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### Printing standards and certification survey in the indian printing industry

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# **Printing Standards and Certification Survey in the Indian Printing Industry**

By Lekha A. Lokhande

A thesis submitted in partial fulfillment of the requirements  
for the degree of Master of Science  
in the School of Print Media  
in the college of Imaging Arts and Sciences  
of the Rochester Institute of Technology

April 13, 2012

Primary Thesis Advisor: Professor Robert Chung

Secondary Thesis Advisor: Professor Robert Eller

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## **Abstract**

The use of graphic arts standards in the global printing industry is increasing as printers discover that the effective use of standards allows them to produce high quality printed goods at competitive costs. This trend is most advanced in Europe, but is also visible in North America and Asia. Despite the fact International Standards such as ISO 9001 have been adopted by the Indian industry at large, the extent to which the Indian printing industry has adopted graphic arts standards is largely unknown. This gap was recognized in 2010 by the Indian Technical Advisory Group for Graphic Arts Standards when this group concluded that data gathering concerning standardization activities & standards compliance in the Indian printing industries was needed. (Jain, Sweden 2010).

This research surveys the Indian printing industry in order to (1) gain an understanding of the extent to which graphic arts standards are currently in use, (2) the factors motivating further adoption in this market, and (3) the obstacles faced by printers wishing to adopt graphic arts standards. The survey instrument and plan are built on the highly successful Printing Standards Survey conducted by the Printing Industry Center at RIT in 2010 (Chung, Jensen 2010).

## **Chapter 1**

### **Introduction and Statement of Problem**

Although Indian industries are rapidly adopting standards such as ISO 9001, the extent to which graphic arts standards have been adopted in the Indian printing industry is largely unknown. In addition, there is little known about why Indian printers have (or have not) adopted standards and the value that they see in using them. One way to address these knowledge gaps is to survey the most relevant segment of the Indian printing industry (4-color offset printing) to gain much needed insight into the use of Standards in the Indian printing industry.

Since very few surveys have been conducted in the past, conducting such a survey and filling the voids in our knowledge of the Indian printing industry is the problem addressed in this thesis.

Graphic arts standards are gaining acceptance in India. The first Indian TAG meeting to discuss print standardization with a view to participation in ISO TC130 standardization efforts was held on Jan 22<sup>nd</sup> 2010. At this meeting, it was agreed by the printing experts in attendance that data gathering as to standardization activities and compliance in the Indian printing industries was needed (Jain, Sweden 2010). At the Monsoon Summit, Alan Dresch, Mellow Color, said, “Indians need to get inside the tent” instead of continuing loose



discussion or criticism of the standards (Jain, Sweden 2010). In short, the Indian printing industry needs to gather data to focus its standardization efforts. A survey would help to fill this gap by answering pertinent questions and helping to develop an industry consensus concerning the value of working to standards.

### **Reason for Interest**

As the Indian printing market matures and becomes more international, standards provide an opportunity for the industry to improve communication with customers and reduce material waste. Customers in other printing markets are increasingly demanding conformance to standards, and this trend may well affect the Indian printing market. Indian printers are not uniformly aware of importance of standards. This survey, in addition to collecting information, also serves as a tool to make this opportunity visible to Indian printers.

The researcher's interest is motivated by a firsthand appreciation for the value of standards. Her undergraduate group project was to standardize local press according to ISO 12647-2. This project resulted in reduced make-ready time, better results and also attracted more customers (Gade, Kulkarni, Lokhande 2010). The researcher's interest in standards was reinforced by her exposure to standards activities at RIT. RIT is deeply involved in international standards work and the researcher realized from the PSA survey in the USA the increasing importance of standardization and certification (Chung, Jensen 2010).

After beginning her graduate studies at RIT and meeting with people like Prof. Robert Chung, Prof. Robert Eller, Mr. Elie Khoury, and Mr. David McDowell, the researcher was motivated to conduct a survey of printing standards and certification in India.

## **Chapter 2**

### **Literature Review**

#### **Part I: The Use of Standards in India**

Indian industries have gone for ISO 9001 certification in a big way since beginning of 1990. This is the principal finding of a survey of companies, which have adopted ISO 9001 in India (Ray 2000). The survey identified three principal internal benefit areas cited by ISO 9001 certified companies: (1) better understanding of process responsibilities, (2) improvements in communication leading to better quality management, and (3) better linkage to other parts of the organization. In addition, certified companies cited improved product quality and contribution to competitive edge as external benefits (Ray 2000). The fact that Indian ISO 9001 certified companies are citing the benefits of certification supports the potential value of graphic arts standards certification for Indian printers.

A second study adds support for this contention (Dick 2000). It is observed from this study that better quality does have a consistent, positive relationship with business performance. Better conformance in quality is linked to competitive advantage. Benefits are largely internal, such as reduction in error

rates and procedural efficiency rather than external dimension such as market share. The principle motivation for pursuing certification is the ability of the certificate to open customer's doors that were previously closed, or would close if certification were not achieved (Dick 2000).

Offshoring and offshore outsourcing, the movement of work and tasks to low-cost countries, has been increasing in scale and scope (Rothenberg, Hira, and Tang 2005). As outsourcing is increasing in scale and scope, a global language for communicating specifications is needed and standards provide this common language. Despite the success and acceptance of ISO 9001 in India, graphic art standards are much less adopted. Nevertheless, awareness is growing. Large printers are aware of standards where as small and medium are not.

During January 2009, the Monsoon Summit was held in three different cities (Mumbai, Delhi and Chennai) by IPP Star. The summit was aimed at leading multicolor sheetfed and heatset web offset printers in the country. The use of graphic arts standards was a focal issue for this summit and IPP Star stated at the end of the summit, "The poll on our website asking about the importance of standardization thus far overwhelmingly reflects [its] importance [to Summit participants]" (IPP Star 2009). This result supports the view that the portion of the Indian printing industry with an understanding of standards is the tip of the iceberg. Leading printers understand, but small and medium printers still need to learn.

The first Indian TAG meeting to discuss print standardization with a view to participation in ISO standardization efforts was held on Jan 22<sup>nd</sup> 2010. At this meeting, it was agreed that there should be some data gathering as to standardization activities and compliance in the Indian printing industries. A suggestion was made to create a set of basic best practices and standards with particular attention to local substrates and conditions (Jain Sweden 2010). As a result, Indian companies are trying to initiate discussion with the Bureau of Indian Standards on getting involved in the international printing standards movement by initially attending the ISO/ TC 130 meetings. (Jain, Sweden 2010).

Printing standards apply to systems, including software and hardware, as well as to printer's workflow whereby printed products are manufactured. For example, proofing systems are often certified for conformance to standards by their suppliers (EPSON Exceed Your Vision , 2012). When Indian printers purchase such proofing systems, they become users of International graphic arts standards, and this is another way by which standards are gaining a foothold in India.

In short, graphic arts standards are gaining importance in India, but the Indian printing industry lacks data needed to focus this effort because there is little known about why Indian printers have (or have not) adopted standards and the value that they see in using them. A data gathering effort is needed.

## **Part II: The Indian Printing Industry:**

India is one of the few markets in the world, which offers high prospects for growth and earning potential in practically all areas of business (Loven 2007). Offset maintains a healthy lead in India. In the past three years, 325 new printing plants have been established. This number is expected to double by 2012. But 74% of the offset printers operate only single color and two color machines (Chhabra 2011).

In India, there is a set of printing industry players which are growing systematically and regularly. These players do not belong to any specific region of India but are scattered all over the country. Nevertheless, India, like many other countries, has industrial development zones and printers are attracted to these areas because they find concentrations of suppliers and customers in them. This has resulted in clusters of printing companies which are located in: (1) North India (Amritsar, Delhi, Faridabad), (2) West India (Ahmedabad, Bombay), and (3) South India (Bangalore, Coimbatore, Madras)

Publishing firms are quite large in number with the majority of these being very small operations (Loven 2007). For example India has more than 60,000 registered newspapers and more than 15,000 publishing houses printing books. The many regional languages served by these publishers drive the large number of companies. In addition to newspapers and books, Indian publishers print

picture post cards, greeting cards and a full range of commercially printed materials (Chhabra 2011).

Privatization was initiated with the aim of integrating the Indian economy with the world economy. This change opened the doors for the Indian printing industry to modernize by investing in the latest technology and machinery.

Today, India is fast becoming one of the major print producers & manufacturers of printed-paper products for the world markets. The quality of printed products has improved dramatically and immense production capacities have been created (Loven 2007).

Some printers have won recognition by winning prizes at international competitions for excellence in printing (Loven 2007). Big printers in India are associated with national printing organizations such as AIFMP, NPES and so on. AIFMP members Pragati Offset, Hyderabad, Silver Point, Mumbai, and Thomson Press, Faridabad are among leading printers who win international awards every year. AIFMP was established in the year 1953. It draws its strength from 55 regional associations spread over the country (Chander 2011).

### **Part III: Conducting a PSA Survey in India**

#### *The original PSA Survey*

In 2010, the Printing Industry Center sponsored a survey of the use of standards and need for certification in the printing industry. A total of 117 survey

responses were received including 90 responses from printers. While open to printers around the world, 71 of the 90 responding printers were located in North America and 15 were located in Europe. Overall, the survey was a great success.

From this survey, several factors which contributed to its success were identified and have been incorporated in the design of the Indian printing industry survey. First, the questionnaire was designed to assess the role of standards in five areas of the Graphic Arts workflow: file creation and data reception, contract proofing, CTP/press calibration, process control and workflow efficiency (Chung, Jensen 2010). This structure proved easy to follow. In addition, an Internet based survey tool was used to implement the survey worldwide. As Internet is readily available in western countries, surveying online was highly effective.

Survey Monkey was selected as the Internet based survey tool for the PSA survey. This tool provides facilities for creating a survey questionnaire, allowing users to log in and take the survey, collecting responses, and analyzing them. This tool proved to be a reliable software application during the original PSA survey.

After reviewing the lessons learned from the PSA Survey, it was concluded that a questionnaire for the Indian printing industry should include two areas in addition to the research objectives covered in original PSA survey – the motivating factors for Indian printers to adopt print standards and obstacles to adopting them.



### *Insights about conducting a survey in India*

A survey of companies with ISO 9001 experience was conducted in India in 2007. This survey provided insight into the scope of the questionnaire and sources of survey participants. The ISO 9001 questionnaire was designed to cover the following broad aspects of ISO certification: profile of the company surveyed, role of top management, reasons for going ISO 9000 certification, benefits of the certification, lessons learned, future direction, satisfaction level with the auditing agencies, general comments, and observations from the implementers of the ISO 9001 standards. The list of certified companies was obtained from the auditing firms operating in India. (Ray 2007).

A survey should take 5–10 minutes for respondents to complete. At about six questions per minute, depending upon difficulty, typical survey is limited to 30–40 questions (Dill 2011).

Online surveys are great alternatives to expensive mail or telephonic surveys. There are a few drawbacks to online survey as far as the Indian population is concerned: not everyone is online, and the demographic that responds to online surveys is generally biased toward younger people (Bhaskaran 2011). It would, therefore, be advisable to use telephone interviews as a second option for those who have not responded online.

Nevertheless, an Internet survey is an attractive option in India. The Internet market is growing fast in India. More than half of the population has adopted Internet services quickly over past 5-7 years (Internet Usage Stats

Report India 2011). The business people we are targeting have a high probability of using the Internet and an online survey should work well in India.

## **Chapter 3**

### **Research Questions**

Five research questions were developed based on the forgoing discussion. There first three questions are aligned with the three main research objectives of PSA survey. Two additional questions were chosen specifically for the Indian printing industry. These questions focus on the motivation for and obstacles to adopting standards.

#### **Research Questions**

1. To what extent are graphic arts standards used in production workflows by Indian printers?
2. To what extent do Indian printers encounter issues and problems, which could be mitigated through the use of graphic arts standards?
3. What percent of respondents are currently certified (PSO, G7, or ISO 9001)?
4. Which factors motivate printers to seek printing certification in India, and what is the relative strength of each factor?
5. What are the obstacles to seek printing certification in India, and what is the relative strength of each obstacle?

## Chapter 4

### Methodology

The methodology used in this research can be divided into five sequential steps as depicted in the following flowchart. Details of each the major steps from “Defining population and set response target” to “Data analysis & documentation” are explained below.

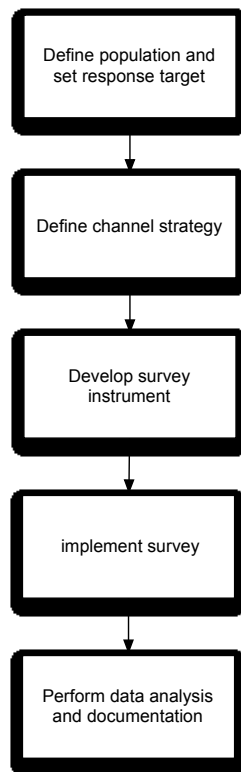


Figure 1. High-level view of the methodology used in this research

## **Step 1. Define population and set response target**

Four-color commercial offset printers constitute the target population for this survey. The Indian printing industry today comprises more than 250,000 big, small and medium printers (Chander 2011) compared to 60,000 in USA (Romano 2010). In the USA, there are approximately 1240 commercial offset printers virtually all of whom operate at least four-color presses (Romano 2010). Scaling the number of US offset printers based on the total number of Indian printers results in an estimate of approximately 5100 commercial offset printers in India. In India however only 26% of offset printers operate four-color presses (Chhabra 2011) which results in a target population of approximately 1300 four-color printers.

In the original PSA survey, the response rate for commercial printers was 6% (Chung, Jensen 2010). Applying the same response rate to the Indian target population results in a response target of 80 printers. While this target was adopted for the survey, the literature review made it clear that there is a significant risk that small/medium printers may not be technically prepared to participate in the survey.

When conducting the survey, a single respondent should represent each company and this respondent should be in a managerial position. Respondents should also be technically sound and know the production workflow of their company. Finally respondents should be aware of customer demands and the priorities of their businesses. Respondents meeting these requirements would typically in positions such as production manager, quality assurance manager, or vice president manufacturing.

## **Step 2. Develop a channel strategy**

The researcher realized that in-country partners would be essential to conduct an effective survey. Three enthusiastic partners were enrolled with the help of researcher's primary advisor's contacts and her previous relationships. In-country partners provided list of 300 potential target printers. Printers were then enrolled through the use of emails followed by telephone reminders. The researcher sent over 1000 emails and made 150 telephone calls to potential participants seeking their involvement in the survey.

## **Step 3. Develop the survey instrument**

The development of Indian Printing Standards questionnaire was based on the survey questions in the original PSA survey. The questions which were not applicable to the Indian printing industry were removed and some questions were modified for ease of understanding by Indian printers.

Two new research areas were introduced for the PSA survey in India. These areas were "motivation for adopting standardization" and "obstacles encountered by Indian printers implementing standards in their workflows".

Survey questions were cross checked versus research questions by developing the table shown in Appendix A. The survey questions were listed against research questions to insure each research question was covered by one or more survey questions.

A survey can be conducted in many ways, over the internet, by telephonic surveys, using face to face interviews, through paper mail surveys and so on. Because of long distances involved, an internet based survey was an attractive option for the researcher. The first step in validating the viability of an internet based survey was to mock up the survey questionnaire in an Internet survey application called Survey Monkey. This mock-up was then given to in-country the partners who reviewed the survey for appropriateness and ease of use in India.

The survey questionnaire was refined with our in-country partners. They were given a chance to provide their inputs to the survey. This helped to engage the in-country partners in the survey and validated the survey instrument.

#### **Step 4. Implement survey**

After refining the survey questionnaire and validating the survey instrument, the survey was ready to launch. The announcement of the survey was made in conjunction with our in-country partners to take advantage of the motivation and encouragement that these partners were able to provide. The announcement of the survey was made by Naresh Khanna in two of the magazines PSA (Packaging South Asia) and IPP (Indian Printers and Publishers) that he publishes. These two magazines are read by most of the Indian printers.

### **Step 5. Perform data analysis and documentation**

After completion of the survey, survey data, exported from the Survey Monkey, was analyzed. Charts, graphs and descriptive statistics similar to those used in the original PSA survey have been included in the Results section below.



## Chapter 5

### Results

The researcher realized that in-country partners would be essential to conduct an effective survey. Three enthusiastic partners were enrolled with the help of researcher's primary advisor's contacts and previous relationships. In-country partners provided list of 300 potential target printers. Printers were then enrolled with the help of emails followed by telephone reminders. Over 1000 emails sent and 150 telephone calls were made in an effort to increase participation. Figure 2 summarizes the launch effort. In the end, 64 printers started the survey and 48 completed it.

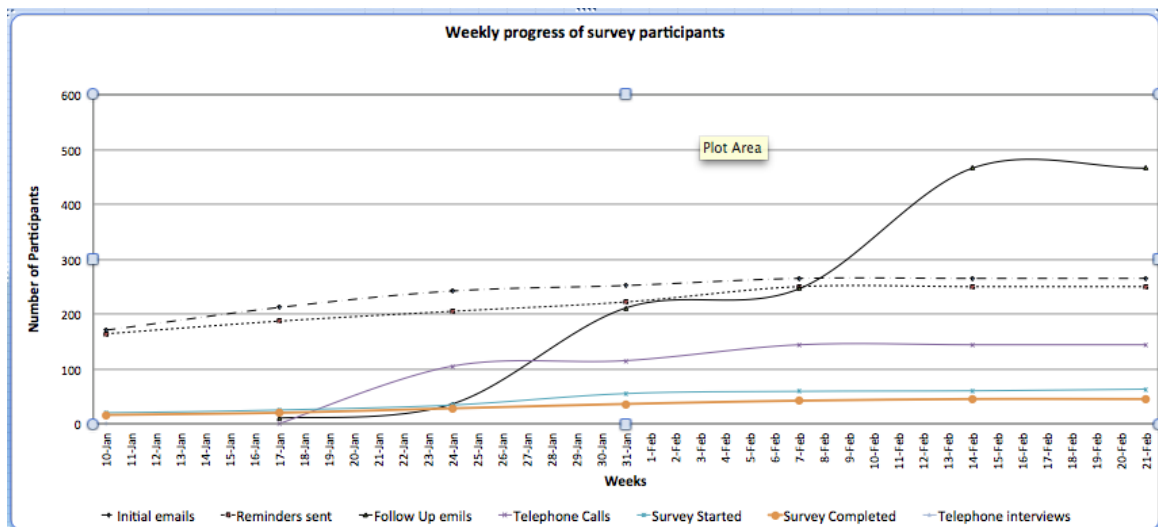


Figure 2. Development of the Survey over Time

## Overview

Based on PSA survey held in North America, target of 80 printers was set. This was based on PSA survey response rate of 6%. The channel development effort resulted in 64 printers who started the survey and 48 completed it. This means in this survey the final response rate was 4%.

This low response rate coupled with the intense efforts required to solicit these responses leads the researcher to believe that use of standards in Indian Printing Industry is immature and practiced by a limited number of printers. This point of view was supported by the website study of the printers who participated in the survey as well as who did not participate the survey. The printers who participated in the survey had well designed and well organized websites as compared to the printers who did not participate in the survey.

As Figure 3 shows, a total of 64 leading Indian printers started the survey. Of these 64 total respondents, 27 respondents were from western part of India, 20 were from South India, 15 were from North India, and only two respondents were from the Eastern part of India.

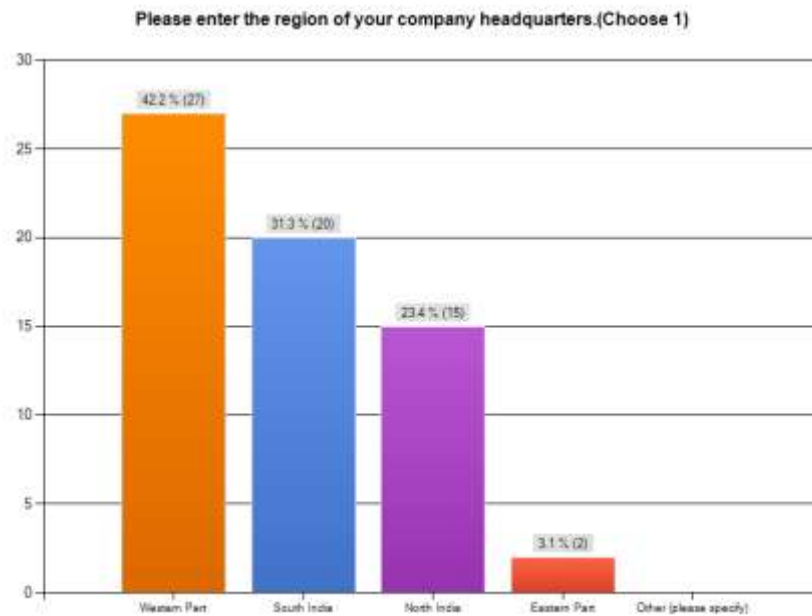


Figure 3. Geographic Distribution of Respondents

Over two thirds of the printers responding were from the commercial printing and publishing segments. The remaining third consists primarily of packaging and label printers (see Figure 4).

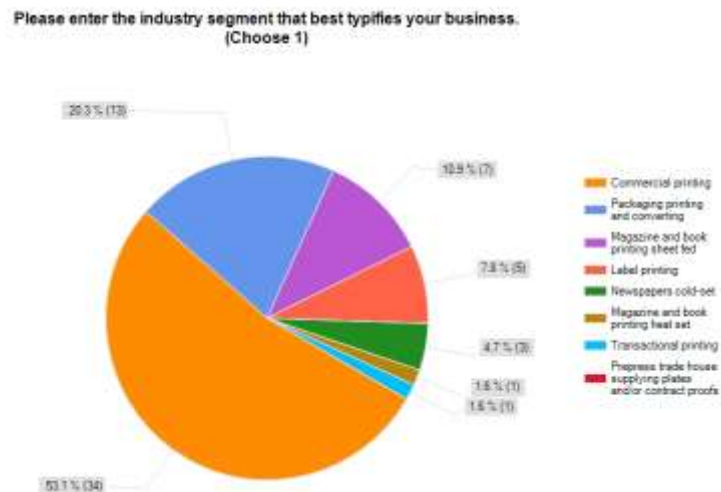


Figure 4. Industry Segments of the Participants

As Figure 5 shows, nearly 70% of the respondents use sheetfed-offset technology. Flexo is the second most used technology with 17% usage.

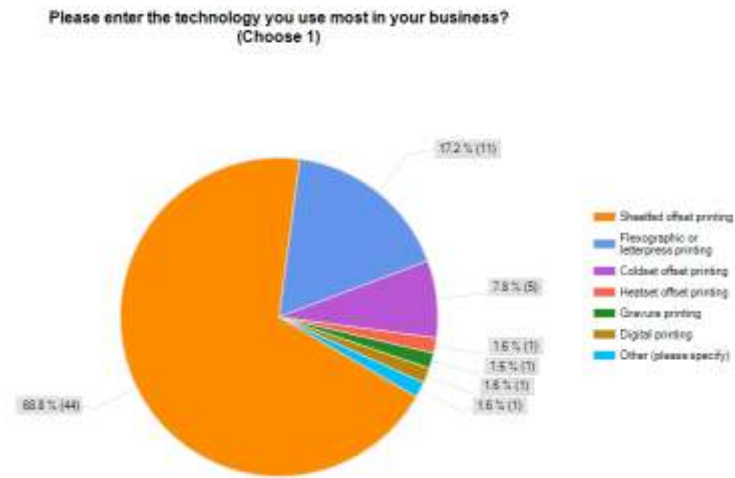


Figure 5. Primary Printing Technology Used

**Research Question 1. To what extent are graphic arts standards used in production workflows by Indian printers?**

In order to answer this question, a survey was developed to gather data at each step in the graphic arts production workflow. The questions were asked in such a way that the data gathered revealed how printers and their customers are using standards. In this section, the results of the survey are organized according to the production workflow. Each step in the production workflow is followed by a narrative describing the survey findings for that step. Finally, the results supporting the narrative are presented as a series of charts and tables.

*Data Reception:*

Over 95% of the printers who completed the survey use a standard color space in Photoshop. Figure 6 shows that two thirds of them use ISO Ctd v2 reflecting the success of the Monsoon Summit in promoting ISO 12647 in India. SWOP and GRACoL account for another one fourth of the respondents. Printers also responded that their customers use a standard color space in the files they send to them. A standard CMYK color space is used most commonly with custom ICC profiles and RGB color spaces being the second and third most common color specifications (see Table 1).

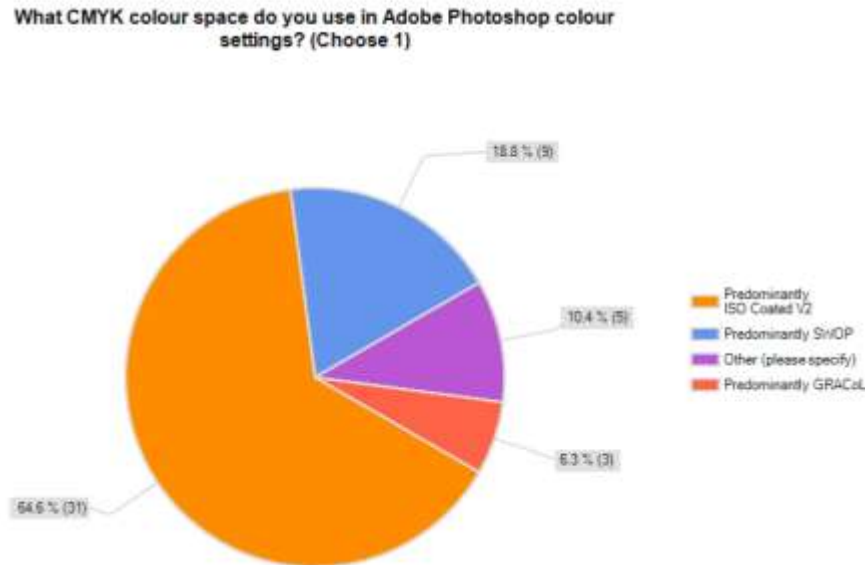


Figure 6. CMYK Color Space Used in Adobe Photoshop

Table 1. Specification of Color in the Files Received by the Printers

Q.7. How is colour specified in the files you receive for the print? Options : 4 - Most important, 3, 2, 1 - Least important. (Forced Ranking)					
Answer Options	4	3	2	1	Rating Average
Not specified	3	8	6	31	1.6
Specified by a standard RGB colour space	2	14	22	10	2.2
Specified by a standard CMYK colour space	36	7	5	0	3.6
Specified by a custom ICC colour profile	7	19	15	7	2.5

Another area investigated by the survey is the use of file format standards.

Here respondents said that PDF/X, an International Standard, is the most commonly used file format. However, as Table 2 shows, many files are received in native application formats such as InDesign, Illustrator and Corel Draw. This

finding was also echoed in the original PSA survey where participants reported extensive use of native application formats.

Table 2. Frequency of File Formats Received

Q.8. Please rank how often your company receives a given file format. Options : 5 - Most important, 4, 3, 2, 1 - Least important. (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
PDF/X-1	14	12	11	4	7	3.5
PDF/X-3	10	18	12	7	1	3.6
InDesign	4	13	14	12	5	3.0
QuarkXPress	0	5	7	15	21	1.9
Other	20	0	4	10	14	3.0

#### *Proofing:*

Approximately one half of the participants either do not use certified color proofing systems or do not know about them. One third of the participants said that their proofing systems are Fogra certified while the remaining participants either use IDEAlliance or another certified proofing system (See Figure 7). As stated in the literature review, proofing system certification is obtained by the system supplier, and is one of the ways that the use of graphic arts standards is gaining a foothold in the Indian Printing Industry.

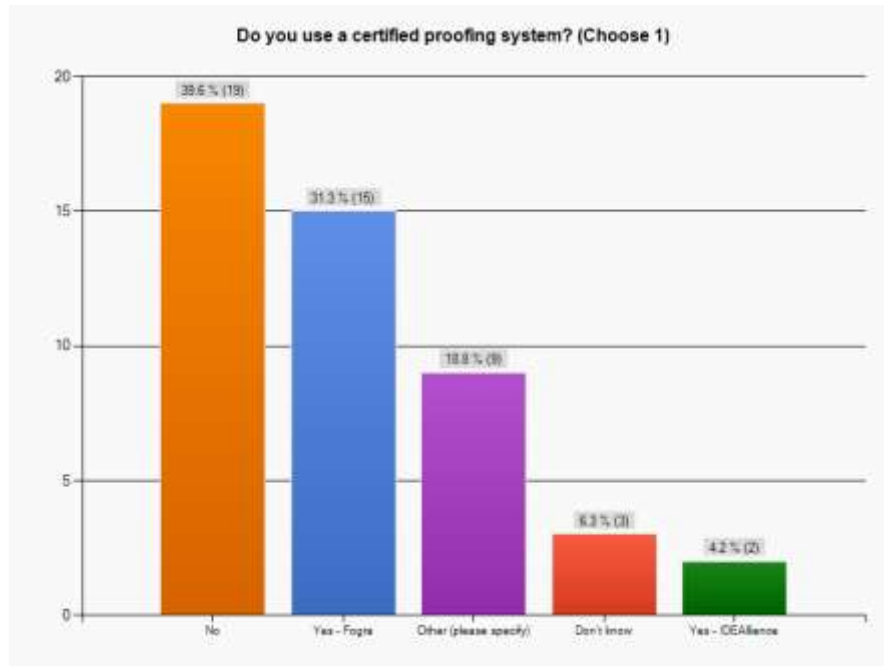


Figure 7. Percentages of Use of Certified Proofing Systems

Questions were also asked concerning proofing standards and practices used by printers and their customers. Participants were asked to agree or disagree with the statements shown in Table 3. Almost four fifths of the total participants agree with the fact that their customers do not supply color proofs and that the proofs they receive are often non-color managed inkjet proofs. Three fifths of the printers use standard profiles such as ISOCTd v2 (ECI) and Coated GRACoL 2006 in their digital proofing workflow. The nearly even division of responses concerning the use of custom proofer profiles and the use of display based proofing indicates that the Indian Printing Industry is still exploring the use of these technologies, and has yet to reach consensus concerning their value.



Table 3. Proofing and Standard Practices

Q.10. Please respond to the following statements by selecting Agree, Disagree, Don't know, or Not Applicable (N/A) (Choose 1)				
Answer Options	Agree	Disagree	Don't know	N/A
Customers often do not supply colour proof	37	11	0	0
Customers often supply non-colour managed inkjet proofs	41	6	1	0
We use standard profiles, e.g., ISOcoated v2 (ECI), Coated GRACoL 2006, in our digital proofing workflow	30	7	2	9
We build our own proofer colour profiles	21	19	3	5
There is a good match between customer submitted proof and our contract proof	23	21	1	3
There is a good match between our contract proof and OK sheet	42	4	1	1
We use display-based soft proofing	19	24	1	4

**CTP:**

The same format was maintained for the questions concerning CTP standards. By looking at Table 4, we can see that only half of the printers are using some form of CTP quality control. This probably indicates that printers are experiencing relatively few problems with their CTP plates and that CTP controls are used primarily for verifying plate quality.

Table 4. CTP Standard Calibration Practices

Q.11.Please respond to the following statements by selecting Agree, Disagree, Don't know, or Not Applicable (N/A) (Choose 1)				
Answer Options	Agree	Disagree	Don't know	N/A
We generate only linear plates	25	18	2	3
We include both linear wedge target and curved wedge target to verify CTP/Press calibration	29	11	3	5
We use a plate reader to verify plate exposure and processing	29	10	0	9

#### *Calibration and Print:*

The next area investigated was use of standards in calibration and print. More than 50% of the printers use TVI calibration to conform to printing standards. This reflects the success of Monsoon Summit in promoting ISO 12647-2. Grey balance and device link methods are second most commonly used calibration methods (See Figure 8).

Which of the following CTP/Press calibration methods does your company use to conform to a printing standard? (Choose 1)

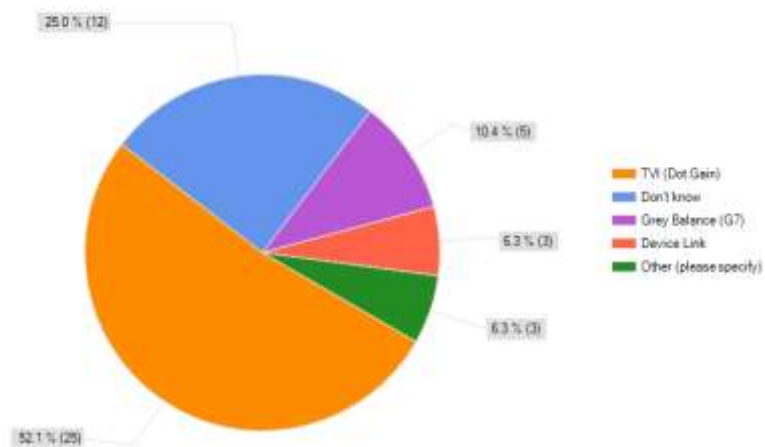


Figure 8.Percentages of Use of CTP/ Press Calibration Methods

Figure 9 describes the state of the Indian Printing Industry with respect to color control. Less than 15% of the participants said that they do not use color measurement control (i.e. control color visually). This reflects that value that most printers see in the ability to quantify color. Hand-held devices are the most commonly used color measurement instruments by the survey participants. Color measurement systems such as auto scanning spectrophotometers and closed-loop color control systems are used by fewer printers. This may indicate that the Indian printers see high value in handheld spectrophotometric measurements but are less certain of the value associated with using high cost online measurement systems.

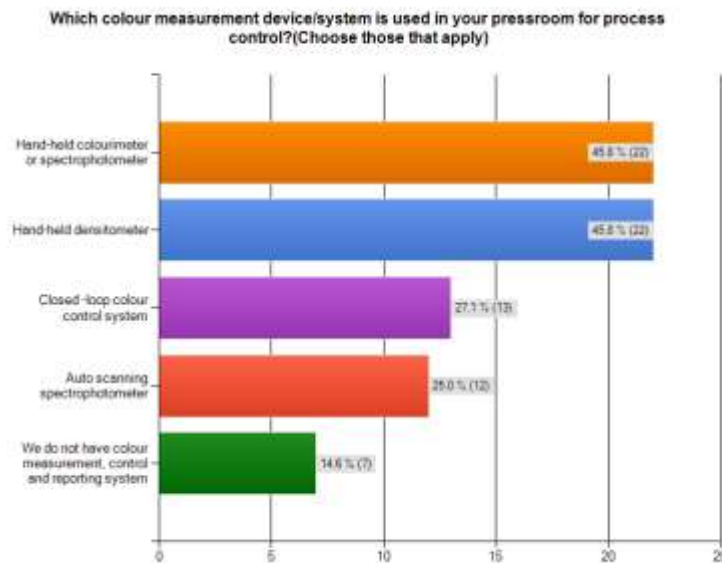


Figure 9. Color Measurement Device/ System Used for Pressroom

Forced ranking was used to determine how printers selected the OK color sheet. Visual match to proof is the most critical factor according to more than half

of the survey participants. Conformance to target densities holds second place, again reflecting the influence of ISO 12647-2 in India. Table 5 clearly shows the predominance of these approaches over competing approaches such as conformance to grey balance or CIELAB values.

Table 5. Factors to Determine color OK Sheet

<b>Q.14. What is the most important factor that determines your colour OK sheet?</b> <b>Options : 4 - Most important, 3, 2, 1 - Least important. (Forced Ranking)</b>					
<b>Answer Options</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>Rating Average</b>
Visual match to proof	27	9	9	3	3.2
Conformance to target densities	12	20	13	3	2.8
Conformance to target CIELAB values	7	6	9	26	1.9
Visual match of grey balance in control strip	2	13	17	16	2.0

**Research Question 2: To what extent do Indian printers encounter issues and problems, which could be mitigated through the use of graphic arts standards?**

In order to answer this question, printers were asked to rank the issues they face in four different areas: daily production issues, issues related to color measuring instruments, technical issues, and color control issues. The results supporting the narrative are presented as a series of tables.

In the area of production issues, having an efficient press make-ready process for achieving color OK is critical to all printers. Having standard operating procedure (SOP) in color critical areas and having customers' PDF files certified to known standards rank as the second most important factors overall. Nevertheless, the industry is deeply divided on the importance of these two factors, with 12-15 printers ranking them as their most important production issues while 10-12 printers ranked them as least important. Interestingly, the number of printer who ranked SOP's and standardized PDF's as least important for daily production is almost exactly equal to the number of printers who stated that they do not print to international printing standards (see Figure 12).

Table 6. Issues Faced by the Printers in daily Production

Q.15. Please rank the importance of the following issues in your daily production. Options : 5 - Most important, 4, 3, 2, 1 - Least important. (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
Having standard operating procedure (SOP) in colour critical areas of the workflow	15	8	5	8	12	3.1
Having customers' PDF files and proofs certified to a known standard	12	10	6	10	10	3.1
Having efficient press make-ready in achieving OK print	10	13	16	6	3	3.4
Having an OK sheet as a production reference	7	9	12	11	9	2.9
Having a right measurement and reporting system in order to verify printing consistency	4	8	9	13	14	2.5

Problems regarding the printers' color measurement instruments were the next issues covered in the survey. Here the clearest finding is that Indian printers regard re-certifying their color measurement instruments as their least important problem, possibly indicating that their instruments rarely cause an issue. On the other hand, having an on-site mechanism for verifying calibration (a Certified Reference Material) was seen to be a desirable capability by most printers (see Table 7).

Table 7. Issues Faced by Printers Regarding Color Measuring Instruments

Q.16. Please Rank the importance of the following issues regarding your colour-measuring instruments. Options : 3 - Most important, 2, 1 - Least important (Forced Ranking)				
Answer Options	3	2	1	Rating Average
Having good inter-instrument agreement	19	8	21	2.0
Having certified reference material to verify measurement accuracy	15	29	4	2.2
Having our colour measuring instrument sent back to the vendor for re-certification	14	11	23	1.8

According to survey participants, papers containing OBA are the most critical technical issue that they face. For printers attempting to conform to ISO 12647-2 this is an expected result. Paper is the fifth color in printing and the color error induced by optical brightening agents can make it exceedingly difficult for printer to conform to published aims when printing on OBA loaded papers. On the other hand, ISO 12647-2 is well accepted in India and only a few printers felt that it did not address the majority of their needs (see Table 8).

Table 8. Degree of Problematic Issues Faced

Q.18. If you print to standards, please rank how problematic the following technical issues are to you. Options : 4 – Most problematic, 3, 2, 1 – Least problematic (Forced ranking)						
Answer Options	4	3	2	1	Rating Averag	Response Count
Paper containing OBA does not conform to the paper white point specified in ISO 12647-2	17	8	4	6	3.0	33
Inks do not conform to ISO 2846	6	13	10	7	2.5	34
Press sheet and proof do not match each other visually	5	9	14	8	2.3	34
ISO 12647-2 only addresses a small part of my customer's needs	7	6	8	15	2.1	34
<i>answered question</i>						<b>34</b>
<i>skipped question</i>						<b>11</b>

Finally, printers face a number of issues in process control. Broadly speaking, these issues can be grouped as external issues (such as agreeing with customers on color matching tolerances) and internal issues (such as controlling color on press). As Table 9 shows, external issues were generally seen to be more problematic, with agreement of tolerances for color matching being the

most frequently encountered process control problem. Internal problems such as controlling color on the press and achieving contract proof to the press match were less frequently cited. Nevertheless, it should be noted that the overall differences were relatively small and that no single issue really stood out from the others.

Table 9. Frequency of Problems Encountered in Process Control Steps

<b>Q.19. Please rank how frequently you encounter problems at each of the following steps in the colour control process.</b> <b>Options : 4 - Most important, 3, 2, 1-Least important (Forced ranking)</b>					
<b>Answer Options</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>Rating Average</b>
Agreeing on how colour ought to be specified with customers	17	12	3	16	2.6
Agreeing on the colour matching tolerance with customers	12	18	15	3	2.8
Controlling colour on press	6	14	18	10	2.3
Achieving contract proof to the press match	13	4	12	19	2.2



**Research Question 3: What percent of respondents are currently certified (PSO, G7, or ISO 9001)?**

Three straightforward, simple survey questions were developed to answer this research question. The results obtained from the answers to these questions are shown in the figures below.

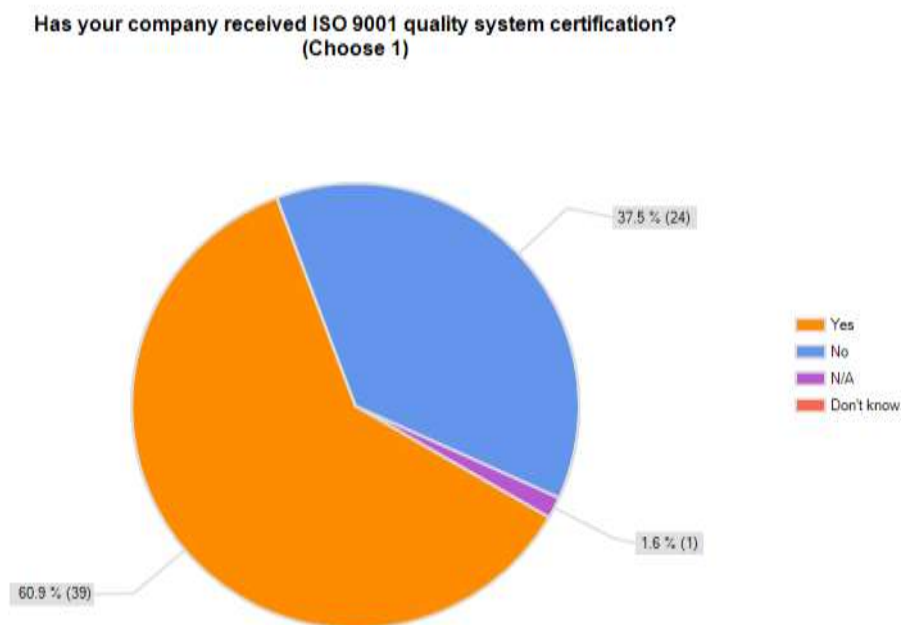


Figure 10. Percentages of ISO 9001 System Certification

Figure 10 shows that two thirds of the printers have their plants ISO 9001 quality system certified. On the other hand, Figure 11 shows that only 25% of them are printing process certified. These printers mostly subscribe to PSO or IFRA (INCQC) with very few being G7 Master Printer qualified.

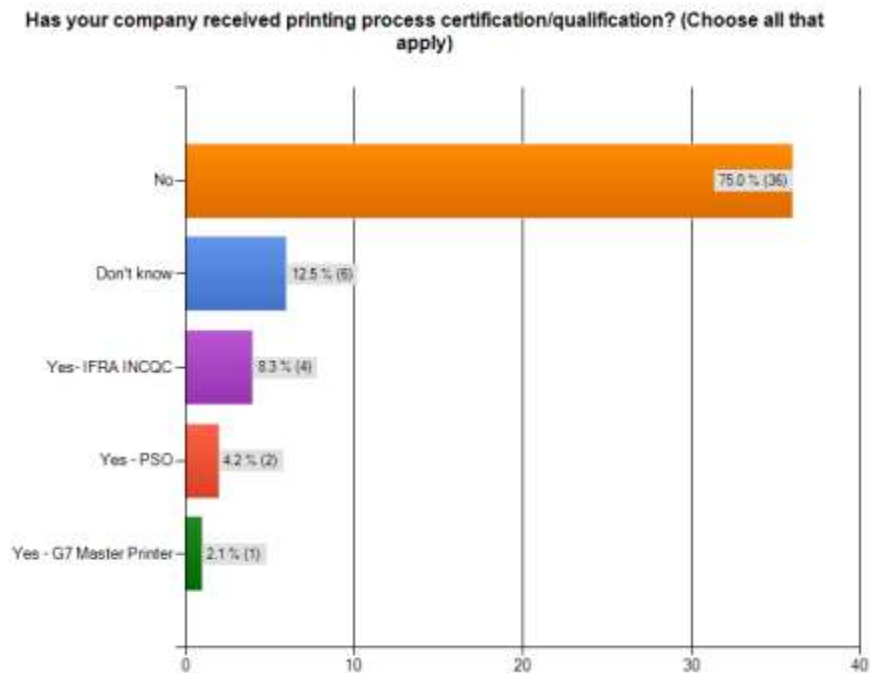


Figure 11. Printing Process Certification

Nearly 80% of the printers said that they print to international standards (see Figure 12).

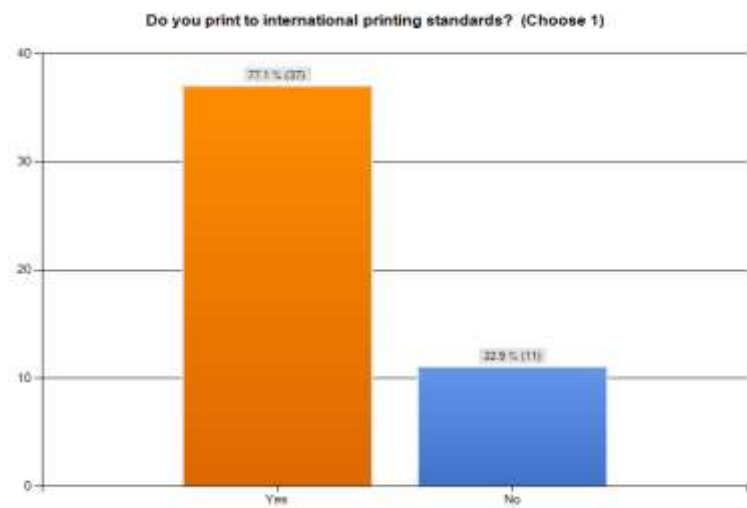


Figure: 12. Percentage Usage of International Standards

**Research Question 4: Which factors motivate printers to seek printing certification in India, and what is the relative strength of each factor?**

The survey showed that the primary motivation revolves around customer demands and internal efficiencies. Approximately 45% of the survey participants said that they have customers who ask for certification. International customers are the primary source of this demand with one third of the printers reporting that they have international customer who ask them if they are certified and a further 10% of the printers saying that they have both international and domestic customers who ask them for certification (See Figure 13). An additional survey question revealed that 85% of the participants get less than 20% of their jobs from the customers who ask for certification.

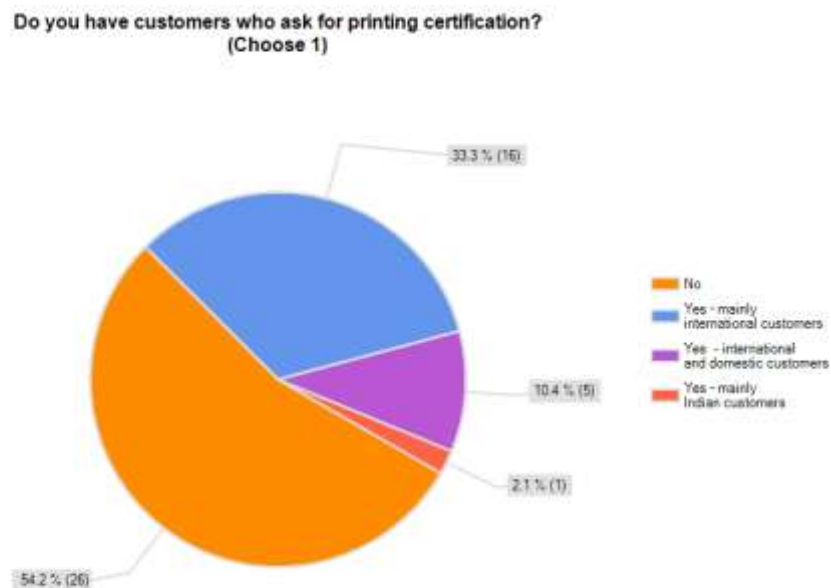


Figure 13. Percentages of Customers Asking for a Printing Certification

According to participants, more efficiency and less waste are the primary internal motivating factors for adopting standards. Reputation in the market and improved communication are much less important (see Table 10). Table 10 also indicates that there is a certain level of confusion concerning the benefits of working to standards and the benefit of certification. Although the question was primarily directed toward the importance of printing certification (i.e. a third party attestation of conformity that builds trust between customers and suppliers), the response highlighted the benefits of working to standards rather than the benefits of being certified.

Table 10. Degree of Importance of Internal Motivating Factors

Q.22. Please rank the importance of the following internal motivating factors as reasons for becoming certified. Options : 4 - Most important, 3, 2, 1 - Least important (Forced ranking)					
Answer Options	4	3	2	1	Rating Average
Less waste	15	14	12	7	2.8
More efficiency	18	22	8	0	3.2
Improves communication	4	6	20	18	1.9
Opens door to market (enhances position in the market)	11	6	8	23	2.1

Almost 95% of the printers who participated think conformity to standards is important. According to them, certification is important mostly to improve the process workflow (see Table 11).

Table 11. Reasons for Printing Certification

<b>Q.25. In what respect do you think printing certification is important?</b> <b>Options : 5 - Most important, 4, 3, 2, 1-Least important (Forced ranking)</b>						
<b>Answer Options</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>Rating Average</b>
To attract customers	13	9	0	6	17	2.9
To improve process workflow	25	12	4	3	1	4.3
To reduce waste	5	12	22	3	3	3.3
To save time	1	11	14	17	2	2.8
To save money	1	1	5	16	22	1.7

**Research Question 5: What are the obstacles to seeking printing certification in India, and what is the relative strength of each obstacle?**

According to printers, availability of press time is the foremost obstacle to becoming certified followed by availability of people time. Many of them think that cost for certification is very large in comparison with its benefits. Only few of printers do not know what is required to become certified (See Table 12).

Table 12. Degree of Importance of Obstacles to Becoming Certified

Q.23. Please rank the importance of the following factors as obstacles to becoming certified. Options: 5 - Most important, 4, 3, 2, 1 - Least important (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
Availability of press time	17	9	8	4	7	3.6
Availability of people time	7	12	10	15	1	3.2
Not knowing what to do	9	4	6	5	21	2.4
Out of Pocket Cost (preparation, certification, and consulting cost)	3	11	12	16	3	2.9
Insufficient benefits compared to cost	9	9	9	5	13	2.9

**Further Analysis**

The results of the survey suggested that some responses might be related, so five relationships were selected for further analysis. The relationships explored are listed below:

1. Printers who are print process certified are also ISO 9001 certified.
2. Certified Proofing Systems are primarily owned by ISO 9001 certified printers.

3. Printers who are print process certified own Certified Proofing Systems.
4. Printers who are print process certified own Autoscanning Spectrophotometers.
5. Print process certified printers own Closed Loop Color Control Systems.

In order to assess the strength of these relationships, the proportion of printer having the relationship in the target population was compared with the proportion of printers having this relationship in the general population. The significance of observed differences was assessed using the z-statistic for differences between proportions. Table 13 summarizes the results of this analysis.

Table 13. Relationships Among Responses

<b>Tests for Related Responses</b>			
<b>Relationship</b>	<b>Percentage In Group</b>	<b>Percentage In Population</b>	<b>Is Difference Significant?</b>
Print Process Certified Printers are ISO 9001 Certified	100% (7/7)	68% (32/48)	Yes (95%)
Certified Proofing Systems are Owned by ISO Certified Printers	59% (19/32)	54% (26/48)	No
Certified Proofing Systems are Owned by Print Process Certified Printers	100% (7/7)	54% (26/48)	Yes (99%)
Auto scanning Spectrophotometers are owned by Print Process Certified Printers	42% (3/7)	25% (12/48)	No
Closed Loop Color Control Systems are Owned by Print Process Certified Printers	71% (5/7)	27% (13/48)	Yes (99%)

As Table 13 shows, 100% of the print process certified printers were also certified to ISO 9001, compared to 68% of the responding population. This difference is significant at the 95% confidence level, and indicates that printers who are ISO 9001 certified but not print process certified represent a significant pool of potential adopters for print process certification. On the other hand, there was no significant relations between being ISO 9001 certified and owning a certified proofing system. This is reasonable because proofing systems are certified by their manufacturers and printers can wind up owning one without a conscious effort to do so.

The remaining three questions concerned relationships between print process certified printers and the kinds of hardware they might own. First, 100% of the print process certified printers who completed the survey own certified proofing systems. This indicates that these printers consciously chose certified systems, and this relationship is significant at the 99% confidence level. While print process certified printer were somewhat more likely to own a scanning spectrophotometer (42% vs 25%), this difference is not statistically significant. On the other hand, these printers are very much more likely to own an expensive closed loop color control system (71% vs 27%), and this relationship is significant at the 99% confidence level. This suggests that print process certified printers capture greater value from using these devices in their standardized workflows, and are therefore more willing to invest in them.



## **Chapter 6**

### **Summary and Conclusions**

The research conducted by RIT and its partners in India was executed in a very professional and efficient manner. The use of an Internet-based survey tool, coupled with email reminders and telephone calls was instrumental in generating responses from as many participants as possible.

We gained an understanding of the role of international printing standards and certification in the Indian printing industry. In many ways, the survey findings are similar to those in the RIT PSA Survey in that top tier printing companies in a given region are aware of the strategic importance of international printing standards and certification. We believe that the number of companies adopting printing standards and seeking printing certification in India will grow for two reasons. First, many printing companies are currently registered under ISO 9001 but have not been awarded printing process certification. Since the relationship analysis demonstrated that ISO 9001 registration is strongly related to printing process certification, these companies represent a sizable pool of potential adopters. Second, international customers are asking for printing process certification and will provide a strong incentive for printers to become certified as outsourcing brings more international business to India.

Contrasting with the knowledgeable top tier of Indian printing is the relative immaturity of the remainder of the Indian Printing Industry. Many small and

medium sized printers are just starting to realize the importance of adopting standards. The high profile of this survey will hopefully result in more Indian Printers being aware of and thinking in the direction of standards. Printers who have adopted standards reported both internal and external benefits. We hope that their responses will encourage other printer to improve their workflow and to attract the international customers by adopting printing standards. If this occurs, then this survey will have been a catalyst for the Indian Printing Industry as it pursues the path toward standardization and the certification.

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## Appendix A

### Relationship of Research Questions to Survey Questions

Table 14. Relationship of Survey Questions to Research Questions

<b>Research Questions vs Survey Questions</b>	
<b>Research Question</b>	<b>Survey Questions</b>
To what extent are graphic arts standards used in production workflows by Indian printers?	Q.04 Q.05 Q.06 Q.08 Q.09 Q.11 Q.12
To what extent do Indian Printers encounter issues and problems, which could be mitigated through the use of graphic arts standards?	Q.13 Q.14 Q.15 Q.16
What percent of respondents are currently certified (PSO, G7, or ISO 9001), and what percent are planning to be certified in the next year?	Q.02 Q.03 Q.07 Q.21
Which factors motivate the adoption of standards in India, and what is the relative strength of each factor?	Q.17 Q.18 Q.19
What are the obstacles to adopting standards in India, and what is the relative strength of each obstacle.	Q.20

## Appendix B

### Tabular Data

Table 15 summarizes the tabulated results of the survey. This table consists of twenty five sections, each corresponding to a single question. The sections have been separated for ease of reading and to avoid page breaks.

Table 15. Tabular Data

<b>Q.1.Please enter the region of your company headquarters.</b> (Choose 1)		
Answer Options	Response Percent	Response Count
South India	27.1%	13
North India	22.9%	11
Eastern Part	4.2%	2
Western Part	45.8%	22
Other (please specify)	0.0%	0

<b>Q.2.Please enter the industry segment that best typifies your business.</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Commercial printing	58.3%	28
Packaging printing and converting	18.8%	9
Newspapers cold-set	6.3%	3
Magazine and book printing sheet fed	6.3%	3
Magazine and book printing heat set	2.1%	1
Transactional printing	0.0%	0
Label printing	8.3%	4
Prepress trade house supplying plates and/or contract proofs	0.0%	0

<b>Q.3.Please enter the technology you use most in your business?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Sheetfed offset printing	72.9%	35
Heatset offset printing	2.1%	1
Coldset offset printing	10.4%	5
Flexographic or letterpress printing	12.5%	6
Gravure printing	0.0%	0
Digital printing	2.1%	1
Other (please specify)	0.0%	0

<b>Q.4.Has your company received ISO 9001 quality system certification?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Yes	66.7%	32
No	31.3%	15
Don't know	0.0%	0
N/A	2.1%	1

<b>Q.5.Has your company received printing process certification/qualification?</b> (Choose all that apply)		
Answer Options	Response Percent	Response Count
Yes- IFRA INCQC	8.3%	4
Yes - G7 Master Printer	2.1%	1
Yes - PSO	4.2%	2
No	75.0%	36
Don't know	12.5%	6

<b>Q.6.What CMYK colour space do you use in Adobe Photoshop colour settings?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Predominantly ISO Coated V2	64.6%	31
Predominantly GRACoL	6.3%	3
Predominantly SWOP	18.8%	9
Other (please specify)	10.4%	5



<b>Q.7. How is colour specified in the files you receive for the print?</b> Options : 4 - Most important, 3, 2, 1 - Least important. (Forced Ranking)					
Answer Options	4	3	2	1	Rating Average
Not specified	3	8	6	31	1.6
Specified by a standard RGB colour space	2	14	22	10	2.2
Specified by a standard CMYK colour space	36	7	5	0	3.6
Specified by a custom ICC colour profile	7	19	15	7	2.5

<b>Q.8. Please rank how often your company receives a given file format.</b> Options : 5 - Most important, 4, 3, 2, 1 - Least important. (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
PDF/X-1	14	12	11	4	7	3.5
PDF/X-3	10	18	12	7	1	3.6
InDesign	4	13	14	12	5	3.0
QuarkXPress	0	5	7	15	21	1.9
Other	20	0	4	10	14	3.0

<b>Q.9.Do you use a certified proofing system?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Yes – IDEAlliance	4.2%	2
Yes – Fogra	31.3%	15
No	39.6%	19
Don't know	6.3%	3
Other (please specify)	18.8%	9

<b>Q.10.Please respond to the following statements by selecting</b> Agree, Disagree, Don't know, or Not Applicable (N/A) (Choose 1)				
Answer Options	Agree	Disagree	Don't know	N/A
Customers often do not supply colour proof	37	11	0	0
Customers often supply non-colour managed inkjet proofs	41	6	1	0
We use standard profiles, e.g., ISOcoated v2 (ECI), Coated GRACoL 2006, in our digital proofing workflow	30	7	2	9
We build our own proofer colour profiles	21	19	3	5
There is a good match between customer submitted proof and our contract proof	23	21	1	3
There is a good match between our contract proof and OK sheet	42	4	1	1
We use display-based soft proofing	19	24	1	4

<b>Q.11. Please respond to the following statements by selecting Agree, Disagree, Don't know, or Not Applicable (N/A) (Choose 1)</b>				
Answer Options	Agree	Disagree	Don't know	N/A
We generate only linear plates	25	18	2	3
We include both linear wedge target and curved wedge target to verify CTP/Press calibration	29	11	3	5
We use a plate reader to verify plate exposure and processing	29	10	0	9

<b>Q.12. Which of the following CTP/Press calibration methods does your company use to conform to a printing standard? (Choose 1)</b>		
Answer Options	Response Percent	Response Count
TVI (Dot Gain)	52.1%	25
Grey Balance (G7)	10.4%	5
Device Link	6.3%	3
Don't know	25.0%	12
Other (please specify)	6.3%	3

<b>Q.13.Which colour measurement device/system is used in your pressroom for process control?</b> (Choose those that apply)		
Answer Options	Response Percent	Response Count
Closed -loop colour control system	27.1%	13
Auto scanning spectrophotometer	25.0%	12
Hand-held colourimeter or spectrophotometer	45.8%	22
Hand-held densitometer	45.8%	22
We do not have colour measurement, control and reporting system	14.6%	7

<b>Q.14.What is the most important factor that determines your colour OK sheet?</b> Options : 4 - Most important, 3, 2, 1 - Least important. (Forced Ranking)				
Answer Options	4	3	2	1
Visual match to proof	27	9	9	3
Conformance to target densities	12	20	13	3
Conformance to target CIELAB values	7	6	9	26
Visual match of grey balance in control strip	2	13	17	16

<b>Q.15. Please rank the importance of the following issues in your daily production.</b> Options : 5 - Most important, 4, 3, 2, 1 - Least important. (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
Having standard operating procedure (SOP) in colour critical areas of the workflow	15	8	5	8	12	3.1
Having customers' PDF files and proofs certified to a known standard	12	10	6	10	10	3.1
Having efficient press make-ready in achieving OK print	10	13	16	6	3	3.4
Having an OK sheet as a production reference	7	9	12	11	9	2.9
Having a right measurement and reporting system in order to verify printing consistency	4	8	9	13	14	2.5

<b>Q.16. Please Rank the importance of the following issues regarding your colour-measuring instruments.</b> Options : 3 - Most important, 2, 1 - Least important (Forced Ranking)				
Answer Options	3	2	1	Rating Average
Having good inter-instrument agreement	19	8	21	2.0
Having certified reference material to verify measurement accuracy	15	29	4	2.2
Having our colour measuring instrument sent back to the vendor for re-certification	14	11	23	1.8

<b>Q.17.Do you print to international printing standards?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Yes	77.1%	37
No	22.9%	11

<b>Q.18. If you print to standards, please rank how problematic the following technical issues are to you.</b> Options : 4 – Most problematic, 3, 2, 1 – Least problematic (Forced ranking)						
Answer Options	4	3	2	1	Rating Average	Response Count
Paper containing OBA does not conform to the paper white point specified in ISO 12647-2	17	8	4	6	3.03	33
Inks do not conform to ISO 2846	6	13	10	7	2.50	34
Press sheet and proof do not match each other visually	5	9	14	8	2.31	34
ISO 12647-2 only addresses a small part of my customer's needs	7	6	8	15	2.14	34

<b>Q.19. Please rank how frequently you encounter problems at each of the following steps in the colour control process.</b> Options : 4 - Most important, 3, 2, 1-Least important (Forced ranking)					
Answer Options	4	3	2	1	Rating Average
Agreeing on how colour ought to be specified with customers	17	12	3	16	2.6
Agreeing on the colour matching tolerance with customers	12	18	15	3	2.8
Controlling colour on press	6	14	18	10	2.3
Achieving contract proof to the press match	13	4	12	19	2.2

<b>Q.20.Do you have customers who ask for printing certification?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Yes – mainly international customers	33.3%	16
Yes – mainly Indian customers	2.1%	1
Yes - international and domestic customers	10.4%	5
No	54.2%	26

<b>Q21.What percentage of jobs do you get from customers who ask for certification?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
0-20%	85.4%	41
20-40%	8.3%	4
40-60%	4.2%	2
60-80%	2.1%	1
80-100%	0.0%	0

<b>Q.22. Please rank the importance of the following internal motivating factors as reasons for becoming certified.</b> Options : 4 - Most important, 3, 2, 1 - Least important (Forced ranking)					
Answer Options	4	3	2	1	Rating Average
Less waste	15	14	12	7	2.8
More efficiency	18	22	8	0	3.2
Improves communication	4	6	20	18	1.9
Opens door to market (enhances position in the market)	11	6	8	23	2.1



<b>Q.23. Please rank the importance of the following factors as obstacles to becoming certified.</b> Options: 5 - Most important, 4, 3, 2, 1 - Least important (Forced Ranking)						
Answer Options	5	4	3	2	1	Rating Average
Availability of press time	17	9	8	4	7	3.6
Availability of people time	7	12	10	15	1	3.2
Not knowing what to do	9	4	6	5	21	2.4
Out of Pocket Cost (preparation, certification, and consulting cost)	3	11	12	16	3	2.9
Insufficient benefits compared to cost	9	9	9	5	13	2.9

<b>Q.24.Do you think that conformity to print standards is important?</b> (Choose 1)		
Answer Options	Response Percent	Response Count
Yes	95.8%	46
No	4.2%	2

**Q.25. In what respect do you think printing certification is important?**

Options : 5 - Most important, 4, 3, 2, 1-Least important (Forced ranking)

Answer Options	5	4	3	2	1	Rating Average
To attract customers	13	9	0	6	17	2.9
To improve process workflow	25	12	4	3	1	4.3
To reduce waste	5	12	22	3	3	3.3
To save time	1	11	14	17	2	2.8
To save money	1	1	5	16	22	1.7

## **Appendix C.**

### **Channel Development**

#### **Identify in-country partners**

Potential in-country partners included representatives from industry associations, industry experts and members of the trade press. A list of potential partners who were identified prior to the survey is shown below:

- i. **NareshKhanna.** Editor, Indian Printer & Publisher
- ii. **Alok Singh.** Delhi Editor, Printweek India
- iii. **Kip Smythe.** Vice President, Global Programs NPES
- iv. **RottiVenkataramana.** President, HT Burda Media. Rotti has also been India's observer at ISO TC130 meetings for the past several years.
- v. **Dr. RajendrakumarAnayath,** Director Heidelberg Training Center India
- vi. **Tarun Chopra.** Ugra ISO Colour Consultant, Colour Mechanics. (TAG member)
- vii. **SatishNaik.**Ugra ISO Colour Consultant, Colour Mechanics (TAG member)

#### **Contact and enroll in country partners**

Out of above list, personalized emails describing the purpose of the Indian printing industry survey and containing a copy of the original PSA survey were sent to Mr. NareshKhanna, Mr. RottiVenkataramana, Dr. RajendrakumarAnayath

and Kip Smythe. The emails were sent to a subset of potential partners due to Indian printing industry considerations (i.e. some potential partners were direct competitors). The introductory email described the survey effort and each potential partner was asked to get back to the researcher and her advisors if they were interested.

In this way in-country partners were enrolled in the survey. The authors of the email were the researcher and her two advisors. This proved helpful in attracting partners by taking advantage of the relationships that her advisors bring to the project.

Mr. Khanna, Mr. Rotti, and Dr. RajendrakumarAnayath got back to us with great enthusiasm for becoming partners in this research effort. The second email to the in-country partners included the survey questionnaire document and also a link to the survey and the password to open the survey. This helped the in-country partners to understand the content of the survey and the capabilities of the proposed survey vehicle.

The partners came up with the suggestions and Skype meetings were arranged to discuss their suggestions and refine the survey. As the team members were in different time zones these meeting were scheduled early in the morning (US time) which is late in the evening Indian time.

Three team Skype meetings were conducted before the survey launch. Additional communication was conducted via email. PowerPoint and a Word documents were shared with all partners and advisors by the researcher before

each Skype meeting. The first Skype call was conducted on December 6, 2011. The agenda for the meeting consisted of issues regarding the survey questionnaire and the survey channel. This was the introductory Skype call between the researcher and her two advisors with the in-country partners. Key outcomes included:

- Initial survey questions were revised to make them easy and interesting so that participants would be more likely to finish the survey. Difficult questions with respect to proofing were revised to make them easier for Indian printers to understand.
- A process for implementing the “One Representative per Site Rule” was proposed.

A second Skype call was held on December 19, 2011. The agenda for this meeting was to discuss the survey questions one by one and take suggestions on each question from the in-country partners. Finally, a third Skype meeting was conducted on Jan 4, 2012. Key outcomes from this meeting were:

- A target mailing list of nearly 300 printers was endorsed and the email to survey participants was finalized.
- A process for tracking and following-up with survey participant by the researcher and our in-country partners was developed.
- The primary and secondary survey channels (Internet survey via Survey Monkey and telephonic survey for non-respondents) were validated by our in-country partners.

- A boxed set of Test Target publications was chosen as the prize to encourage participation.

In addition, our in-country partners co-authored an introductory email to participants with the researcher and her advisors. This email invited participants to take the survey, explained what the survey is about, emphasized the importance of the survey to the Indian printing industry, and provided a survey link and the password. This email was sent to 170 printers successfully in the first week. This email was followed by the gentle reminder email, which served the purpose of reminding printers about the survey and proved to be effective. Every week follow up emails were sent offering printers help if they had any questions about taking the survey or they needed explanations. This was followed by the telephonic reminders to the printers, which was done by researcher's peer in India. In all, over 1000 emails and nearly 150 telephone calls were made to encourage survey participants. After a strong initial response from 20 of the most advanced Indian Printers, our in-country partners received feedback indicating that many Indian Printers lacked the background required to understand the standards referred to in many of the questions, and found the survey difficult to complete. In response, the researcher extended the deadline for the survey, conducted additional surveys by telephone, and enrolled her friends in the Indian Printing industry to generate additional responses. In the end, 48 completed surveys were received.