Srivatana Interprint Public Company Limited

2009 Second Place Winner
CIP4 International Print Production Innovation Award
for
Best cost/benefit realization and improvement in efficiency as a result of process automation implementation
Executive Summary

Sirivatana is the largest printing factory in South East Asia. We currently employ 4,000 highly trained professionals with a turnover of 1850 million Baht (54 million USD). The Sirivatana product portfolio includes typical offset print products such as magazines, pop-up books, coffee table books, commercial print materials, maps, boxes and calendars. Almost 200 machines are available to handle jobs from the point that they are ordered, up until their physical delivery.

The Sirivatana Interprint Company has received more “Asian Print Awards” and “Thai Print Awards” than any other company in recognition of our accomplishments. Nevertheless, in the drive for continual improvement, we realized that we had to implement JDF in order to increase the productivity of our company. Most of the work related to administration, report making and coordination was done manually. Due to this, there was always a risk for a large amount of errors, losses and delays in the workflow process. The procedures that our company followed did not meet the industrialized standard and were not suitable for an operation of our size. The installed software applications were very poor, did not fit the core business and were not supportive of the company as a whole.

The Sirivatana Company had grown exceptionally fast and because of this, it was not functioning as well as it could have been. Many employees were struggling just to push their customer’s job through each step of the operation. If we ever wanted to work with the JDF standard, we would have to change drastically, planning out a workflow that would increase the efficiency of the entire company.

Clearly we had to make a variety of changes to achieve a real JDF workflow. Unfortunately, with no effective computer systems to automate or link the company’s functions, we were unable to improve. Most of our problems were caused by a lack of coordination in different departments, the inability to communicate between them, and manual data entry without a common database. The implementation of a JDF workflow and MIS software was the only way to sufficiently increase our productivity.

We knew that bringing JDF into our company would not be an easy task. Our workflow had to be completely redesigned and the mindset of our staff would have to be the significantly altered. Employees would no longer be working as individuals, but as a part of our dedicated team.

Our old workflow was not structured with an MIS. Information had to be manually gathered, analyzed, transported and communicated manually by employees called “manual traffic teams.” Since the introduction of the new JDF workflow, these “manual traffic teams” have been eliminated. The HIFLEX MIS transfers job information directly into Prinergy. Jobs move faster, are more accurate, and easily travel throughout the various departments of the company.

The opaque JDF connections in this diagram are planned.
HIFLEX-Kodak link features:

- Automatic Job Creation
- Better access to archived jobs / faster search and response times
- Automatic booking of material consumption
- Inventory checks of plates are accurate
- Prepress progress is visually represented for the CSR
- Up-to-the-minute plate status for the scheduler

We have experienced an increase of 15% value added in the production department. In summary, we have reduced our staff by 269 people in all areas of Sirivatana (marketing, machine operating, etc.). The need for the “manual traffic teams” position was completely eliminated with the installation of the MIS, and throughput time for total business has decreased by approximately 33%. The net present value (NPV) of the implementation is calculated with USD 16,670,742. The return on investment will be 1960.1% within the next 5 years.

Section I. Background — Please provide a description of the subject workflow environment and conditions prior to implementation:

COMPANY PROFILE
Sirivatana Interprint PCL was founded in 1976 with a registered capital of THB 500,000 (14,690 USD). The focus of the company lies in printed office forms and ordinary printing work. Today Sirivatana is the largest printing factory in South East Asia and has received many awards including “Asian Print Awards” in 2006, 2007 and 2008, as well as the “Thai Print Awards” in the same period.

With 4,000 highly trained employees, Sirivatana Interprint is using the latest prepress, press and post press technology. In fact, Sirivatana Interprint PCL fulfills all of the conditions required to become the preferred printing partner in our region.
Our facilities are equipped to manufacture a wide range of publication formats. Limp, perfect and cased bound books, magazines, leaflets, brochures, diaries, calendars and publications requiring extensive hand work – such as pop-up books and direct mail. We have received more Asian Print Awards than any other company. They cover the full range of processes and are proof of our commitment to quality.

Our ‘one stop printing solution’ approach allows us to support a customer from the design of their product to its shipment anywhere in the world.

Sirivatana’s mission is to provide printed materials and services that are superior to our competitors in both quality and value. We accomplish this through a program of continual improvement aimed at consistently exceeding our customers’ expectations. We undertake all work in a professional and ethical manner following the highest international standards. We are highly accredited and are proud of our customers, our team members and the communities in which we live and work. We have dedicated ourselves to ensure that they all prosper with the assistance of the Sirivatana Company.

Mr. Pornthep Samatiyadekul, Chairman

Mr. Kevin Snook, Managing Director
The Sirivatana product portfolio includes:
- Coffee Table Books (30%)
- Magazines, Catalogues, Brochures, Annual Reports (45%)
- Maps, Directories (5%)
- Pop-Up books, Children Books (10%)
- Wire-O, Spiral Bound Books (1%)
- Calendars (8%)
- Boxes/ Slipcases (1%)
The following machines are currently in use:

Prepress equipment and machinery:
The heart of our prepress department is our modern Prinergy PDF workflow system from Kodak. It drives two CTP machines from Dai Nippon. Additionally, we have 22 Macintosh workstation, 3 imposition stations, 3 scanners, as well as proofing and color management equipment (GMG, Eyeone, Gretach) all dedicated to prepress operations.

Press machinery:
19 sheet fed offset printing machines, Komori brand from Japan and Heidelberg brand from Germany, are in use. In total we have 82 color units.

We also utilize 13 Komori web presses from Japan. These machines are suitable for printing on 45-130 gsm paper, such as LWC (light weight coated paper, newsprint paper, wood free paper, gloss/matt art paper) in huge quantities (50,000 copies and more) and are used for products like magazines, brochures, catalogues, annual reports, directory books, map books, dictionary’s, etc.
Postpress or binding machinery list:

- 11 Folding machines
- 4 Perfect binding machines
- 4 Auto Stitching machines
- 2 End Pasting machines
- 2 Case making machines
- 2 Casing In machines
- 2 Laminating machines
- 2 Silk Screen machines
- 1 UV coating machine
- 7 Die-cutting machines
- 18 Punching machines
- 5 Foil Stamping machines
- 1 Polywrapping machine
SITUATION PRIOR TO JDF IMPLEMENTATION

We knew that our business and manufacturing processes did meet the highest standards appropriate for the size of our company. For this reason we hired a Print/Media consultant to do a Process Audit of our entire operation. The objective was to identify all the weaknesses in our business and manufacturing processes and compare them to an international benchmark. We could then arrange a working platform which would clearly define the potential improvements that might be made in productivity. The Process Audit took five weeks and the results were broken down for each department and plotted as a spider-web diagram.

Process Audit Result
The consultant company’s findings were very interesting. They were impressed by the size of our operation and the fact that our company was able to work efficiently despite the many insufficient business processes. They also noted that the quality level which our company is able to output despite its shortcomings was very impressive. They were less impressed by our basic processes, including our machines and equipment, the flexibility of handling processes (on cost of standards) and the general task distribution. However, they thought that we would still be able to maintain profitability in spite of this as well.

The biggest problems they uncovered dealt with the following subjects:

- There was no cost center organization available
- The central processes were weak (Business processes were not framed or standardized)
- Supportive processes (such as MIS or an integrated data infrastructure) were missing
- The organizational set up was function instead of process oriented
- The output performance in any area was weaker than expected
- Utilization ratios and capacity loading ratios were not available
- Management tools were missing
- The material storage (RM, WP, FG) problems were hindering production
- Logistic concepts interfered with production operation
- Insufficient management because there was a lack of management data
- Customer liaisons wasted up to 70% of their time clarifying “unclear” issues
- Working tools were absolutely insufficient (about 275 forms)
- Functionalities in many areas are mixed and partly confronting with each other
- There was a lack of cost / performance orientation
- Software applications were very poor: they did not fit the core business, they were not supportive of the company as a whole, and they were sub optimizing
- Estimating was based on pricelists rather than on actual cost center costing

Summarizing, we recognized that with 275 active and 300 less active forms we had:

- Too many complicated processes
- Too many working steps
- Too many people involved
- Too many inaccuracies
- Too much word of mouth communication
- Too much unreliability
- Too much time consumption
- Too much distributed responsibility
- Too much reassurance
- Too much waiting time
- Too little efficiency (TQM)
- Too little productivity
- Too many potentials lost
- Too much repetition
Our workflow before JDF implementation (2006) was roughly as follows:

- Information was received from clients by email, fax, and occasionally phone
- Customer handed directly to sales team member
- Sales team preparing RFQ (request for quote)
- RFQ sent to estimating
- Transfer of softcopy back
- Quote developed
- Signing and pricing of quote on hardcopy by manager
- Either purchase order or signed quote received from manager
- Job opening process starts
- Job opened in the Production Planning Center (PPC) for Job Number
- PPC okays job after the verification of documents through Manager (no real work-instruction)
- Filling in all documents needed for production at PPC
- All tasks completed manually
- Afternoon job meeting (prepress, PPC, sales team) discussing each job and hand out materials (about 10 to 15 people, takes about one hour). About 17 forms required.
- Chasing the job more than 70% of total time
- After completion of job, samples are sent, and checked by the customer for quality
- Shipping information sent to logistics team
- Ask for white dummy of any book. (dummy department is a part of post press)

The preparation of a job was totally undervalued in the past, as estimating only delivered questionable cost data and did not work out production performance standards. Because of these inefficiencies, a plan was devised to improve our internal job management and an expert estimating system became a requirement of all MIS systems we examined.

We began to look into MIS systems with our consultants. It was decided that performance based estimating data should be used not just for quotations, but also for scheduling, and technical work instructions (job dockets). We also examined the possibilities of a JDF system that would control the workflow while possibly making machine adjustments for make ready in prepress, press and post press.

The Sirivatana Company had grown so fast that we were barely able to function using our traditional workflow. Sales people were competing with each other, struggling to get their customer’s job through our convoluted operation. We had to accept that improvements were no longer possible in our current situation. We were depending on hundreds of people’s individual work-habits and performance standards. The inefficiencies and inconsistencies of information between departments were caused by our own workflow. We would have to evolve in order to maintain profitability, and an automated JDF workflow was the answer.

**Section II. Objectives** — Please provide a description of the printer, publisher or prepress service’s goal and motivation, including any quantities criteria upon which the goals were established:

**Basic Understanding of Required Change**
Clearly we had to change for JDF. With no effective computer systems to automate or link the company’s functions in place, we no longer had any room for improvement inside our old workflow. We had to implement MIS software which would encourage a JDF workflow and increase our productivity. The
objective was an increase of up to 35%. We also hoped to achieve an enhancement of customer satisfaction, as well as implement training for our staff to give them the opportunity to grow personally and professionally.

Before bringing JDF into our company we knew that we would have to do the proper research. We decided to pursue the following objectives:

- Find a Print dedicated Management Information System (MIS) which links the entire printing process from customer contact through to manufacturing, shipping and billing. The MIS should work with a single database stored on a dedicated server and should eliminate the need to re-key redundant data at any point in the company (business + production) processes. This would eliminate administration errors, reduce administration time and eliminate re-work.
- The MIS must be fully JDF enabled as all our equipment and machines coming in during the foreseeable future are going to be JDF interfaced to accelerate productivity on the shop-floor. This is essential to achieving our goal of a fully cross linked printing agency.
- The raw data entered into the system throughout the company should automatically be converted into information that can be utilized for every department. For example customer job specifications should be entered and immediately converted into estimates, schedules and detailed work instructions. This would eliminate calculation and data manipulation times and would also standardize our work processes.
- The work instructions generated by the MIS should cover the entire supply chain process including material ordering, pre-press, press, post press, packing and delivery, while being JDF compliant.
- Work instructions should be automatically linked to specific customer requirements so the customer company can be certain that we are working to their specific needs.
- The MIS must have an e-business module allowing customers to examine their jobs in our system during the manufacturing process. This promotes a joint understanding of job progress and payment status.

The Process Audit results also indicated that the required undertaking would not just include MIS and JDF installation. In fact, we had to redesign practically every manual workflow and business practice to change the employee mindset from individualists to a collaborative team.

Re-engineering for JDF implementation

The planned project intends to redesign our operation and allow us to reduce staff by roughly 30%. We will also upgrade productivity ratios by roughly 21%, increase capacity utilization by roughly 26% and increase the productivity of the entire company (TFP) by roughly 35%. These improvement ratios can be initiated within a time range of 2 years with additional features implemented in year 3.

We evaluated the actual outcome of the JDF-targeted re-engineering program in detail with the associated staff and cost savings. Cost savings by reducing staff to an adequate level through a maximum of 3 years (wage raises not calculated) is 28 Million Baht, totalling up to about 788,650 USD. In year number 5 additional staff will be cut, allowing us to raise productivity further as we become accustomed to the new workflow. At this point, we will be approaching the Productivity Ratios established in Sirivatana’s Export Markets, including Europe and the USA.

Section III. Methodology — Please provide a description of the process of selecting a solution, including alternatives and deciding factors:

In order to begin utilizing JDF, we first decided what the main criteria for our new MIS System should be. This sounds much easier than it was. In Thailand and Asia in general, MIS systems are really quite rare and there is very little experience with it in our market. We looked in Europe and the USA, but we were hampered by language barriers. We decided to narrow our search parameters and focus on the
specifications that were the most important to our company. We developed a list of our primary selection criteria when considering an MIS:

- The MIS must improve workflow and allow process integration (JDF)
- The MIS must integrate print related environments (premedia, prepress, press, postpress, etc.) into the workflow
- There should be proven program routines, as well as extensive customization opportunities
- The spectrum of functionalities should be very wide and be able to handle a very diversified company like Sirivatana
- The MIS should be able to steer and control practically all business and manufacturing workflows
- The integration of eBusiness (B2B, B2C, Web-Interface) is essential
- The technical expertise of premedia, prepress, press, postpress, and distribution must be available in the MIS
- The core features of the MIS must be estimating, order processing, materials management, customer management, and it must collaborate with financial and payroll accounting
- An electronic planning board that determines the best sequence of jobs based on a number of different variables
- It should select the most efficient equipment to run on based on the parameters of the job
- Production data should be collected remotely and fed directly into the MIS for process control
- A JDF-interface is required so job data can be sent directly to the machine for adjustments
- Real time job status information is desired

What alternatives were considered?
A number of competing MIS systems were considered and evaluated. In total, six vendors of MIS systems had been compared. Those systems were evaluated based on 136 criteria which were subdivided into 17 main Criteria Groups. Altogether, 816 criteria had to be evaluated, which was a fairly complex and exhausting task.

HIFLEX achieved the highest marks; the runners up got 58%, 71%, 72%, 77%, and 78% of the HIFLEX markings. The decision was finally made to implement the HIFLEX System because of these results. It must be acknowledged, that the Asian (Thailand) location of Sirivatana played an important role in all ratings as none of the vendors being evaluated in Asia had JDF, with the exception of HIFLEX. None of them had any maintenance, service or training exposure to Thailand. A very important issue in the decision making process was also to figure out which vendor would be able to adapt to the Thai mentality and culture which differs tremendously from the cultures of the western hemisphere. Selecting the right system was not just a fact finding mission, but an experiment in cross-culture business.

Section IV. Implementation Story — Please provide a description of the implementation effort including timeline, participants, critical path/milestones, obstacles overcome (if any), training and testing:

The HIFLEX MIS is currently integrated with the KODAK PRINERGY workflow system. The implementation story starts in May 2007 and includes the following steps:

1. **DATA PREPARATION AND TESTING**
   
   Start: May 2007
   
   Data preparation for 120 separate pieces of equipment had to be specified in all departments. Hourly rates for roughly 350 cost centers also had to be calculated so that the true cost of running jobs could be determined. 1,200 Paper grades and 1,200 Customers went into the new HIFLEX system for testing.
Participants:
Besides the Project Team, which leads and controls all events, the production managers, supervisors, accounting managers, logistics and purchasing employees have been involved in this wide reaching workflow alteration.

Obstacles overcome:
The definition of all the individual machine complexities into the Thai language and the following translation into English became a difficult obstacle. The definition of performance standards for each machine was also a stumbling block, since we had never defined performance standards before it was required by the HIFLEX MIS.

2. IMPLEMENTATION OF HIFLEX MIS – PHASE 1

Start: January 2008
As planned in the original schedule we were able to implement the HIFLEX Estimate, HIFLEX Order Book and HIFLEX Stock module in January 2008 on a trial and error basis.

Participants:
The Project Team led the way, acquiring a deeper understanding of the system and training 40 HIFLEX users. The sales teams took responsibility for the Customer Relations, Sales, Estimating, Work instructions and wide areas of Purchasing as well as Warehouse insight. Former function oriented staff became process oriented, broadening the scope of their positions in the company. They now handled entire customers and were responsible for their job throughout the entire workflow, which happened to be a very large challenge.

Obstacles overcome:
- Workflow changes for all employees, focusing on the new technological approach.
- Configuration and customization of HIFLEX MIS to support all product type estimations and the complex requirements from each department.

3. IMPLEMENTATION OF HIFLEX MIS – PHASE II

Start: January 2009
The HIFLEX Production Control System and HIFLEX Scheduling module were implemented. JDF connectivity between the HIFLEX MIS and KODAK PRINERGY Workflow System was achieved. As the link to KODAK PRINERGY had been installed at other
HIFLEX-Kodak customers, it was considered proven technology prior to implementation. No obstacles had appeared.

The implementation was broken down into two steps: The first step was a test period, which did not include automatic cost booking in HIFLEX MIS. When automatic cost booking was activated in the second step, prepress events and approvals were translated to cost center and material data in HIFLEX. Manual entry of prepress production data was no longer required, and shop floor data collection became mandatory.

Participants:
A project team with 20 HIFLEX users, mainly comprised of production staff, focused on HIFLEX Scheduling, while a smaller team of 3 prepress managers were involved in the implementation of the HIFLEX-Prinergy JDF interface.
4. **PLANS FOR THE FUTURE**

We will be expanding the JDF network into our pressroom as soon as possible. The first machines to connect will be our JDF compliant Komori presses. The HIFLEX scheduling system that we have already introduced in step 3 functions as the JDF controller in that respect. As plates are made ready they are visualized on the planning board. From that moment on change of job is unlikely, so we forward our JDF data to the pressroom during this time.

Sirivatana intends to be the first fully integrated JDF user in Asia, with live data flowing to both the prepress and press departments. We are very optimistic and confident that we can achieve this goal.
Section V. Resulting Workflow/Processes — A description of the resulting workflow, including any applicable workflow or process diagrams. At a minimum this must include two workflow diagrams: both the starting workflow (prior to the implementation being described in the application) and the final workflow. Interim phases of workflow may be diagramed, but are optional.

Our old workflow was not structured with an MIS but characterized by manual information collection, analysis, transportation and communication by so called “manual traffic teams.”

Since the introduction of JDF workflow, the “manual traffic teams” have been eliminated. HIFLEX MIS transfers the job data via JDF directly into the Prinergy system causing jobs to move faster and more accurately through the workflow. This data is also ready to travel into the press and post press departments when our connections are complete. Opaque JDF connections in this diagram are planned for the future.
The resulting JDF workflow comprises the following steps:

- Transfer of customer job information into standardized job specifications that allows direct estimation in the HIFLEX MIS
- Estimate created

Four different versions of the same hardcover book in the same estimate. The structure of our estimate system follows the JDF specification (see below).

Figure 2-2: JDF tree structure

Source: JDF Specification 1.4, page no. 65

Figure 2-4: Example of a Process chain linked by Input Resources and Output Resources

Source: JDF Specification 1.4, page no. 68
• Generation of MIS job ticket
• Clear technical problems (20% of cases) with technical support team via MIS
• Clear pricing with team-leader
• Prepare quotation
• Send quotation via MIS in form appropriate for customer (PDF, fax, mail etc.)
• Expect incoming order via MIS control function
• Revise estimate according to customers demand once customer has placed the order
• Define order confirmation
• Send JDF job definition from HIFLEX MIS to KODAK PRINGERY prepress system

**Automatic Job Creation**

Administrative and production data is automatically transferred to Prinergy via JDF for job creation as orders are entered in the HIFLEX MIS. Re-keying of the job specifications is no longer necessary. After the order has been created via JDF in Prinergy, the two systems maintain a constant link between the customer order and the prepress job.

**Better access to archived jobs / faster search and response times**

If a historic order has to be accessed, it can be easily found, since the administrative data in Prinergy was supplied by HIFLEX (thus, guaranteeing data consistency between the two systems).

**Automatic booking of material consumption**

During proof or plate production, Prinergy supplies HIFLEX MIS with JMF feedback. This includes operator, event time and date, work type (e.g. printer’s error, author’s correction, chargeable, non-chargeable, etc.), materials consumed (page proofs, form proofs, plates), proof and plate approval status, page thumbnails and operator comments. Material consumption and cost center times are automatically booked against the job, which leads to an accurate and reliable cost reporting.

![Display of a thumbnail-preview in the HIFLEX MIS. The associated high res PDF opens in Acrobat when the thumbnail is clicked.](image)
Inventory checks of plates are accurate

The inventory of available plates is now accurate because every plate output is logged in material booking.

Prepress progress visual for the CSR

Today the CSR profits from an accurate view into a job’s progress. From the order book anyone can see if files have already been provided, what the current approval state is and if there are any chargeable alterations. If the customers call to check on the order, the CSR department can respond immediately.

Up-to-the-minute plate status for the scheduler

Additionally the plate status is automatically updated on the scheduler’s digital planning board. Important information is now more transparent, allowing the scheduler to see if the plates for an urgent job are available, for example.

After the JDF interface was established between HIFLEX and KODAK PRINERGY, the workflow has been changed dramatically:

- Clarification of job scheduling with the Production Control Department
- Generation of job tickets according to the complexity of the job. Either standard job tickets or job tickets with instructions for every process are generated.
- Scheduling department takes over the manufacturing control, material disposition, and tracking of all manufacturing processes internally and externally
- A totally electronic job ticket is generated for the correct cost center
- Data collection takes place on produced jobs. This happens automatically in the CTP department via JMF feedback, while shop floor data collection terminals are utilized in the collection of data from equipment that is not JDF connected.
- Costing reports of the job are run to determine any additional costs that have to be invoiced to the customer
- Preparation of invoice as well as delivery papers inside the MIS system
Section VI. Optional Detail — Please provide at least one of the following:

- **ROI** — Please provide a quantitative analysis of the hard and soft ROI factors expected and realized, to include breakeven analysis, IRR or NPV determination of hard factors and testimonial evidence from users or customers as to the realization of soft benefits.

| In the lifecycle of investment (5 year calculation),
| the calculated Return on Investment (ROI) is 1960.1% and
| the Net Present Value (NPV) is USD 16,670,742 (discounted with 6%) |

The JDF project in our company involved a complete process reorganization and implementation of an MIS system. In the following Return on Investment (ROI) we have calculated all the costs involved in moving to our new workflow against all the benefits achieved in a five year lifecycle.

Before examining the ROI calculation itself, we will examine the benefits of our new JDF integrated workflow:

- **Shift of technical competencies out of production and into the customer service teams**
- **Automated estimate in minutes, compared to days**
- **Improvements in technical skills – MIS estimate is like a skill coach**
- **Now the customer service team is fully responsible for handling the total job process from customer contact to the fully signed off work-instruction and production start**
- **Cost savings for about 20 traffickers that were eliminated**
- **Production is concentrating 100% on production only, no pre-preparation work for jobs is done in the production department anymore**
- **We have experienced a huge increase in accuracy with JDF structured work instructions instead of the word of mouth communication through traffickers that we used previously**
- **Work instructions give machine operators guidance for each job, information that was not accurate of sufficient before implementation**
- **33% decrease in throughput time for the total business process of one job**
- **Logistics have been introduced to focus all processes around the HIFLEX automatic planning board**
- **HIFLEX MIS transfers the job data via JDF directly into Prinergy causing jobs to be more accurate and move faster through the workflow**
- **JMF feedback from prepress is transferred back to MIS to allow cost control, improved scheduling and status tracking**
- **Increase of production value add by 15%**
- **Reduction in Administration staff, 50 people**
- **Reduction in Marketing staff, 6 people**
- **Reduction in Machine Operator staff, 23 people**
- **Reduction in Unskilled Workers, 187 people**
- **Reduction in Department heads, 3 people**
## Periods

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### 2 - BENEFITS

**C Increased added value**

1. Increase in sold production by 15%

   (paper excluded)

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**D Reduced costs**

1. Admin staff, 50 people
2. Local Marketing, 6 people
3. Machine operators, 23 people
4. Unskilled workers, 187 people
5. Department heads, 3 people

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**E Annual benefits (C+D)**

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**F Cumulative benefits**

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**G Discounted annual benefits = PV(E)**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
</table>

### 3 - COSTS

**H One time costs**

MIS Software, Hardware, Installation, Training, Customization Services
Kodak JDF/JMF Link

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation, Training</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
</tr>
<tr>
<td>Customization Services</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
</tr>
<tr>
<td>Kodak JDF/JMF Link</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
<td>$30,240</td>
</tr>
</tbody>
</table>

**I Recurring costs**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licenses and Maintenance</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
</tr>
</tbody>
</table>

**J Annual costs = (I+J)**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$599,440</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
<td>$84,000</td>
</tr>
</tbody>
</table>

**K Cumulative costs**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$599,440</td>
<td>$643,440</td>
<td>$727,440</td>
<td>$811,440</td>
<td>$895,440</td>
</tr>
</tbody>
</table>

**L Discounted annual costs = PV(K)**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$599,440</td>
<td>$79,245</td>
<td>$74,760</td>
<td>$70,528</td>
<td>$66,536</td>
</tr>
</tbody>
</table>

## NET VALUE

**M Annual net value = (F-K)**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1,797,225</td>
<td>$4,292,371</td>
<td>$4,292,371</td>
<td>$4,292,371</td>
<td>$4,292,371</td>
</tr>
</tbody>
</table>

**N Cumulative total**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1,797,225</td>
<td>$3,732,931</td>
<td>$8,025,301</td>
<td>$12,317,672</td>
<td>$16,610,042</td>
</tr>
</tbody>
</table>

**O Discounted annual value = PV(N)**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$1,797,225</td>
<td>$4,049,406</td>
<td>$3,820,195</td>
<td>$3,603,957</td>
<td>$3,399,960</td>
</tr>
</tbody>
</table>

**ROI per Year = F/K**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>321.3%</td>
<td>511.0%</td>
<td>511.0%</td>
<td>511.0%</td>
<td>511.0%</td>
</tr>
</tbody>
</table>

**ROI Present Value = SUM(H)/SUM(M)**

<table>
<thead>
<tr>
<th></th>
<th>100%</th>
<th>100%</th>
<th>100%</th>
<th>100%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1960.1%</td>
<td>1960.1%</td>
<td>1960.1%</td>
<td>1960.1%</td>
<td>1960.1%</td>
</tr>
</tbody>
</table>

## NET PRESENT VALUE

**P Net Present Value (SUM(P))**

<table>
<thead>
<tr>
<th></th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
<th>4th year</th>
<th>5th year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$16,670,742</td>
<td>$16,670,742</td>
<td>$16,670,742</td>
<td>$16,670,742</td>
<td>$16,670,742</td>
</tr>
</tbody>
</table>
About project financial analyses

Return on Investment
The term Return on Investment (ROI) is frequently used in different ways. In financial circles, the strict meaning of Return on Investment (ROI) is Return on Invested Capital, a measure of company performance. The company's total capital is divided into the company's income (before interest, taxes, or dividends are subtracted).

Most business people use "ROI" simply to mean the "Return" (incremental gain) from an action, divided by the cost of that action. In this sense, an investment that costs $100 and pays back $150 after a short period of time has a 50% ROI. This is exactly how it is used in the financial analysis of Sirivatana’s JDF implementation.

Net Cash Flow (can be found in the line 'Annual Net Value' (N))
Cash flow, like income, focuses on the difference between money coming in and money going out over a time period. (Net Cash Flow = Cash Inflows - Cash Outflows). Cash flow results do not include some items found in the income statement, such as depreciation expense. Depreciation expense, for example, does not represent an actual cash payment during the reporting period, but rather an accounting charge against earnings. As a result, depreciation expense is not a "cash outflow" in the above financial analysis.

Discounted Cash Flow (DCF) (can be found in the line 'Discounted annual value' (O))
The DCF is a cash flow summary that has been adjusted to reflect the time value of money. It is an important criterion in evaluating or comparing investments or purchases. All things being equal, the purchase or investment associated with the larger DCF is the better decision. DCF makes use of the Present Value concept, the idea that money you have now should be valued more than an identical amount you would receive in the future. Why? The money you have now could (in principle) be invested now and gain return or interest, between now and the future time (interest rate used in the above financial analysis is 6%, (A)). Money you will not have until some future time cannot be used now. Therefore, the future money's value is discounted in financial evaluation, to reflect its lesser value. What that future money is worth today is called its "Present Value".

Net Present Value (can be found in the line ' Net Present Value ' (P))
The net present value is a form of calculating discounted cash flow. It encompasses the process of calculating the discount of a series of amounts of cash at future dates, and summing them. Therefore, the height of the net present value is dependant on the length of the period for the project financial analysis. The period which we have chosen for the financial analysis of Sirivatana’s JDF project is five years.