The Journal of
IMAGING SERVICES
ISSN1055-8098
Volume 17, No. 4

CONTENTS

Planning Considerations for Production Film Scanning 1

Article Abstracts 2

Industry Knowledge Assessment Survey Results 14

Professional development assessment questions for this issue 30

CHARTS and DIAGRAMS

An ideal process flow for film scanning 11

Tables and charts of the surveyed responses to the following questions beginning on page 14.

Q1: What is the average budget for a production document imaging project?

Q2: At what point in a project does large-scale production document imaging or workflow planning usually occur?

Q3: Approximately how many publicly held companies make up the production document-centric to workflow industry in the U.S. and Canada?

Q4: What percentage of total industry revenue do publicly traded companies constitute?

Q5: What is the average revenue breakdown of an OEM?

Q6: What type of client is most likely to increase the overall revenue of an OEM, and why?

Q7: What two services offerings represent the most significant growth in revenue for consulting and production service bureaus in the U.S. and Canada?

Planning Considerations for Production Film Scanning

by Derek Jenkins

In the previous issue of the Journal I wrote about some of the image processing details that can be applied to digital microfilm capture. I also wrote about their use and the impact on processing the job. Using this knowledge and data gained through the sample and inspection process will make the costing of the job a more accurate process, from both the service bureau and the customer's position.

Each customer has unique issues and unique requirements. In many cases the experienced service bureau has already encountered them and has devised the strategies, approaches and methods to resolve them. In other cases, they need to create the approach method or start formulating one. Networking with one's peers and partners is a great method to help solve these unique issues and also share workloads when they become too burdensome, or just not practical for profit margins.

To estimate the cost of a job is not an easy task, and can be disastrous if attention to detail is bypassed and the quote thought-process is rushed. When I'm asked, "How much does it cost to scan film?" I don't answer the question directly, rather, I ask: "How long is a piece of string?", as the question has no simple response. I then explain that the best way is to gather the requirements and then run a sample. These samples can take a long time, but will always provide the best information for both the costing and understanding of the potential issues in processing the job. Above all, the sample will provide an example to the customer of what your organization will deliver, at what quality and at what cost.

I want to stress that processing a sample both validates the information gathered by the sales staff, fills in the details that are unknown by the customer, and confirms that you can produce the type and quality of work that the customer wants. It also provides a benchmark of the deliverable which can become the agreed upon measurement of performance during the project.

In my previous business, I made the following statement in every quote sent out from our service bureau to a customer:

"This quote is based on the sample rolls processed. Should the film delivered for production differ significantly from the samples, then we reserve the right to adjust our prices."

continued on page 4 →

The information gathered by the sales personnel, along with the notes taken during the sample process that we used to make the quote, effectively documented the film's properties and any issues that we anticipated. If a sample needs to be re-done (which sometimes becomes necessary) we don't want to re-discover the unique features of the roll that took the first operator two hours to find.

During the costing I first used my salesperson's project sheet that contains the customer requirements and then look at the production sample. At this point I am looking for the scan speed and any setup, detection, cropping, quality, or output issues that will effect the general production rate.

From this evaluation, using conservative mathematics, I can calculate an estimated hourly production rate. I normally use only 50 minutes per hour and 7 hours in a shift to allow for all the unforeseen problems that will delay the scanner from operating. By using conservative numbers I can eliminate the simple setup and rewind time from the costing equations.

Costing a job can be done in many ways. Different approaches are a matter of personal preference, and therefore one method is as valid as another, just as long as all resources are considered. I use a simple method of combining my sample production rates with preparation and QA time and add a factor for any rescanning that may be required. Next, I do a reality check to see how my price measures up against known prices of competitors.

Last of all, I adjust the price by the 'X' factor to end up with a per image cost. I am not addressing indexing in the costing, as the main focus of this article is film scanning. Other companies go as far as building a cost for each project based on all the elements that go into running a business from loaded employee cost, lease payments on scanner, building costs, utilities, and management overhead. This is a valid approach, but not my method of choice. Most methods will come up with similar costs, as the reality check and 'X' factor are more influential on the price than other production costs.

Simple costing using a mid-range film scanner.
If the sample production rate on a medium level scanner is 80 frames per minute (FPM) or 4000 frames per production hour, which includes all scan operations, rotations, de-speckling, cropping, and compilation of the TIFF-G4 images to disk. Post processing will not be required, but the images will need to be written to CD, so that the following can be estimated:

With a $120 per hour production goal and 4000 images per hour scan rate, this translates to 3¢ per image. The film is in good condition, so my prep-time loading factor is zero. This also means that my re-scan loading will also be zero. My reality check says that 3¢ is a good price because my known competition normally charges a higher rate. At 10,000 images per CD, the media cost will be less than a $1.00, so I could throw in the CD's. However, it would be better to charge a flat rate per CD produced, since I think the customer will want one (1) CD per roll and a duplicate made as well.

As a side note, I always follow up e-mail quotes with a paper copy, including prints of some of the sample pages which include a version in reduced format of 9 images per page. I do this for two main reasons:

1. Evaluating quality of an image on a monitor is very subjective, especially for the non-computer literate customer. Viewing tools may or may not scale images accurately. For example, when scaling to gray, they make images look great, and without greyscale they can make images look weak or washed-out when they are not. Monitors can distort images and make the image aspect ratio appear out of proportion and blurred. Therefore, the printed page can help the average user see what they will actually get.

2. Printing out a single page of images along with a number of 9-up prints allows the manager to check the work of the scanner operator. Glancing though 100 images on a screen takes time. Looking through 11 pages of large thumbnail images is very quick and usually catches most of issues. In some ways, it also keeps the operators on their toes, because they know the images will be examined.

Simple costing on a high-end film scanner.
The production goals and rates on a high-end film scanner are 280 and 240 FPM, or 12,000 frames per production hour, including the normal production processes detailed above, and the cost per frame would be 1¢. My reality check says that is too low and I should charge 3¢ per frame. My 'X' factor says that 2.5¢ would win me the job as I know my competition only has a mid-range scanner. My 'X' factor also says that I will have to burn a lot of CD's quickly, so I may need to dedicate staff to that operation. Therefore, I add back 0.25¢, to make the price 2.75¢ per image.

Complex costing on a high-end film scanner.
If the film is not perfect and the image quality is a little weak, a sample production rate might be as high as 280 FPM. This sample was not easy to setup, but once it was set it ran okay. During the sample it was noted that some images were being cropped because of poor edge definition.

At 240 FPM the rate will be 12,000 frames per production hour. With a $240 per hour production goal, the cost per image will be 2¢. The prep time will go up because I will inspect the whole roll, as well as my post-production time because the whole roll will need to be inspected. Additionally, the post-production time will also increase because I will need to do 100% QC.

These two factors just loaded the price by 50%, making the cost 3¢. The implication of 100% QC is that any bad images will be re-scanned, since it was noted that chopped frames were present during testing. Another noted factor is that some of the images were a little weak. This factor loads the rate to 1¢ making a total of 4¢ per image. This means that we will be charging approximately $480 per production hour for this mediocre film, but we may have to do a lot of extra work to deliver acceptable quality.

Poor film or very high quality demands from the customer can increase the pricing rapidly. If the setup and image quality were not recognized as a significant issues because no sample was done, the job would have been a big money-losing event.

Depending on the capability of your scanners and QA software, you may consider running this job differently. This technique has only become available with 4th generation film scanners. This technique requires scanning the rolls and saving both the cropped G4 image along with the uncropped grayscale image. If an image appears substandard during the QA step, the saved JPG version can be cropped, thresholded, and filtered manually until the best quality image is obtained. The manually processed image is then saved to disk in place of the original substandard image.

This method does not require the remounting of the film roll on the scanner. This method is done during the QA time slot, so that the process of merging the rescanned data is not required. The cost projection, using this method would probably come to about 3.5¢, which would likely yield a more profitable job.

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In many ways, competition and the current market rates have more to do with the final price than any other factor. From the market perspective, the service bureau has to conform and make a profit within the prevailing market rates. Running an efficient and technically current operation is one of the keys to success in this production-oriented business.

Scanning delays are, in my opinion, the biggest loss of revenue that can be controlled and turned directly into a bottom line profit. When I first started scanning film in 1990, we had to work out all the how's and why's of microfilm processing. The best thing I ever did was to study the time and motion of operating my prototype scanner. I had the operator log each and every step done to a roll. We timed setup, scanning, QA and indexing, as well as the offloading of the deliverable images for each and every roll we processed.

We did this for over two months. Once we had gathered the data, we started refining the process by overlapping tasks and streamlining programs. The gathered data allowed us to start to find the issues and activities that made us spend more time than required. Within the first month we were seeing improvements, and by the end of the study we had nearly doubled production.

From this effort we found that an idle scanner costs a lot. Every minute that the scanner was not producing images we were not making money. If we lost scanning then the production pipeline became empty and everything stopped. With this is mind, we did everything possible to keep the scanners operational. These are the steps we learned:

• Perform a QA check before scanning, then organize the film by features such as chronological sequence, film type, reduction ratio, and orientation. This preparation will make processing easier by minimizing major setup reconfigurations. Sometimes, going as far as to view the whole roll of film on a light table can avoid surprises that cause wasted time. This review should catch any really bad film that may need special handling. These bad rolls should be skipped during normal production and assigned to the most experienced "scanner guru" for processing later.

• Prepare production log sheets so the operator knows the order in which rolls should be processed, and more importantly, what work is expected within the shift. This step is also a central place to track problems, productivity, and even operator performance and quality. *This is key, because reprocessing a roll or conducting rescanning is very time consuming, which in turn translates to lost production.*

• Assign multiple operators to work as a team and rotate scanning with QA/indexing, pre-production and post-production tasks amongst them. This minimizes the boredom and allows the scanner to remain running. *As a side note, if possible do not have the person who scanned the image QA the same work.*

For example, a trip to the restroom (and the chat at the water cooler) took 15 minutes. The scanner stopped two minutes after the operator left. This resulted in thirteen minutes of non-production. If the scanner is capturing 200dpi 24x film runs at 290 images per minute, then in that thirteen minutes, 3770 images could have been scanned.

Lunch breaks for the production team should be staggered to minimize any impact to production efficiencies.

Stagger the work-starting times for production team members. Have one operator start and finish early, the second working normal hours, and the last operator can start and finish late. This has now turned an 8am to 5pm day into a 6am to 7pm day, adding 4 hours more production and also allows for overtime from 7pm onward.

• If your scanner rewind speed is slow, have the operator rewind the film on a mechanical winder while the next roll is being processed.

The current available technologies allow an approximate eighteen-second rewind time, but the older scanners can have a rewind time of up to two minutes. Using the same 200dpi 24x example as above, the average third-generation film scanner runs at about 160 frames per minute, or 4 rolls per hour, producing up to 32 rolls a shift. At a two minute rewind per roll, that is sixty-four minutes. This is enough time to do 4 more rolls of film or an additional 9,600 frames per shift. Simplistically, at 2¢ per image that is $192.00 of production income lost.

Attention to detail will make a scanning operation more cost effective. Being cost effective, in turn, allows you to be competitive. Being competitive should lead to more work. Also, by paying attention to details, the quality of the deliverable will be high and repeat work and referrals should increase.

Technology at work

Once the scanning operations are coordinated and running well, the technology used in the processing network should be reviewed to improve productivity. This is a big hurdle and major expense for any service bureau, but being too far behind will significantly impact profitability in the end. Updating part of your processing network may not produce the maximum benefit until the entire network is updated, so forward-thinking and careful planning is important. For example, when laying in new network cables to your building, make sure you use CAT-6 Gig-E and not CAT-5 100base-T. You may not need the capacity today, but you will tomorrow.

Scanners

Thirteen years ago, 15 frames per minute was considered a good rate, and when it jumped to 25 FPM we were all ecstatic. Currently, production rates are much faster and demand more from all networked equipment in order to maximize throughput and minimize overhead. Today the available production film scanners fall into three classes: 100 FPM, 180 FPM, and 300 FPM.

Lower-end film scanners are still shipped, but from a cost justification standpoint, they cannot be realistically considered as production-grade devices. Each production-grade class has pros and cons, but based on the cost/performance ratio, the higher performance machines have the greatest potential of being the most efficient devices in most production environments, and therefore the most cost effective.

Scanner technology has not changed very much in the last few years, although electronics have advanced, software is more capable, and the capacity of a PC is always improving. In April this year, most manufacturers announced new products. This pushed the top end of film scanners to 300 FPM, while nearly doubling the production rates of the middle-level film scanners to 180 FPM.

Networks

When we started out 10base-T Ethernet was standard. It linked to the 386-based file server with a pair of very expensive 650MB disks costing $2,500 each. We did not have CD-R, and had to rely on tape backup or the then emerging WORM optical drives. Currently, we have at minimum 1000/100/10 base T networks or even fiber optic based systems. We have multi-processor 3.0Ghz network servers and NAS storage devices with multi-gigabyte tape backup drives and DVD's storing 4.7 or 9.4GB.

These specifications are the higher-end, but planning for updating your network will only improve the efficiency of your operation.

For example:

- If it currently takes twenty minutes to copy the image data to the CD burner, it may only take ten minutes on a newer network.
- If the scanner can send 100 FPM in TIFF-G4 across a network today, it may only be able to write 10 FPM if the images are grayscale, unless the network topology is updated.
- If the current network storage can hold 100 reels of G4 data, it will only be able to handle 10 rolls for grayscale, unless the disk space is increased.

Disk drives

Older generation drives disk drives were 5400rpm 4GB. Recent generation disk drives were 7200rpm 80GB. The current generation's average disk drives are 240GB SATA-150, with the high-end drives of 240GB SCSI-320. RAIDS are more common to both improve speed, but also to provide redundancy in case of mechanical failures.

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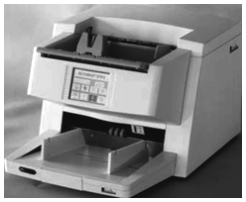

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It is likely that most operations will use Network Attached Storage (NAS) RAIDS in the near-term. These devices connect directly onto to the network and provide a large volume of drive space, with the security of a RAID. It is easily expandable by just adding more disk drives.

From a service bureau position, I need my network to accept data as fast as it can be scanned. Then it needs to be delivered it back to my QA stations as needed, without slowing down my scanner with network bottlenecks. If I don't have the throughput, then my production will suffer. Therefore, in order to increase scanner performance, an equivalent increase in data transfer will be required.

CD/DVD drives
Today the CD-R is inexpensive and practical for data delivery. DVD is now becoming more standardized and can store the larger JPG grayscale images that are being requested more practically.

However, one thing concerns me about the writeable CD's and DVD's, and that is long-term storage. Although I have not followed all the arguments in detail, my current interpretation of what I read is that CD-R (especially the cheaper ones) cannot be relied on for data integrity. Even in as short a time frame as two years, some CD-R's stored in ideal environments are failing because of instability of the dye. Assuming this issue is the same of DVD's, then we need to use another medium for the long-term backup of image data.

Saying all that, CD's and DVD's are idea for delivery of images to a customer. Make sure that you are using the correct speed CD media, and for DVD's make sure you are using the fastest write-times available, otherwise it will take too long to write a full disk.

How much horsepower does a workstation need?
Well, for Q/A not much, as any inexpensive 2.0Ghz machine will be more than fast enough for the average work, as long as that PC can deliver data faster than the operator can process it. If I increased the CPU speed by 50% to 3.0Ghz, it would not give me a 50% increase in productivity. However if I increase the network from 100base-T to 1000base-T I may see an increase.

If I increased a post-process station doing cleanup and/or OCR I would see a 50% increase in productivity, as long as the data can be delivered to and from my PC fast enough. The selective use of the new technology, coupled with newer networks and disk drives, will benefit productivity. Just look for the bottleneck, be it CPU power, disk size, or network band width, and then remove it.

Helping the customer justify the conversion
A customer wanting to convert their film, and a customer who can afford to convert their film, may be two different people. Most potential customers do not know how many images they have, and what the conversion would cost. The average person can grasp the concept of the number of images in the tens of thousands, or even the hundreds of thousands, but in microfilm scanning work, we deal in millions of images, and somewhere in the number of zeros, the size of the project gets lost.

Those millions of images multiplied by a few cents can produce sticker-shock for the unprepared. Therefore, as I do my investigation and prepare my quote I am also looking for the return on investment (ROI). If I can help my customer sell the conversion to their management, then I have a far better chance of getting the job, compared to a service bureau that just dropped off a simple quote based on unverified requirements and statistics.

When working with a customer (assuming that they want my help) I probe with two sets of questions. The first set is to help show ROI, the second set is to see if the practical issues of the new system have been considered. Additionally, I need to discover where I can apply my expertise and capabilities.

Is there an ROI or is it just an expense?
When probing ROI, I am looking for the obvious points of this project that will be of significant benefit to the customer. I am also looking to see if the customer has thought of all the cost areas in the project. These cost benefits may include:

- productivity increases
- potential staff reductions or labor redistributions
- the elimination of older technologies and their associated maintenance costs
- reduced costs due to realized efficiencies
- increased goodwill due to more efficient and accurate services

In some cases the budget has been approved, and the project is going ahead, or the project has been expensed and no further justification is needed. However, in many cases, any

help that can be offered is welcome. To visualize this, I'll use an example of a hypothetical insurance company. This company stores all policy data on microfilm in an off-site Record Center (RC), or in the same building. Policyholders call in to the Customer Service Department on a daily basis. The Customer Service Representatives (CSRs) send requests to the RC for the policies. Records are searched, retrieved, and then printed on request. The records are then returned to the CSR who then attempts to call the policyholder back.

On average, three long distance attempts later, the request is closed by sending an update back to the RC, where it is filmed and added to the jacket (policy holder's file?).

Let's break this down into the individual steps and associated estimated simple costing:

1. The CSR gets a call from the policyholder (at the policyholder's expense).

2. The CSR takes down the request details and sends them to the RC.
    a. 10 minutes - to make notes about the request.
    b. 5 minutes - to write a request and send it to the RC.

3. The RC locates the file.
    a. 5 minutes - to pick up the request and locate the records.
    b. 5 minutes - to print 14 pages at a cost of 10¢/page.
    c. 5 minutes - to pack and send the data back to the CSR.

4. CSR calls the customer back.
    a. 5 minutes - to make (on average) two phone attempts to talk with policyholder, which are unsuccessful.
    b. 10 minutes - to successfully contact the customer by phone at the company's expense.
    c. 5 minutes - to document the changes requested by the customer and send them back to the RC for archiving.

5. Records film and file change documents.
    a. 1 minute - to film the documents.
    b. 10 minutes - to cut the film, locate the policy, and update and re-file the records.

6. Hidden costs:
    a. additional RC staff
    b. storage space and associated overhead
    c. reader/printer operating cost
    d. reader/printer maintenance
    e. filming operational cost
    f. film processing maintenance
    g. additional telephone calls

If a rate of $30 per hour is used for labor, 10¢ per page for the printing costs, another 20¢ per page for the filming and processing costs, and 15¢ per minute for effective telephone cost, this then makes this total cost about $35.

If an image system had been in place, the process would have been a little more streamlined. The process might work like this: The policyholder phones in, the CSR locates the data requested online, updates as needed, and concludes the phone call. All of this occurs within the one call and that call is made at the policyholder's expense. This cost would have been less than 10 minutes of CSR time (or about $5.00) making a difference of $30.00 of expense per call.

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Repeat this at a rate of 250 times a day, and the potential savings are: $7,500 per day, $37,500 per week or $150,000 per month. Cost justifying the conversion of one million 30 page policies at an estimated $1.50 per policy is $1,500,000, or about a ten month ROI. If you add to that the cost of a new imaging system, the ROI could be less than 18 months. The savings on CSR staff and infrastructure could also increase the ROI (shorten the period), as each person will become more efficient.

This description is a little too simplistic, as I am not considering many small things, including the time it will take to convert the images, the ramp-up of the image system, and the corresponding ramp-down of the microfilm records department. However, as a hypothetical example I think it demonstrates the potentials.

Is the conversion practical?
The second consideration that I probe for is establishing how practical the system seems. It is one thing for the customer to have the approved budget to convert their data and they just want it done ASAP, but so many customers are trying to build the case for conversion, and without good analysis, they may never get the project off the ground.

It is very frustrating to help develop the project justification and identify the costing for a project and then have it fizzle because of a lack of interest due to a weak justification of the short-term expenses.

During my due diligence with the customer, I try to find the following type of details. Most of the time, the customer is very open with me, as confirmation of their planning ensures that no points are missed.

- How will the images be stored?
- How much storage will be needed?
- How will the images (and indexes) be imported into the system?
- Has an image system been specified, identified and qualified?
- How will the images be accessed?
- Does the indexing requested structure match how the documents will be accessed?
- Does the volume of work warrant the expense?
- How practical is this project with the known volume of work?

Hypothetically, let's look at a smaller company that prints logos and names on widgets. They have a large archive of past work. They have repeat business from 25% of their customers within 24 months, after that the records are no longer needed because they are considered out of date.

If they wanted to convert the archive of 300,000 orders each with 30 pages it will translate to 9,000,000 total pages. If the costs were the same at $1.50 per customer, then the conversion cost will be $450,000. On the basis of a rate of 25% repeat business only, 75,000 orders or 2,250,000 pages will be needed at a cost of $112,500. This project, can effectively be approached in two ways:

The first option is the simplest, which is to run a day-forward operation. Do not convert any data until it is needed, then do it on-demand, using the old equipment. Although this may present the least direct costs, it does require the company to maintain the staff and equipment to do the on-demand conversion and the new image system will not be used to its full potential initially. Unfortunately, this option does not include any active microfilm/fiche conversion. However, to the management team this may be the most attractive approach, unless a better alternative can be shown.

The second option requires the customer to provide the service bureau with all past order data, or process it themselves. Without much effort, the repeat orders over the last few years can be isolated. Then the selected order jackets can be retrieved and scanned-in, which will allow the system to come on-line quickly. Once the main scanning is complete, I would usually offer the company a quick turnaround conversion service allowing them to minimize the amount of legacy equipment they needed to keep and maintain.

Turning down jobs
I have found that it was always better to tell a customer no, and not do the work, than take on a marginal job and deliver less than what was expected. I know that I have gained the respect of the customer when I say no, and then I look for another way to do business with them. I also have found that when I have ignored my gut feeling it has come back and bit me.

Most service bureaus can't afford to make the mistake of taking on work that loses money. Considering the numbers, if we work with a 1¢ error it can turn quickly into a $10,000 loss. So my advice is, if your equipment, staff, or capabili-

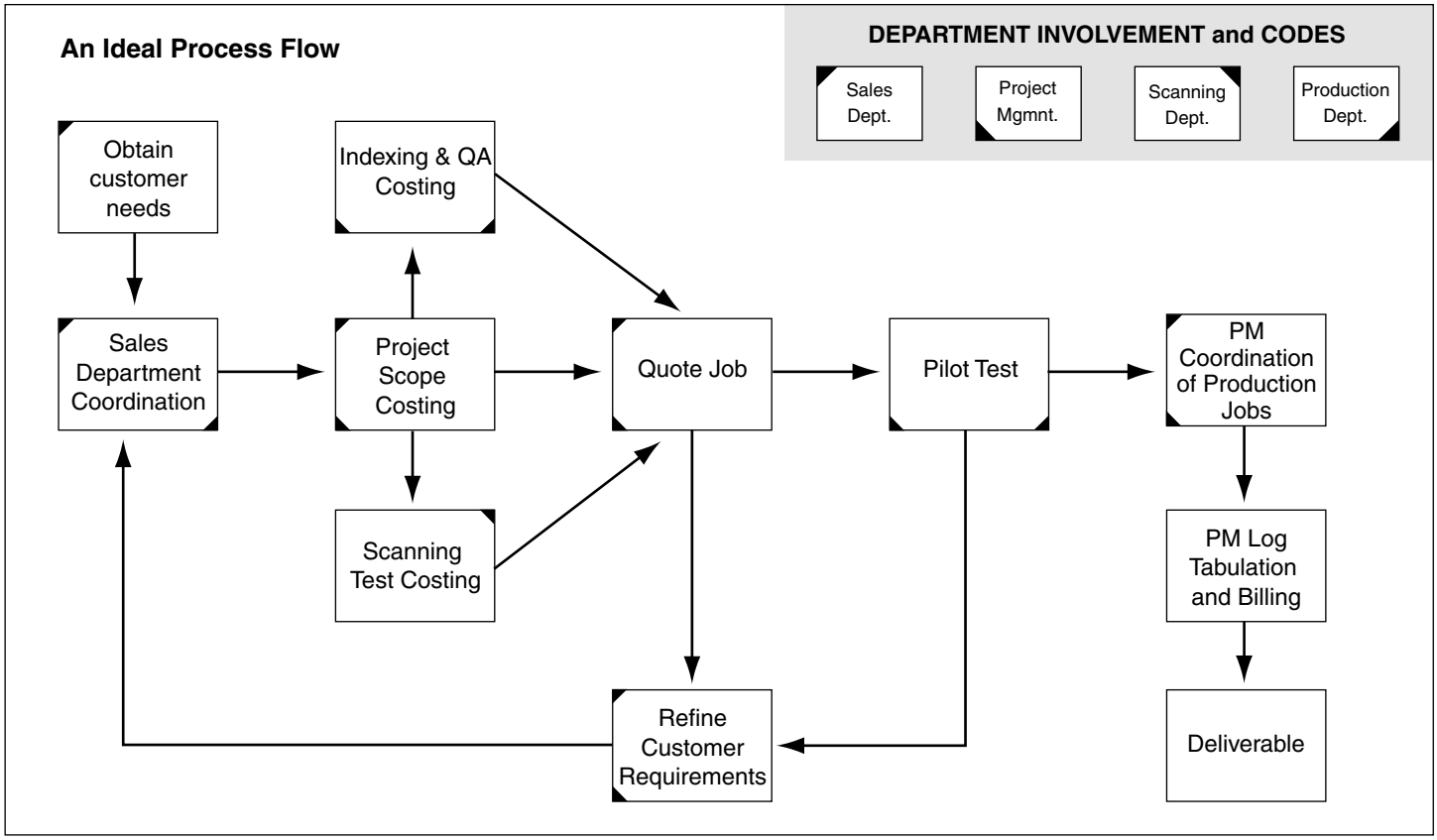
ties can't handle the work, then don't do it, or get someone involved who can ensure that the work can be done as expected.

An ideal process flow would be as follows:
1. Sales department obtains the customer requirements.
2. Sales department co-ordinates quote preparation by seeking input from the production specialist.
3. Index & QA build requirements and associated cost.
4. Scanning department build requirements and associated cost.
5. Sales and project manager build project scope
6. Project manager with sales builds quote for customer
7. Project manager and sales adjusts and refines quote based on feedback from customer.
8. Project manager with production runs pilot test
9. Project manager co-ordinates production and keeps customer and sales apprized of the project's status.
10. Project manager takes production logs, prepares information for billing and arranges periodic deliveries back to customer.

This is a description of a simple task flow of the project management for a film digitization project. In some cases, the same person will do more than one job. In others, each department will be responsible for providing the required input to facilitate the production workflow. What I have learned over the years is that, with some exceptions, sales and production must have a clear line of definition between them.

Without turning this into a debate about the pros and cons of sales-driven companies vs. production-driven companies, my views are biased towards the production side. So many times (again, with exceptions) the sales staffs' lack of production experience, coupled with the drive to make the commissioned sale, will tend to under-price and over-commit what production can achieve.

Once that happens, the situation usually deteriorates into finger-pointing, and the customer is always the one to suffer. Certainly, the sales agent's interface with the customer is very important, but once the job is sold and the contract is signed, sales staff should go on to the next customer and stay out of production, leaving coordination, management,



and fulfillment to the project manager.

The task flow should be as follows:
1. The sales agent obtains the customer requirements. We have talked about what needs to be done during the data collection phase. A skilled sales person will get the correct data so that the next step is simplified.

2. The sales agent coordinates a quote preparation by seeking input from the production specialists. Production consists of many steps. Each step has a cost and a time constraint. While the quote is being prepared, sales should be coordinating all of the data from each of the production departments or outside sources. As this coordination progresses, a project manager should be assigned so that the transition to production is smooth.

3. Indexing and QA build requirements, and associated costs are calculated. Indexing and QA is an art in itself. Every job is different and every job is custom. This phase may be done in-house, farmed-out to another bureau, or even done offshore. Indexing and QA should be quoted separately from scanning, as this may be the most expensive part of the whole project. Just like doing a test run in scanning work, indexing will require a similar test. These exercises will not only set the baseline for project estimates, but also allow for the unknown to surface so it can be addressed.

4. The scanning department estimates build requirements and associated costs. In the same way indexing provides a cost,the scanning department needs to do the same. Running a test case will give you a good idea of performance and most possible problems.

5. The sales agent and project manager build the project scope. With the data and requirements of the job established and agreed upon, sales should start building the statement of work (SOW). The SOW defines what is expected, as well as what is required of each department.

6. Project manager with the sales agent builds a quote for the customer. Prepared with the data provided by each department and their associated test runs, the sales agent should now start building the customer's quote. Once the quote is drafted, a reality-check should be coordinated with each department's input, and pricing should be adjusted accordingly (as given earlier on page 4).

7. The project manager and the sales agent adjust and refine the quote based on feedback from the customer. With the initial requirements and quote prepared, both the sales agent and project manager adapt it to fit exactly with the customer's requirements. Any changes will force the proposal back to steps 2, 5, and 4.

8. The project manager with the production department runs a pilot test. I always like to take the first week of production and call it a pilot. Special attention is given to making sure everything is as expected and planned. Going back to the customer at this point, with major concerns that differ from the expected, is not a major issue, but leaving it until the project is nearly over is certainly not a good idea.

If refinements to procedures and costs need to be made, then this may be the last opportunity to do it. If refinements are made then the quote should go back to step 4, to make sure it gets fully reviewed.

9. The project manager coordinates production and keeps

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the customer and the sales agent apprised of the project's status. Once the project is running, the main point of contact should be the project manager. Project management should be making sure that the deliverable is of the expected quality, that production issues are addressed with each involved department, and that the customer is happy and informed of any issues that are being handled. It is also the project manager's responsibility to keep sales up to date on the project's status.

10. The project manager compiles and analyzes production logs, prepares billing information and makes periodic deliveries to the customer. As the project progresses, data and images will need to be delivered. Project management must take the production logs and compiled jobs and turn them into the deliverable, as well as the billing information for accounting.

Depending on the project size, this may be a daily, weekly, or monthly requirement. I do not recommend monthly billing, as it both strings out payments and may delay the discovery of any financial issues with the customer.

For a long time I did not have a direct sales force. All work came to me by word of mouth or by reference. With very few exceptions, our customers were satisfied, and referred our name to others. I cannot put a value on this, but I do know the hard work was worth it.

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