calculation including:   * The unmatched cost/benefit values from benefit table and ROI calculation. * Failing to include hardware/software related cost/benefit into the ROI calculation. * Failing to use accumulated cost/benefit. * Failing to point out the year that the system cost pays off. (Having ROI=0) |

### NDI/NCS Interoperability Analysis

#### Introduction

<< Identify the Non-Developmental Item (NDI) and Net-Centric Services (NCS) including open source software or libraries that you are using/ plan to use in your project and analyze their interoperability. >>

##### COTS / GOTS / ROTS / Open Source / NCS

<< Identify all candidate commercial off-the-shelf, government-off-the-shelf, research-off-the-shelf, open source software, libraries, and net-centric services component that you are using/ plan to use. Also identify the purpose of each component. >>

Table 10: NDI Products Listing

|  |  |
| --- | --- |
| **NDI/NCS Products** | **Purposes** |
|  |  |

##### Connectors

<< Identify the connector, for example

* “In this project, we use PHP/MySQL Connector to enable the PHP web application to retrieve and query data from the database”. >>

##### Legacy System

<< Identify the connector, for example

* “In this project, the development system has to be able to interoperate and works well with “BusinessWorks” version 5.2, which is a software system that the client is currently using.” >>

#### Evaluation Summary

<< Summarize the final selection of your interoperable NDI/NCS, its usage and its comment. Example can be found in ICSM EPG> Task: Analyze NDI Interoperability for NDI / NCS project. >>

Table 11: NDI Evaluation

|  |  |  |
| --- | --- | --- |
| **NDI** | **Usages** | **Comments** |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| Example of NDI Evaluation | | |
| **NDI** | **Usages** | **Comments** |
| Apache (2.36) | Web Server | **Positive points**    - Freeware    - Widely used    - Documentations available    - Client’s requirement **Negative points**    - No negative points |
| MySQL (5.0) | Database | **Positive points**    - Freeware    - Robust    - Suitable for Large/Small scale systems    - Widely used and trustworthy for performance    - Client’s requirement **Negative points**    - No maintenance support |
| ... | ... | ... |

|  |  |
| --- | --- |
| Software Risk Management Techniques | |
| **Source of Risk** | **Risk Management Techniques** |
| Personnel shortfalls | Staffing with top talent; key personnel agreements; team-building; training; tailoring process to skill mix; peer reviews |
| Schedules, budgets, process | Detailed, multi-source cost and schedule estimation; cost/schedule as independent variable; incremental development; software reuse; requirements descoping; adding more budget and schedule; outside reviews |
| COTS, external components | Benchmarking; peer reviews; reference checking; compatibility prototyping and analysis; usability prototyping |
| Requirements mismatch | Requirements scrubbing; prototyping; cost-benefit analysis; design to cost; user surveys |
| User interface mismatch | Prototyping; scenarios; user characterization (functionality; style, workload); identifying the real users |
| Architecture, performance, quality | Simulation; benchmarking; modeling; prototyping; instrumentation; tuning |
| Requirements changes | High change threshold: information hiding; incremental development (defer changes to later increments) |
| Legacy software | Reengineering; code analysis; interviewing; wrappers; incremental deconstruction |
| Externally-performed tasks | Pre-award audits; award-fee contracts; competitive design or prototyping |
| Straining computer science | Technical analysis; cost-benefit analysis; prototyping; reference checking |

**NDI/NCS Interoperability Analysis**

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Table 11: NDI Evaluation

|  |  |  |
| --- | --- | --- |
| **NDI** | **Usages** | **Comments** |
|  |  |  |

* Inter-component Compatibility
* Product performance
* Functionality
* Documentation Understandability
* Flexibility
* Maturity of product
* Vendor support
* Security
* Ease of use
* Training
* Ease of installation/upgrade
* Ease of maintain
* Scalability
* Vendor viability/stability
* Compatibility with USC IT infrastructure
* Evolution Ability
* Ease of Integration with third-party software

**Final Structure:**

1. **NDI/NCS alternatives, NDI/NCS evaluation & analysis results**

**-List out all NDI/NCS alternatives.**

**-Look up for NDI alternatives and tabulate pros and cons of each NDI alternative according to the features chart.**

**- Evolutionary feasibility doubt**

1. **Business case (beginnings, including benefits analysis);**

**3. Major risks;**

**-Identify major risks and their mitigation steps.**

1. **Capability and LOS feasibility evidence;**
2. **personas**