

**Migration from Proprietary to Open Source Tools & Technologies**

**A term paper by**

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**Table of Contents**

[Introduction to the Project 4](#_Toc354916548)

[Project Initiation 4](#_Toc354916549)

[Business Case for the Project 4](#_Toc354916550)

[Executive Summary 4](#_Toc354916551)

[Project Goals 5](#_Toc354916552)

[Implementation Plan Outline 5](#_Toc354916553)

[Existing System and Desired Areas of Impact 6](#_Toc354916554)

[Desired Values of the Project 6](#_Toc354916555)

[Alternatives 6](#_Toc354916556)

[Required Funding and Support 6](#_Toc354916557)

[Project Charter 7](#_Toc354916558)

[Project Description 7](#_Toc354916559)

[Measurable Organizational Value (MOV) 7](#_Toc354916560)

[Resources (People, Technology, Facilities, Others) 8](#_Toc354916561)

[Feasibility Study 9](#_Toc354916562)

[Technology and System Feasibility 9](#_Toc354916563)

[Economic Feasibility 9](#_Toc354916564)

[Operational Feasibility 9](#_Toc354916565)

[Scheduling Feasibility 10](#_Toc354916566)

[Project Planning 10](#_Toc354916567)

[Requirement Analysis 10](#_Toc354916568)

[Project Scope Management 10](#_Toc354916569)

[Project Scope 11](#_Toc354916570)

[Testing Scope 12](#_Toc354916571)

[Project Schedule 13](#_Toc354916572)

[Estimation of Effort, Resource with the risks defined 13](#_Toc354916573)

[ETL Jobs for Conversion to Open source ETL tool 15](#_Toc354916574)

[Project Risk Analysis 16](#_Toc354916575)

[Project Quality Standards 18](#_Toc354916576)

[Project Execution 19](#_Toc354916577)

[SDLC Model 19](#_Toc354916578)

[Project Monitoring and Controlling 19](#_Toc354916579)

[Project Health Check 19](#_Toc354916580)

[Report on Performance 20](#_Toc354916581)

[Financial Performance 20](#_Toc354916582)

[Conclusion 21](#_Toc354916583)

[References 21](#_Toc354916584)

# Introduction to the Project

Open source software’s are becoming very popular among the industry whether it is telecommunication systems, personal productivity applications, inventory management software’s, operating systems, management support systems or general purpose software’s. It is slowly becoming the critical part of every organizations project management strategy in-order to keep the costs low along with the better support and accountability. As it is known that using the Open source tools can drastically reduce the expense towards licensing cost, maintenance cost as well as acquiring the tools and framework, for example the difference between the support cost and licensing cost can be as good as 90%.

This is also obedient that use of open source tools and technology comes with its own share of risks. So to manage the stakeholder expectation, the schedule, the quality of the deliverables, finding the right resource and managing the unknown-unknown can be quite challenging.

In order to gain the strategic advantages associated with the use of open source tools and technology, few initiatives were taken to move away from using 100% proprietary tools and technology to mix of open source tools and technologies. It was projected that the migration may lead to the significant savings ranging between 5-10% of overall costs associated with the use, support, licensing and deploying the proprietary tools. This term paper provides a brief insight to the project of migration from the company wide used various proprietary tools to the open source tools and technologies.

# Project Initiation

## Business Case for the Project

### Executive Summary

We as a company XYZ are manufacturers of the capital equipment’s and business solutions related software’s and tools. As a feature of product, these products are very precise in nature and highly customized. To manage these types of product we involve many vendors, outsourcing and feature secrecy. The corporate goal being to do more with less, increase the productivity, reducing the cost, optimizing the procurement time, as well as overheads its being decided to reduce the use of proprietary software and tools throughout the organization.

The whole idea of migrating from the proprietary software tools and technologies to the open source tools and technologies is to do more with the less cost, increase the productivity of cross functional teams with-in the organization from different business units, reducing the overall software development and maintenance costs including the licensing and dependency of the different vendors. This is observed that by the adaptation of open source software and technologies many of the organizations around the globe has significantly reduced their profit margins and able to better manage the cross functional software requirements.

### Project Goals

Decisions for the migration from proprietary to open source tools and technologies can lead to the significant reduce in the company expenses on the proprietary tools licensing and maintenance costs. For the fiscal year 2013-14, the goal set up by the company CEO is as follows;

1. Reduce the expense by 8%,
2. Increase the productivity by 10%
3. Increase the operating margin by 4%.

### Implementation Plan Outline

The first cycle of project implementation has to be exercised on the HR department of the organization. The implementation schedule is as follows;

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Project Phase or Milestone : Migration of HR Support Systems** | | |
| **Project Release** | **Project Phase** | **Duration** | **Jobs** | |
| Release 1 | Phase 1 | 21 Weeks | 469 | |
| Release 2 | Phase 2 | 15 Weeks | 353 | |
| Release 3 | Phase 3 | 10 Weeks | 325 | |
| Release 4 | Phase 4 | 4 Weeks | 83 | |

Rest of the department’s has to be migrated based on the success/failure of the above exercises.

### Existing System and Desired Areas of Impact

The MOV table on page 7 lists the potential areas that this project will impact and summarizes the measurable organizational value of the project.

### Desired Values of the Project

As the MOV suggests, based on the conducted research on the different departments within the organization, its obedient that this project will provide significant profits in terms of total cost incurred, maintenance cost involved with the proprietary software’s and the licensing and training costs involved with the use of proprietary software’s.

### Alternatives

The analyzed alternatives for the project are as follows:

1. Continue with the current system with slight modification in the existing process.
2. Start implementing the new systems based on the open source tools, in multiple phases. First implement for a particular business unit then proceed further based on the future outcomes.
3. Partially outsourcing and partially developing the system in-house(core functions of the company which are confidential and can do a lot of business impacts) by using the open source software and tools.
4. Fully outsourcing the work to the vendors in a strict and disciplined environment in-order to protect the confidential and classified information. Total cost associated to each approach will be described in details under the cost planning section of the project.

### Required Funding and Support

The starting investment for the first phase of migrating from proprietary to open source tools and technologies is around $.5 million. The subsequent phases will vary between .5 to .75 million USD. This includes the cost incurred in developing the new systems, implementation and maintenance of the systems and training the staff to make familiar with the new systems.

## Project Charter

### Project Description

As mentioned in the “Executive Summary” section of the “Business Case for the Project”.

### Measurable Organizational Value (MOV)

In making great effort to improve the existing system, Company xyz is proposing to overcome of the licensing and maintenance costs associated to the proprietary software and tools and moving towards the implementation of software’s developed using the open source tools and technologies. The MOV table below lists the potential areas that this project will impact and summarizes the measurable organizational value of the project.

| **Organizational**  **Impact** | **Value** | **Metric** | **Time Frame** |
| --- | --- | --- | --- |
| Strategic | Decreasing the reliability on the proprietary software’s. | Reduce the expenses by 8%, Increase the productivity by up to 10%, Increase the operating margin by 4% | 36 months |
| Financial | Reduce licensing, maintenance, support, training & dependency on the proprietary software’s. | Reduce total cost of using the proprietary software between 5-10%. | 18 months |
| Operational | Reduce the operating cost between 16-20%.  Recognize the specific tools and technologies to be replaced. | Reduce the operating cost between 16-20%.  Recognize the specific tools and technologies to be replaced in each of the departments. | 12 months  6 months |

### Resources (People, Technology, Facilities, Others)

* **People**
  + **Project Sponsor –** The project sponsor will be a high level person within XYZ with enough time and authority to make business decisions for the project.
  + **Business Super user / Subject Matter Expert -** This person will provide details about the current process and play a major role during the scope analysis phase to make sure the project fits in their business culture.
  + **Project Manager –** He/She will be in charge of managing all critical elements of the project like the schedule, budget and scope.
  + **Systems Architect –** He/She will be the technical lead for the project and will be responsible for the seamless connection of each module of the system.
  + **Systems Analysts –** He/She will be in charge of documenting the requirements and providing the high level design specifications, integration training and user training.
* **Technology**
* Broadband for internet connectivity.
* Five/Eight phone lines for communication and teleconference purposes.
* Streaming Servers and 2 MySQL database servers.
* 25 workstations and 8 laptops for the project team each equipped with Ubuntu Linux along with the supporting software’s.
* 5 Switches and 2 Routers to maintain the Lab for the testing purpose.

**Cost of Resources**

* **Hardware/Software**

|  |  |  |
| --- | --- | --- |
| **Resource** | **Cost** | **Source** |
| 2 MySql Server Machines | None only hardware cost associated to it is approximately $2000 USD | Internal |
| 25 Ubuntu Linux Machine | Hardware cost approximately $20’000 | Internal |

## Feasibility Study

Feasibility study confirms the benefits of proposed system will justify the project cost and budgeting. Project feasibility study is mainly referred by the following five areas commonly known as TELOS,

### Technology and System Feasibility

Based on the technology and system feasibility performed for the project, it is found that the organization is having many capable and good resources that can be utilized to perform the so said job of migration from proprietary tools and technology to the open source tools and technologies. System feasibility report says that the new systems can generate more profit to the organization as compared by the use of proprietary tools and technologies.

### Economic Feasibility

#### Based on the economic feasibility performed on the project it’s found that the organization is going to gain revenues between 5 to 8%. The other benefits involved are as follows:

Significant gain in revenues, Less dependency on the software vendors, Less licensing and maintenance cost for the software’s deployed across various BU’s, Increase in the operating margins by 4 to 6%

### Operational Feasibility

Operational feasibility checks for the measures of how well a proposed system solves the problems and takes the advantage of the opportunities identified during the scope definition and requirement analysis phase. Project look very much feasible based on the scope and requirements mentioned in the below paragraphs of the document.

### Scheduling Feasibility

This is the measure of how reasonable the project timetable is, are the project deadlines are reasonable. Based on the study performed it’s identified that the schedules which are divided in 3 major timelines (as mentioned in the business case for the project) has enough times to demonstrate the success of the project. After the end of first timeline it can be very clear how much the revenues would be generated or saved by the execution of the project.

# Project Planning

## Requirement Analysis

System requirement document mainly consists of a brief introduction to the project, purpose and scope of the project and a description of any existing system and the current system environment. It provides an insight to the customer’s future strategies and plans pertaining to the project along with the assumptions, dependencies, limitations and constraints on the project execution. It also covers the detailed functional requirements along with the use cases related to the project execution. It documents the mandatory and desirable project characteristics along with the deadlines related to each individual requirement. Below are some of the sample requirements:

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirement Id** | **Requirement Description** | **Priority** | **Project Phase** |
| Functional\_REQ\_1 | Open source based solution should be portable across different machine architectures. | 1 | Phase 1 |
| Functional\_REQ\_2 | Open source based solution should be able to handle the interaction with different customized user interfaces. | 1 | Phase 1 |
| Functional\_REQ\_3 | Open source based solution should be able to interact with different mysql database servers. | 1 | Phase 1 |
| Functional\_REQ\_4 | Open source based solution should be secure enough to cater with the password theft problem across the systems. | 1 | Phase 1 |

## Project Scope Management

For the program of reducing cost by taking advantage of Open source, the scope was well defined. The scope was to migrate all code developed in the proprietary Tool to open source tool before the start of the next fiscal year, so that the license fees for the proprietary tool can be saved for the next fiscal year and the same cost can be utilized for the new open source tool and the expectation is that the ROI on this effort will be achieved in next 3 years of time.

This was decided that the development effort will be outsourced to a third part vendor. To minimize the risk, the overall program effort was divided into multiple projects/phases.

### Project Scope

Vendor Company will provide Information Technology services which shall be executed as a set of prioritized tasks in phased manner that will be completed within specified duration from project start.

* Document Open source tool best practices, approved by the XXXX, the company.
* Develop code for the  functional areas as per best practices document
* Migrate / convert the data stage ETL jobs to work in Open source tool platform
* Get the sequencers working in Open source tool Platform
* Error handling done in the code developed in Open source tool as per best practices document
* Vendor shall make reasonable efforts to explore methods to optimize “all” ETL jobs, code and number of steps. Where possible, Vendor will make recommendations to XXXX to consolidate similar jobs.
* Document Test strategy, test plan for unit testing, quality assurance and integration testing for testing the above mentioned modules. It will be approved by XXXX.
* Remote connectivity using VPN or Citrix as a way to design, develop, build and operationalize ETL open source Data Integration platform
* QA on transformations and jobs developed for above mentioned functional areas includes data comparison/validation and performance verification.
* Two weeks post production support after each production deployment assuming production deployment is performed within schedule of project defined herein.
* Knowledge transfer to XXX ETL support team
* Support during user acceptance testing (UAT) assuming UAT for jobs is completed within the respective phase and schedule defined herein.
* Perform unit, integration testing services. Compare ETL execution run time with current documented execution run time within Proprietary tool. Configure Open source ETL tool environment to optimize jobs to achieve “best-effort” of ETL jobs to execute at similar or better execution time than the current proprietary environment for the respective job or functional area.

### Testing Scope

* Testing scope will be as below
  + Unit Testing

Each individual job provided to XXXX will be unit tested in the development environment (Citrix/PC) with a small subset of data as required. Once these results are reviewed and signed off from a functional perspective, the complete set of jobs for the respective sequencer will be deployed and tested in the server environment.

* + Integration /Functional testing

For the duration of this project, integration testing will be considered as part of the testing phase during which the end to end integration and functional aspects of the ETL jobs will be tested on server environment. All jobs will have proper error handling. Alerting mechanisms which are already built into the jobs will be migrated and tested. Jobs will be tested at a job level, sequencer level and at a functional level for data accuracy.

* + Performance Testing

Performance testing and tuning phase will focus on identifying jobs with lower performance and identifying the root cause for the performance issues. The team will then define measures to improve the performance which would be documented and implemented. Load testing will also be performed with peak load (as provided by XXXX) to meet the existing SLA.

The project will be executed as a set of prioritized tasks mutually agreed between both parties which shall be completed within the duration of the Project Term.

## Project Schedule

Release 3 will consist of all jobs in Phase 3 and Phase 4. End Date is the completion of ETL migration and readiness for deployment to production by XXXX. The End Date constitutes the schedule for which Vendor has completed its scope for ETL migration defined and code ready for deployment to production. Production deployment date needs to be worked out during first 2 week of the engagement.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Project Phase or Milestone** | | | | | |
| **Project Release** | **Project Phase** | **Start Date** | **End Date** | **Duration** | **Jobs** |  |
| Release 1 | Phase 1 | 9/3/2011 | 01/31/2012 | 21 Weeks | 469 |  |
| Release 2 | Phase 2 | 02/12/2011 | 05/31/2012 | 15 Weeks | 353 |  |
| Release 3 | Phase 3 | 06/15/2011 | 08/30/2012 | 10 Weeks | 325 |  |
| Release 3 | Phase 4 | 09/07/2011 | 10/10/2012 | 4 Weeks | 83 |  |

## Estimation of Effort, Resource with the risks defined

To calculate the effort and estimate the resource, it is required to understand the current process, the complexity of each job, the patterns, the common routines, the risk involved with the open source tool. To mitigate the risk, we established a partnership with the most reputed player in the market related to the tool, selected more experienced resource from the team as the subject matter expert as well as people having extensive knowledge in the technology area.

With the duration pretty well fixed, the need of the hour on calculating the number of resources required to complete the job. While doing the analysis, the inputs from the following were used…

1. The expert judgment – since this field is matured, the jobs are running in proprietary tool – so the judgment was more relevant
2. Albrecht Function point analysis – Here we looked at how many sources (homogeneous / heterogeneous) are being used. What are the types of output – homogeneous/heterogeneous, the location of input/output, the reference data and over all complexity of the job.
3. Out of the total effort, 35% are allocated to understanding the code and need, 25% for development and 40% towards testing and bug fixing. Qualification of jobs – Simple, Medium and complex
4. The standard industry practice is 30% of the jobs are simple, 50% are medium and 20% are complex (80:20 rules).
5. Estimation of hours

Simple job – 10 Medium job – 16 Complex job – 24

|  |  |  |  |
| --- | --- | --- | --- |
| **Total jobs – 469 – Phase 1** | **No of jobs** | **Reasonable Effort** | **Total Effort** |
| Simple | 141 | 10 | 1410 |
| Medium | 234 | 16 | 3744 |
| Complex | 94 | 24 | 2256 |
| Effort - A |  |  | 7410 |
| Arch. Design - Integration / Migration / Implementation / Env. Setup - B | 12% |  | 889 |
| Total effort (A+B) |  |  | 8299 |
| Buffer - C | 10% |  | 829.9 |
| Max Effort - in hours |  |  | 9128.9 |

**Calculation of Resources – Phase 1**

|  |  |
| --- | --- |
|  | **Total Weeks - one person** |
| Man Hours per week – 40 | 228 |
| No of independent jobs - 35% - 65% are dependent |  |
| To complete in 21 weeks - no of person - Designer / Developer | 10 |
| PM | 1 |
| Architect | 1 |
| Environment Setup / DBA | 1 |
| QA | 3 |
| Total no of people | 18 |

**Resource Availability**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Activity -** | **Dependency** | | | | **No of developers** | **QA** |
| Migration from Source to stage |  |  |  |  | 4 | 1 |
| Migration from stage to work |  |  |  |  | 4+3 | 1+1 |
| Migration work to target |  |  |  |  | 4+3+3 | 1+1+1 |

### ETL Jobs for Conversion to Open source ETL tool

The actual list of jobs may reduce or increase up to ten percent (10%) per phase. The total list of jobs considered under the fixed price is 1,230 and a buffer of 10% if required.

| **Deployment Phases** | **Functional Area** | **Number of jobs Ready for user acceptance** |
| --- | --- | --- |
| Phase 1 | Engineering, HR | 469 |
| Phase 2 | Customer Service, Marketing & Sales | 353 |
| Phase 3 | Training, Systems Analysis | 325 |
| Phase 4 | Orders, Booking, Billing | 83 |
| **Total Number of Jobs for all four phases** | | **1230** |

## Project Risk Analysis

Any project can run into unexpected problems. When such unknown problem occur in a project and change the outcome of a project activity then we term it as “**Risk**”. We can do the following to deal with Risk.

**Avoid** – Preventing the risk from happening so that it does not impact the project.  
**Mitigate** – Taking some kind of action so that the risk cannot cause major damage to the project.  
**Transfer** – To pay someone else to tackle the risk.  
**Accept** – When we cannot do any of the above to reduce risk then we need to accept it but still we know what might happen if it occurs and can do planning for the same.

Company started with categorizing project risks as below.

**Project Risks**

**Organizational Risks**

**Technical Risks**

**External Risks**

**Staff Attrition**

**Customer Issues**

**Quality Issues**

**Project priority changes**

**New laws, external vendor dependency etc.**

**Technical training, support etc.**

**Funding cuts etc.**

After defining the high level **“RBS” (Risk Breakdown Structure),** company was better equipped to do the further identification and analysis of risks associated with the project. To identify risks following techniques were followed. Brainstorming, Delphi techniques (ideas from experts), Interviews, Requirements, project plan review, Project assumption analysis, SWOT (Strength, Weakness, Opportunity & Threat) analysis, Organizational check list etc.

We get the possible list of risks with relevant analysis and the reason for which it might occur. Therefore, with this information we also came up with their probability of occurring and the impact to the project if the same occurs. All of these information were compiled in below risk register. In this register, high impacting risks with high probability of occurring were prioritized rather than prioritizing the risks which are high impacting but the likelihood (probability) of their occurrence is very less. Risks identified with low probability of occurring with low impact were moved to a “**Watchlist**” which is just a list of risks which company does not want to forget but still want to keep an eye on it.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Identified Risk** | **Probability** | **Impact** | **Potential Response** |
| 1. | Experience with new open source technology is less for migration | High | High | Tie up with external consultants |
| 2. | Open source technology support | High | High | Tie up with vendors |
| 3. | Impact on existing system for open source migration | Significant | Significant | Strict adherence to migration rules/guidelines. |
| 4. | No quality assurance for open source code | Significant | High | Stringent quality process for derived code. |
| 5. | Legal risks associated with the use of open source software | Medium | High | Advice from legal dept. of Org. |
| 6. | Intellectual property rights | Significant | High | Create awareness among developers |

**Note:-** For probability, high is >= 50%, Significant is 30-50% & Medium is 10-29% chance of happening and for impact high is >30%, Significant is 20-29% & Medium is 10-19% above budgeted expenditure. All Low-Low probability/impact risks were moved to wish list for monitoring.

Still we cannot plan for all the risks that can happen to a project but the risk register can be constantly reviewed and updated to close some risk items and to add some more new as the project progressed towards closure. Following methods were followed to monitor and control risks throughout the project.

1. Risk reassessment meetings during project progress.
2. Variance and trend analysis to see actual budget & schedule over planned ones.
3. Reserve analysis to compare open risks with available funds.
4. Risk audits via external parties to check project risk strategies.
5. Technical performance measurement to compare the actual to planned performance parameters.

## Project Quality Standards

Quality standards help to check project deliverables conformance to the project requirements. These standards ensure product of the project meets the user needs satisfactorily. This project followed ISO quality model to ensure the project product quality. This model helps identify below major software quality parameters. Quality metrics were collected with respect to the following standards.

1. **Functionality** – Functionality software provides to meet user needs. Can be sub categorized as Suitability, Accuracy, Interoperability, Security, Functionality Compliance. Compliance indicates adherence to legal requirements and Interoperability indicated ability to interact with other systems.
2. **Reliability** – Software reliability parameters such as maturity, fault tolerance over time and compliance here indicates adherence to application related standards. Sub-Categorized as Maturity, Fault-tolerance, Recoverability, Reliability Compliance
3. **Usability –** Recognizes how easily users can use, operate and understand the software and also measures the attractiveness of the software. Sub-Categorized as Understandability, Learnability, Operability, Attractiveness, Usability Compliance
4. **Efficiency –** It indicates the software performance relative to the amount of system resources used and compliance is related to application standards. Sub-Categorized as Time behavior, Resource utilization, Efficiency Compliance
5. **Maintainability** – This indicates how well the software can be maintained. This also says how easily software can be analyzed, changed & tested along with a software stability indicator. Compliance is related to application standards. Sub-Categorized as Analyzability, Changeability, Stability, Testability, Maintainability Compliance
6. **Portability** – This indicates how well software can be ported from one environment to another. Shows how well it can adapt & can be installed in environments and can co-exist with other software products. It also shows how well it can replace other software. Compliance is related to application standards. Sub-Categorized as Adaptability, Install ability, Co-existence, Replaceablity, Portability Compliance

# Project Execution

## SDLC Model

This project used both waterfall and scrum agile methods. The waterfall model was used during the initial phase of the project as the system was very complex and initial stage needed some structure to get quality requirements and to have a lock on the same.

Initial phase can be viewed as below.

**System Design**

**Analysis**

**User Requirements**

**Feasibility Study**

The project got better clarity on the complex system to be built once it got the sign off till system design. Then the agile scrum method was chosen to develop the system iteratively as the system was very novel and this system used new open source technologies. Prototyping was also used to test out requirements and assumptions. Incrementally some percent of project were pushed live. Value to cost ratio used see the benefit of incremental delivery. Visually it can be represented as below. Time boxing of a month was done for each iteration.

**Iteration (n)**

**User Stories (n)**

**Test/QA (n)**

**Implement (n)**

**Design (n)**

**Evaluate working version (n)**

**Deploy (n)**

**System testing (n)**

This way the selection of SDLC model for this project enabled the benefits of both structured and iterative models for this project.

# Project Monitoring and Controlling

## Project Health Check

Project health check meetings are traditional type of standup meetings to check the project execution status from various angles. Basically this meeting is done to review project status to understand any impact to the overall project and to provide a better understanding of the project status to all the teams involved. For this project, one “SPOC” (Single Point Of Contact) person from each involved team attended the meeting to provide the status with respect to the project and also to address any issues, risks, open questions with respect to all other teams involved in the project. Finally the status meeting report is circulated by project manager conducting the meeting among the team via email so that all the teams involved (including team members) can clear the open issues by next health check meeting for smother project execution. This meeting was usually held twice a week for this project. It consisted project & dev manager from business side; back end dev team, front end dev team & QA team representatives and broadly covered following items in the meeting.

1. Open questions to the business for the project requirement reviews.
2. Development side status with respect to project schedule, scope etc. Any development side issue, staging issues etc. reported.
3. QA team status with respect to project testing so far. Any bottlenecks reported to dev so that fixes gets prioritized.
4. QA team reports if the incremental build can be deployed in Live environment or not. If not then project status is not Green but Red.
5. Project status improvement since last report.
6. Management side update for engineering.
7. Top issues with description and action notes.
8. Project risks are reviewed here to check against the plan.
9. Any decisions to be taken by senior management.
10. General information update across all teams.

## Report on Performance

### Financial Performance

* Net Profit Growth - The growth in net profit from sales of XYZ product in the given sector was 9% in the year 2012-13 against 2% in the previous year.
* Average cost of product, Average Revenue

The average cost of product increased 7% in the year 2010-11 to 2011-12. But by shifting from propriety to open source the average cost of product decreased by 5% in the Year 2011-12 to 2012-13. The average profit of the company increased 9% in the year 2011-2012 to 2012-2013 by reducing average product prices by 5%.

* Capital Employed - The total capital employed in the company has decreased 8% in the year 2011-12 to 2012-13. This includes support head for open source systems.

# Conclusion

By shifting from propriety systems to open system, we saved more than 80% in our fixed expenses. As a result we can do better product pricing, better selling margin but also increased the expense by adding additional support for open source systems. But in a long run (3 Yrs. down the line) will have better ROI.

There were issues with Open source ETL tool from stability point of views, the support point of view and features point of view. But when you compare the cost of the open source tool (cost Is not for the tool but for the professional services) , it is 10% of the cost of the proprietary tool that is available in the market. So the saving on utilizing the open source tool is extremely attractive. So one and only one factor that drives the companies to opt for open sources tools and technology is only because of cost saving and that is the one of the most important factor for selecting the tool.

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