The Financial Services Technology Consortium

~ FINAL REPORT ~

IMAGE QUALITY AND USABILITY ASSURANCE: PHASE I

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Executive Summary

In March of 2004, the Financial Services Technology Consortium and 28 member organizations, (including 14 financial institutions, clearing houses, and exchanges) launched a project to develop an interoperable set of terminology and metrics for image quality and usability for check image exchange and industry use. With the recent passage of Check 21 legislation, FSTC members believed, and work to date confirmed, that reaching agreement on common mechanisms for describing and expressing image quality and usability was both urgent and important. These common definitions and measurements will help minimize questionable disputes and check image returns, enable service levels between organizations, and ensure the quality of images delivered to customers.

To facilitate the development of image quality terminology and metrics, FSTC embarked upon an accelerated project with four primary goals:

- Develop a common terminology for describing image quality and usability
- Develop a set of metrics to communicate image quality defect and usability information between institutions
- Develop a model to understand the industry cost of poor image quality in an exchange environment
- Determine next steps to define specific metric values and thresholds for defects and to facilitate industry adoption.

The project team accomplished these objectives in a 101 day effort ending July 1, 2004, although the linkage between metrics and usability will be established in Phase II. The key results for each of these objectives are summarized below and described in more detail in the final project report.

The project concluded that industry adoption of standard image quality and usability metrics will greatly improve the industry's chances to realize the substantial benefits of a Check 21 environment.

Image Quality

The project team defined Image Quality as "*The totality of characteristics of an image that bear on its ability to satisfy stated or implied needs.*" Image quality is an umbrella term referring to a number of characteristics in the image, including any defects in the source document or introduced in the image capture process, the usability of the image and information contained within it for the required business purposes, and the faithfulness of the image rendition to the original source document.

The project team also defined a list of 16 defect-oriented metrics (see Table 1) to describe measurable defect conditions that could affect image usability. The team defined a standard measurement scale for each metric.

The image defect metrics definitions are designed to enable rapid, low-cost measurement of image characteristics to determine the probability that an image will be usable. All of the metrics are based on the entire document, not specific information fields within a check. FSTC is not proposing that any individual measurement be required at this point because experiential data is needed to validate the effectiveness of each metric in predicting a usability issue. In the proposed subsequent project, FSTC will work to define the specific thresholds at which each metric indicates the presence of a defect which makes an image unusable.

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Table 1. Summary of Image Defect Metrics and Units of Measure

Metric/ Defect	Measure
1. Undersize Image	Image size in inches
2. Folded or Torn Document Corners	Missing area in tenths of inches
3. Folded or Torn Document Edges	Missing area in tenths of inches
4. Document Framing Error	Extra scan area in tenths of inches
5. Excessive Document Skew	Skew angle in tenths of degrees
6. Oversize Image	Image size in inches
7. Piggyback Documents	Flag
8. Image Too Light	Pixel percentage
9. Image Too Dark	Pixel percentage
10. Horizontal Streaks in Image	Pixel percentage in scan line
11. Below Minimum Compressed Image Size	Compressed image size in bytes
12. Above Maximum Compressed Image Size	Compressed image size in bytes
13. Excessive "Spot Noise" in Image	Count of noise spots
14. Front-Rear Image Dimension/Feature Mismatch	Image size difference
15. Carbon Strip Detected	Flag
16. Image Out of Focus	Pixel Gradient (GS/Color only)

The team will provide the metrics definitions to the ASC X9B committee for incorporation into the formal ANSI standards process. The metrics, and other appropriate information, will also be provided to clearing houses, exchanges, and financial institutions for inclusion as appropriate in image interchange agreements and business practices.

Image Usability

The project team defined Image Usability as "*The legibility and completeness of the information in a digital representation of a source document necessary to perform a specific function.*" It is more difficult to define usability than it is to define image quality defects using simple metrics, because measuring the legibility of a field is complex and can be influenced by factors, such as handwriting, which are unrelated to the quality of the image. Unlike image quality defects, the definition for Image Usability is restricted to the information on the check.

Further, the project team defined usability in terms of the uses of information, identifying four critical uses for check processing. These were (A) collections, exchange, and posting, (B) exceptions and returns, (C) fraud detection and loss prevention, and (D) customer uses. The number of information elements required increases from use (A) through use (D), with more diverse and less standardized information elements essential for (D) customer uses, than for (A) collections, clearing, and posting. The full report documents the information elements required for each of these uses.

Complete measurement of image usability may require locating and independently testing multiple information fields on the check. The project team has concern that the processing time required for testing multiple fields may be greater than is practically available in a high speed environment.

Image Usability also extends beyond the requirement for legibility of information to a human reader. Any of the four business uses defined above may have both automated and manual processes. Image Usability therefore encompasses varying automated uses, including RECO processes such as Courtesy Amount Recognition or Legal Amount Recognition (CAR/LAR). To some extent, the

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results of these processes provide usability measurements, but not in a form that can be consistently measured by solutions from different vendors.

In the brief period of Phase I of the Image Quality and Usability Assurance project, the team did not define any specific interoperable usability measures that applied to the check as a whole. The team explored the possibility of subdividing the area of a check using multiple zones, to enable more precise measurement of areas of interest. There was not sufficient time to fully pursue this option, or to evaluate the merits of field-level usability metrics. As a result, further investigation into usability metrics will be conducted as part of a subsequent phase to the project.

Impact of Poor Quality Model

The project team set out to understand the business impact of poor image quality in an exchange environment. The team narrowly modeled business process costs for evaluating, handling, and returning transit items of questionable quality. The team arrived at a set of assumptions regarding image volumes and rates of quality problems detected at various points in the transaction lifecycle and collected available cost data from Global Concepts and participating banks.

After in-depth analysis, the team concluded that it would mislead the industry if too many assumptions regarding unknown costs, indirect impacts, and image exchange rates were inserted into the model. This is particularly true due to the currently un-quantified impact of poor quality images on a broad range of banking operations and customer processes, in addition to increased risk of loss and decreased customer satisfaction. As a result, the narrow model the team defined was determined to be too narrow to provide specific, useful information on the true economic impact of poor quality on the industry.

The project team was able to draw some significant conclusions from the modeling effort, however. The most important of these conclusions are:

- If truncating banks do not provide good quality images, costs related to poor quality are expected to dramatically increase for both truncating and paying banks.
- Direct image quality related costs for the industry increase by at least two times if a paying bank receives poor quality images or cannot trust its exchange partners' image quality.
- Adopting common image quality and defect metrics and definitions is the key first step in establishing verifiable and trustable image exchange quality standards.

Phase II Project Proposal

The project team determined that the following activities should be core to continuing the Check Image Quality and Usability Assurance effort into a six-month Phase II project.

- Testing a large quantity of images to determine defect thresholds, occurrence rates, and correlation with usability problems
- Prioritization and recommendations regarding which specific metrics to measure
- Working to obtain adoption of project results in standards bodies and rules organizations
- Continuing efforts to refine specific usability metrics

One additional activity, defining a calibration test deck, was also discussed. FSTC determined that the ASC X9B group already plans to create such a test deck; therefore, FSTC decided this activity should not be included in the Phase II project.

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Project Background

In March of 2004, the FSTC launched the *Image Quality and Usability Assurance* (IQ&U) initiative, with the long term goal of defining an operational framework for the industry to ensure that any check image, regardless of its capture point, meets the industry's minimal requirements:

> *"Every check image capture point, whether centralized high-speed capture, or distributed low- and medium-speed capture, must have a robust, standardized acceptance/rejection engine capable of determining whether a check image is reasonably acceptable for downstream recognition and processing, and ultimate payment."*

The FSTC first recognized the potential need for check image quality standards during the *Paperless Automated Check Exchange and Settlement* (PACES) project, which was launched in late 1997 as a collaborative effort led by the FSTC with the Image Archive Forum, the Electronic Check Clearinghouse Organization (ECCHO), CHAS (now the NCHA Regional Exchange), the New York City Clearinghouse (NYCH), banks, vendors, and the Federal Reserve System.

> *"Since the purpose of the PACES environment is to truncate the paper check at the bank of first deposit and send the image of the item as presentment, the images sent by the collecting bank become the critical element for BackOffice processing and image statements. The quality of the images exchanged has therefore become a primary concern among the banks."*

The IQ&U Assurance initiative was created by FSTC members in response to the imminent mandates of the *Check Clearing for the 21st Century Act* (Check 21), which is scheduled for implementation in late 2004. With the advent of Check 21, the U.S. banking industry is quickly approaching adoption of check image exchange and check image capture at centralized as well as merchant, teller, and ATM locations. Financial institutions ultimately have substantial risks for losses due to defective or 'un-transactable' check images.

To prepare for the implementation of Check 21, financial institutions must ensure that image quality assessment and assurance capabilities are effective, or face significant financial, operational, and reputation risks. Expectations are that physical checks will be destroyed or returned to customers at the conclusion of a payment transaction, rather than processed through the payment system, image quality becomes paramount. If image quality capabilities are inadequate adoption of image exchange will be slowed, and financial institutions may face unacceptable risk.

As the FSTC embarked upon this project, there were no widely accepted industry-level definitions of what makes an image acceptable for processing and payment, nor was there a common language to describe image defects. The scope of the first phase of the initiative, which was scheduled to be completed by July 2004, was to quantify the likely cost of poor quality and the benefits from having defined metrics, develop the core requirements for image quality and usability, define a set of core metrics and their scales, and develop a detailed plan for Phase II.

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Project Goals and Objectives

The FSTC's initial Prospectus for the Image Quality and Usability Assurance Initiative defined the long-term goal of the project in these terms:

> *The FSTC Image Quality and Usability Assurance initiative has the long-term goal of defining an operational framework for the industry that ensures that any check image, regardless of its capture point, meets the industry's minimum requirements. A 90-day first phase is proposed that will quantify the problem and expected benefits of investment, develop the core requirements for image quality and usability, inventory the image metrics that can be utilized, and develop a detailed plan for Phase II. With this foundation in place, Phase II would seek to develop, test, and publish the technology and business specifications that together can be implemented by financial institutions and technology vendors to minimize risk, maximize cost savings, and ensure strong adoption of image exchange.*

Working within this overall mandate, the project participants adopted the following statement of the goal of phase I:

> *The goal of phase I of the IQ&U project is to define a standard set of terms and concepts associated with an agreed list of objectively measurable image attributes (metrics). This "toolkit" can then be used by banks and image exchanges to unambiguously specify rules (policies) for image quality.*

The project participants also recognized the importance of quality thresholds in defining industry-standard measures of the practical usability of images; the following additional statement anticipates the scope of a phase II (or subsequent) effort focused on usability:

> *The IQ&U project may, in a later phase, also define a lower bound on image quality expressed in terms of threshold values of the metrics identified in phase I. In that case, banks and exchanges could specify policies that set image quality requirements at or above the defined lower bound, but could not specify policies that set image quality requirements below the defined lower bound.*

The scope of phase I was constrained to objectively measurable image quality defects—deviations from a perfectly complete and accurate image that can be assessed by standard measurements that do not involve subjective judgments (e.g., by a human examining the image) or semantic analysis. Defects in a check image may or may not affect the usability of the image for some or all purposes; a defect measurement therefore provides essential data for usability analysis, but does not *in and by itself* represent a definitive answer to questions such as whether or not specific data elements are legible, or whether the image can be successfully processed by an automated recognition engine.

The project participants adopted a diagram developed by Accredited Standards Committee X9 to represent the relationships among different conceptual "levels" of image quality and usability assessment. In this hierarchy, the image defects with which phase I of the IQ&U project are concerned are relevant to the "defect analysis" levels at the base of the pyramid (as illustrated by Figure 1):

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Image Quality Assessment Hierarchy

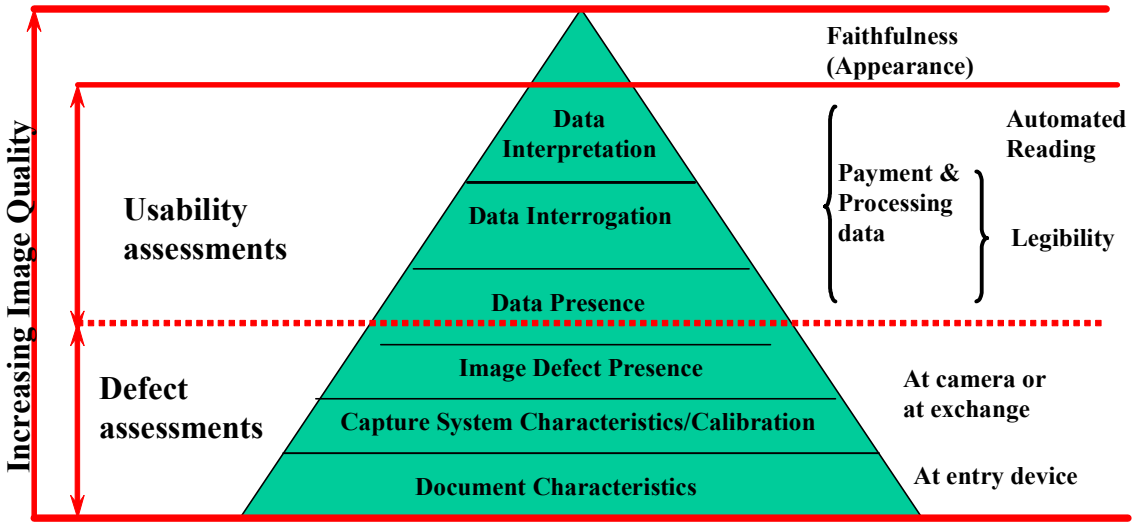

Figure 1: Conceptual Image Quality Assessment Hierarchy
Source: Dexter Holt and ASC X9B15

At the level of defect analysis, the principal concern is to determine, based on well-defined standard criteria that can be applied uniformly to all measurement circumstances, whether or not a particular defect is present.

The usability of an image, with which the "usability analysis" levels of the hierarchy in Figure 1 are concerned, involves "fitness for purpose"; it is best represented as a more or less continuous spectrum, such as the one for the legibility of a text field, illustrated in Figure 2:

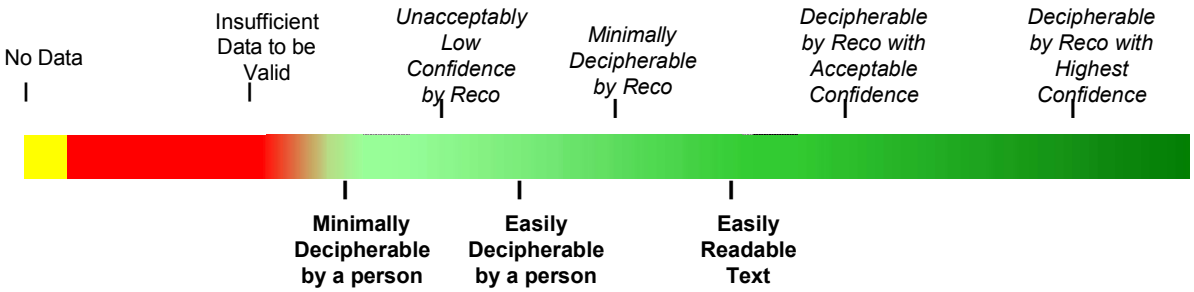

Figure 2: Image Usability Spectrum

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With these goals in mind, the project participants adopted the following four specific objectives and deliverables for phase I of the project:

1) Quantify the problem and the expected benefits of solving it
   Cost of Poor Quality Model

2) Develop the core requirements for image quality
   Image Quality Defect Definitions

3) Develop the core requirements for image usability
   Analysis of Fields on a Check; Business Uses

4) Develop a detailed plan for Phase II
   Phase II Plan

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Definitions

The FSTC IQ& U project team determined, consistent with the project objectives, that common definitions were important for key terms being used in the project and in the industry. Towards that end, the project team reviewed available definitions, and where no suitable definitions were identified, established and agreed upon new definitions. The conceptual diagram contained in the project background section of the report (the pyramid) helps illustrate the relationship between these terms.

All definitions in this section are focused on check images. The following items represent the definitions agreed to by the project team for critical terms.

Image

Definition: A digital representation of all or part of a physical item, including any associated parameters required to interpret the digital representation. The digital representation is created by sensing light reflected from the item.

- Source: ASC X9B TG-100

Commentary: An image is a digital representation of an underlying (front and/or back) source document. A Check Image is a digital representation of a source document where that document was a check. An image taken using special equipment may contain information which is not visible to the human eye.

Image Faithfulness

Definition: The accuracy and completeness of a digital representation of the information and graphic details contained within the source document.

Commentary: Image Faithfulness is a narrower term than Image Quality, as faithfulness relates to the degree of preserved detail of both informational and non-informational aspects, such as background patterns. It is not a requirement to have a perfectly faithful image to satisfy most business requirements.

Different image technologies have different intrinsic degrees of faithfulness. A proper black and white image of a standards compliant check will not contain background details, for example. Generally, the faithfulness or fidelity of an image will improve with an increase in the bit depth (number of colors or shades of gray) and resolution (measured in dots per inch). A very high resolution color image could achieve the highest degrees of faithfulness to the source document, up to being virtually indistinguishable from the original.

Image Defect Assessment

Definition: *An analysis of an image of a source document based upon an established defect list. Defects will be assumed to be present when metrics exceed industry threshold values.*

Commentary: *Image defect assessment is measured using a set of image defect metrics. These metrics may measure characteristics of the source document (e.g. torn corners), or characteristics of the image itself (e.g. too few or too many pixels). Image defect assessment must be able to be performed reasonably accurately without reference to the source document.*

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Image Defect Metrics

Definition: The set of measures used to quantify the likelihood that a digital check image has conditions that would render the information contained within the source document unusable in the image.

Commentary: Image Defect Metrics are the measurements defined to permit the determination and description of the condition of a check image. These metrics provide a mechanism for describing the condition of the document/image as a whole with the intent of determining the probability of an image being good enough to satisfy the four required business uses ((A) collections, exchange, paying, (B) exceptions and returns, (C) fraud detection and loss prevention, and (D) customer uses).

Many of the metrics identify conditions which are related to a potential defect in the image of the source document. For each defined Image Defect Metric, a material defect exists if the measurement indicates a high probability that a loss of information has occurred between the source document and the image. The specific values for these measurements that may render the check information unusable will be determined in a subsequent project.

Image Quality

Definition: The totality of characteristics of an image that bear on its ability to satisfy stated or implied needs.

Commentary: Image quality is defined as the totality of characteristics that bear on the ability of an image to meet the "needs", or to satisfy the business uses for which the image is necessary. Image quality may be described by a set of metrics to identify image defects, the presence and legibility of information, and capture characteristics. The work of the FSTC Phase I Image Quality and Usability Project has focused on specifying metrics to quantify the presence and extent of defects in an image, particularly where those defects may impact the ability of the image to satisfy the business needs (usability).

For the purposes of satisfying the requirements under the Check 21 Act, the information on the check is what is important. A high quality image will, by virtue of its quality, provide an accurate and sufficient representation of the information on the original source document.

This definition was derived from a definition of quality originally included in ISO 8402 "Quality management and quality assurance – Vocabulary" (now superseded by ISO 9000:2000). The FSTC project team has adapted this definition to be specific to images.

Image Usability

Definition: The legibility and completeness of the information in a digital representation of a source document necessary to perform a specific function.

Commentary: Image usability is concerned with the ability of a human being or automated process to use the information contained within a check. Typically this information will be text, but in some cases it may be other features of the check, such as a security feature. Usability requirements include both manual reviews as well as automated systems, such as automated character recognition. At a minimum, an image must be usable by a human.

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Image Usability Assessment

Definition: An analysis of an image of a source document to determine the likely usability of selected information contained within the image.

Commentary: Image usability assessment specific metrics have not yet been assigned. These metrics measure the legibility of specific fields of information on the check, and may be a result of a specific assessment process, or may be a byproduct of other processes, such as automated recognition.

Image Usability Metrics

Definition: The set of measures used to determine the likelihood and extent to which the information in an image is usable if it was present on the source document.

Commentary: Image Usability Metrics are the measurements to permit the determination and description of legibility of key information in a check image. Usability metrics may also define alternate aspects of legibility, such as might be required to support an automated character recognition process, or reading of a barcode from a document. Usability Metrics are to be defined to (a) identify the absence of sufficient data in an image when the data was likely present on the source document, and (b) to assess the likelihood that important information in an image is sufficiently legible to meet one or more of the four defined business uses ((A) collections, exchange, paying, (B) exceptions and returns, (C) fraud detection and loss prevention, and (D) customer uses).

Legibility

Definition: The ability of a human viewer to decipher the information in a digital representation of a source document.

Commentary: While the definition of legibility refers to the ability of a human viewer to decipher the information from a check image, other degrees of legibility may exist, such as necessary for automated character recognition. During Phase I of the Image Quality and Usability Assurance Project, FSTC did not identify specific measurements to quantify the legibility of a field of information.

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Image Defect Metrics

Defining a set of Image Quality metrics, and the measurements for each metric, was the primary goal of the FSTC Image Quality and Usability Assurance Phase I project team. The team determined that the metrics should be focused on measuring characteristics of an image which could lead to a defect which might impact the usability of the image for its required business purposes. Given the limited amount of time available, the project team focused on creating a list of Image Defect Metrics first, with a plan to establish Image Usability Metrics once the Defect Metrics were completed.

The Image Defect Metrics definitions are contained in a separate document produced by the project team. In total, the team identified 16 metrics to include at this stage. Each of these metrics was designed to measure a common defect condition, and to be a fast process so that these metrics can be applied in a low or high speed environment. All of the metrics defined address the document as a whole, and require no knowledge of the semantic information on the document, or the location of specific fields of information. These metrics are:

- Undersize Image
- Folded or Torn Document Corners
- Folded or Torn Document Edges
- Document Framing Error
- Excessive Document Skew
- Oversize Image
- Piggyback Documents
- Image Too Light
- Image Too Dark
- Horizontal Streaks in Image
- Below Minimum Compressed Image Size
- Above Maximum Compressed Image Size
- Excessive "Spot Noise" in Image
- Front-Rear Image Dimension/Feature Mismatch
- Carbon Strip Detected
- Image Out of Focus

For each Image Defect Metric, the project team documented:

- a definition of the metric,
- measurement units,
- criteria for determining if the defect is present,
- possible sources of the defect,
- illustrations of the defect,
- possible business impacts from the defect, and,
- whether it was possible to recover from the defect, given access to the source document.

Full details for all of the metrics may be found in the document titled "Image Defect Metrics" produced by the FSTC project.

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Impact of Poor Quality Model

With Check 21 scheduled for October implementation, it is useful for planning and policy purposes to understand the business costs of image quality, both with and without agreed upon image quality and usability standards in place. If image quality is poor or inconsistent, many of the potential savings from Check 21 may be lost. With this in mind, the project set out to model the costs of poor image quality in an exchange environment, given the presence and the absence of agreed upon quality metrics and standards.

The project team set out to understand the business impact of poor image quality in an exchange environment. Using information provided by participating banks and the payment systems consulting firm Global Concepts, the team narrowly modeled business process costs for evaluating, handling, and returning transit items of questionable quality, and arrived at a set of assumptions regarding rates of quality problems detected at various points in the transaction lifecycle.

Model Use Case

The use case upon which the model is based covers check image exchange between a bank of first deposit (called the truncating bank), and a paying bank. This use case accounts for the vast majority of check transactions. The model is parsed into five steps, or modules, each with its unique set of activities and related costs. The model use case is outlined in Figure 1.

In Step One of the model, the truncating bank images or "truncates" the check, and forward presents the check images to the paying bank. In Step Two, the paying bank receives the forward presented check images for payment, processes the images, and notifies the truncating bank when images are of unacceptable quality. Step Three covers the truncating bank's response to the paying bank's notifications of unacceptable check images. In the case of an item received within deadline, this response may include sending a rescanned image or a paper check. For items received outside of deadline after the paper check has been destroyed, this response may include sending a gray scale image (or an image created for another purpose), or resending the same image again because with the paper check destroyed no alternative exists.

In Step Four the paying bank receives the replacement images, paper checks, or original images back from the truncating bank for payment, and notifies the truncating bank when there is a customer loss associated with poor image quality. In Step Five, the truncating bank responds to notifications of paying bank customer loss.

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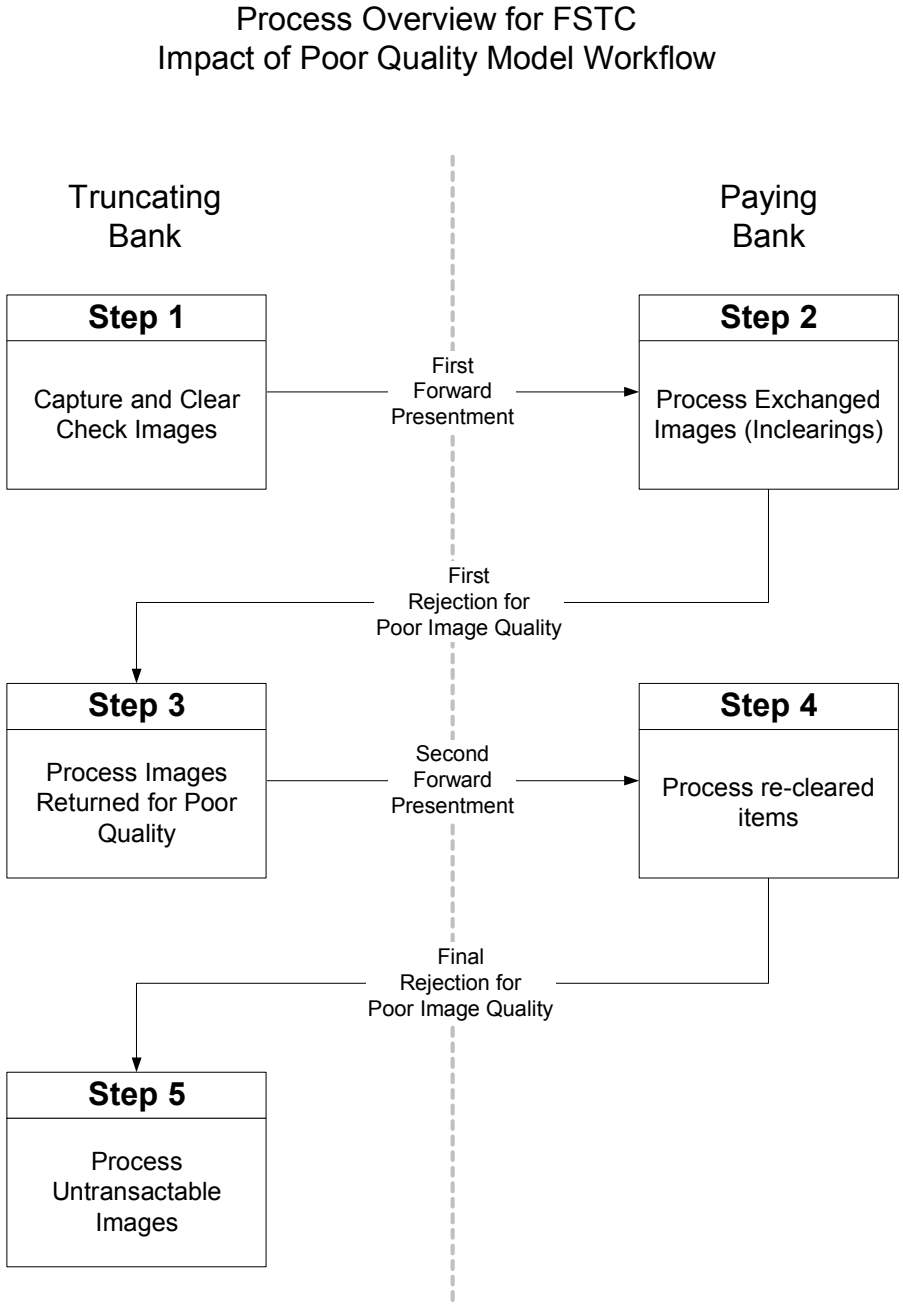
Figure 3. Model Use Case – Process Flow Overview



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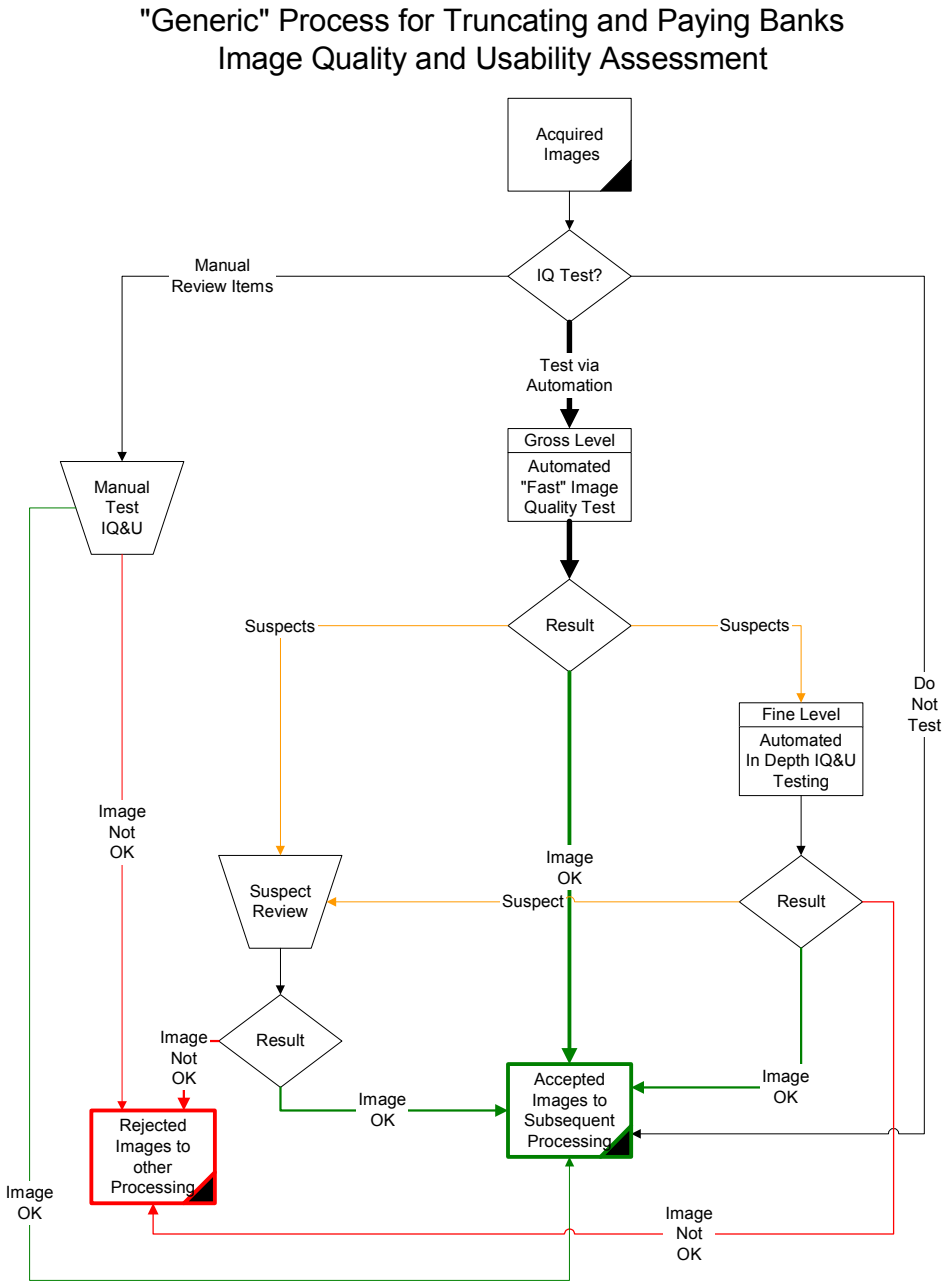
Use Case Process Flow - Testing

The image quality and usability testing which occurs in Steps One, Two and Four follows a common process flow shown in Figure 2. In this flow, check images are subjected to initial testing, which can be either a high level "fast" quality test, which FSTC members expect to be the case for most large banks, or in the case of smaller banks which do not have automated test equipment, the testing can be done manually. Any images identified as quality "suspects" based on this initial testing are then tested further either manually or via automated in-depth testing.

Figure 4. Image Quality and Usability Testing Process Flow



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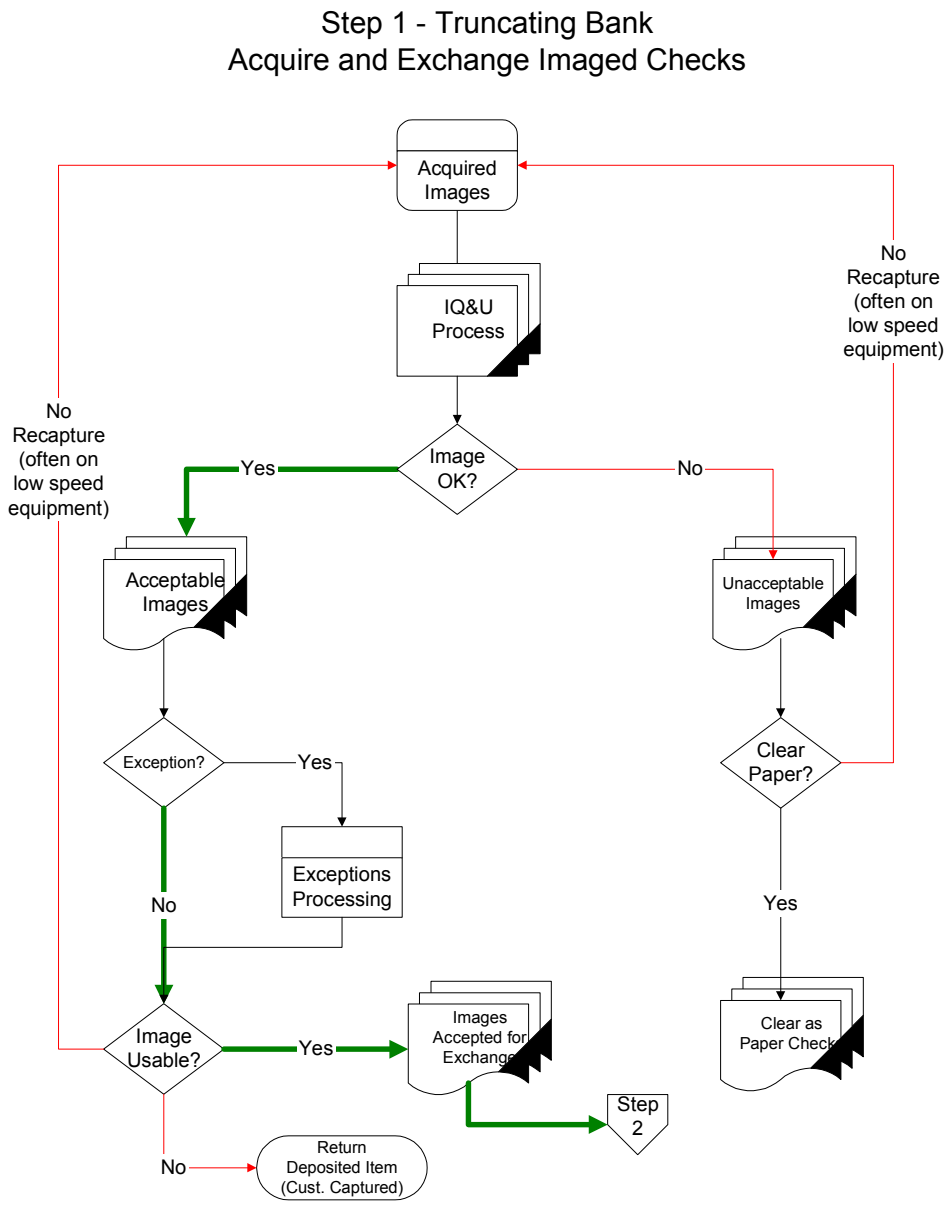
Use Case Process Flow – Step One

In step one the truncating bank subjects a percentage of images to the testing process shown in Figure 4. Since the truncating bank is liable for losses due to image quality, the participants in the project universally agreed that good risk management practices would require the truncating bank to test 100% of the images it exchanges.

If quality problems are discovered during this testing (or during normal banking operations), these images are rescanned. Either the rescanned images or paper checks are sent to the paying bank.

Figure 5. Step One Process Flow



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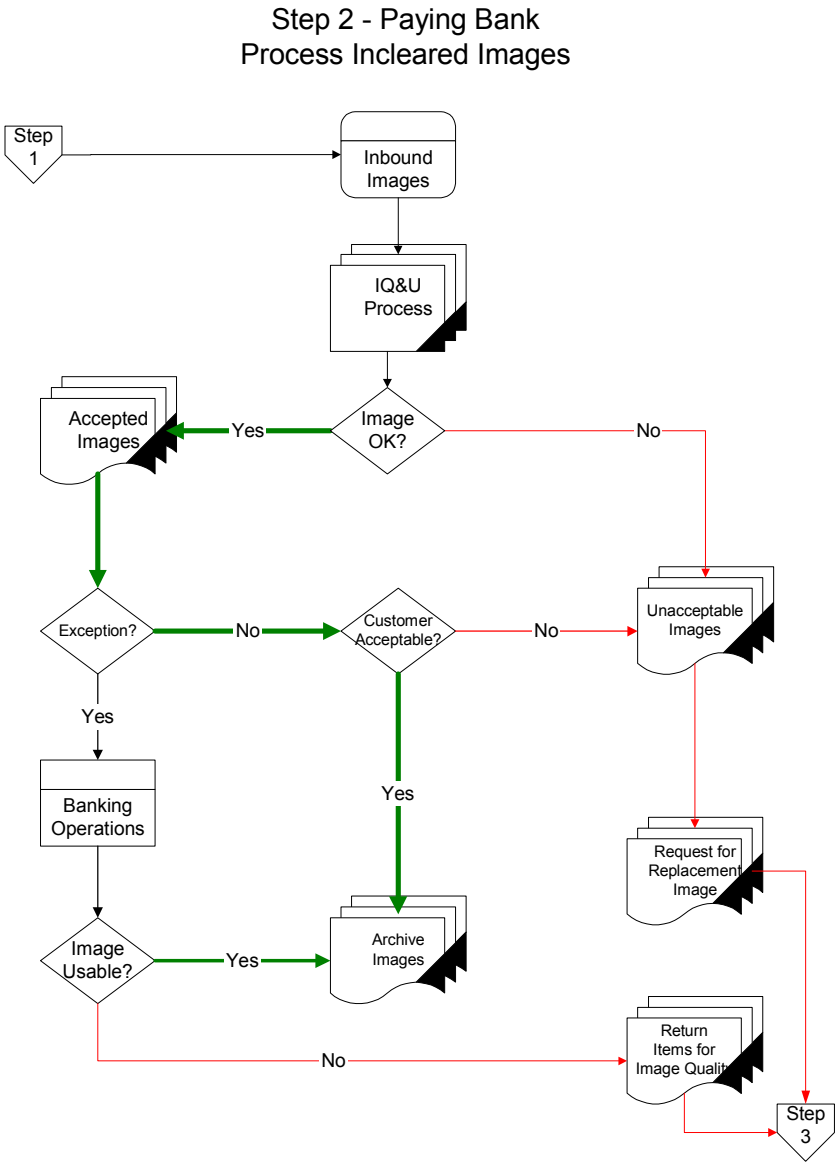
Use Case Process Flow – Step Two

In step two the paying bank subjects a percentage of images to the testing process shown in Figure 2. This percentage will vary, depending on the paying banks level of trust in the image quality of the transmitting bank. Some banks have indicated that with image quality standards in place they will test only a small sample on a statistical basis, but without image quality standards, they would test most or all of the images received through exchange.

If quality problems are discovered during this testing (or during normal banking operations), the paying bank notifies the truncating bank that the images are unacceptable.

Figure 6. Step Two Process Flow



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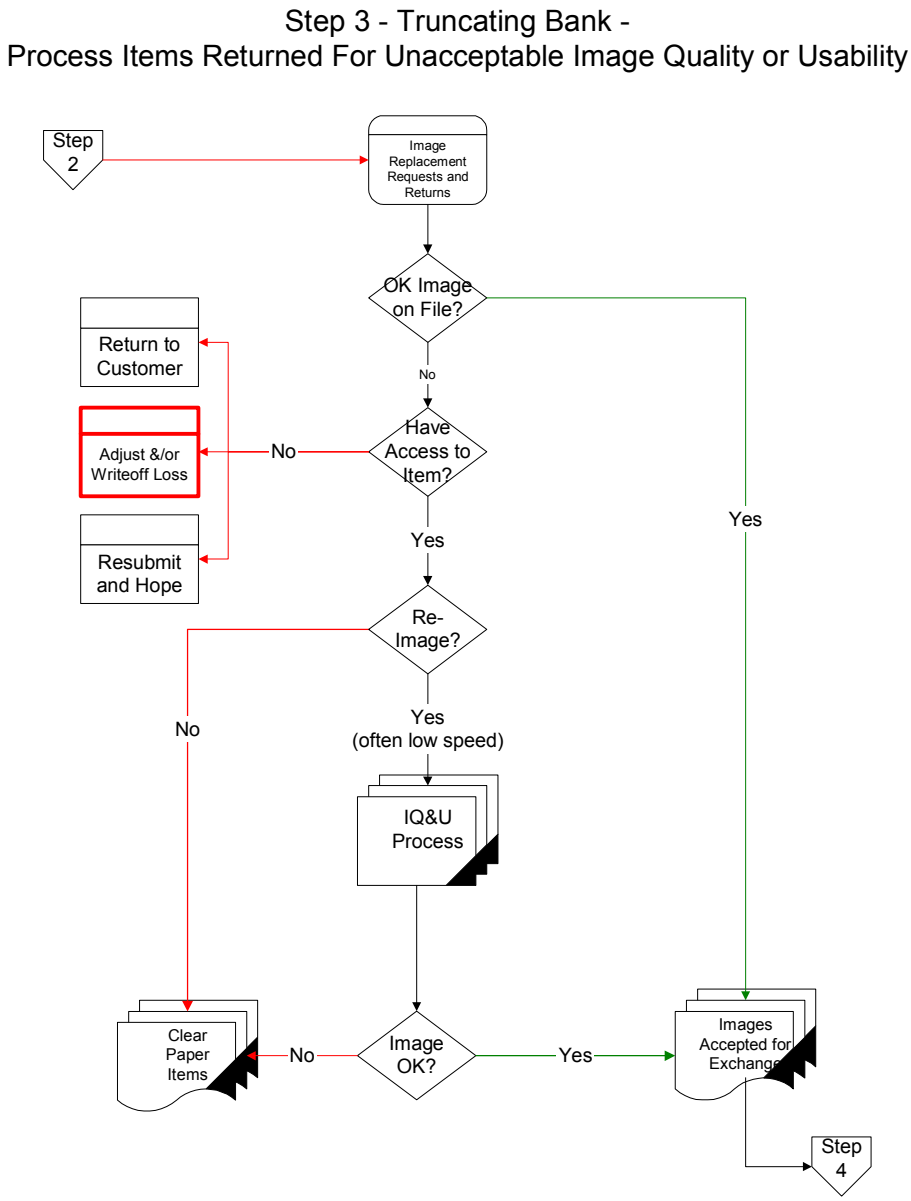
Use Case Process Flow – Step Three

In step three the truncating bank is processing images which were rejected by the paying bank for image quality reasons. For items returned within deadline, the truncating bank may rescan paper checks and send the rescanned images to the paying bank, or it may send paper checks instead. For items rejected outside of the return window midnight deadline, or after the paper check has been destroyed, the truncating bank either sends a better image if it has one, or resends the same image again (Resubmit and Hope). (For modeling purposes, we assume that for transactions rejected after the midnight returns deadline the paper check has already been destroyed by the truncating bank). In some cases, when the original document was scanned by a corporate customer, for example, the truncating bank may be able to reverse the transaction for the deposited item and charge the customer.

Figure 7. Step Three Process Flow



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Use Case Process Flow – Steps Four and Five

In step four the paying bank receives the replacement images, paper checks, or original images back from the truncating bank for payment. The paying bank may subject a percentage of the incoming images to the testing process shown in Figure 4.

If the customer experiences a loss, and there is not a good quality image available, the paying bank may notify the truncating bank, or it may decide to absorb the loss itself. For substantial disputes, court proceedings may occur, particularly in cases where restitution for collection costs and proximate losses is demanded.

Figure 8. Step Four Process Flow

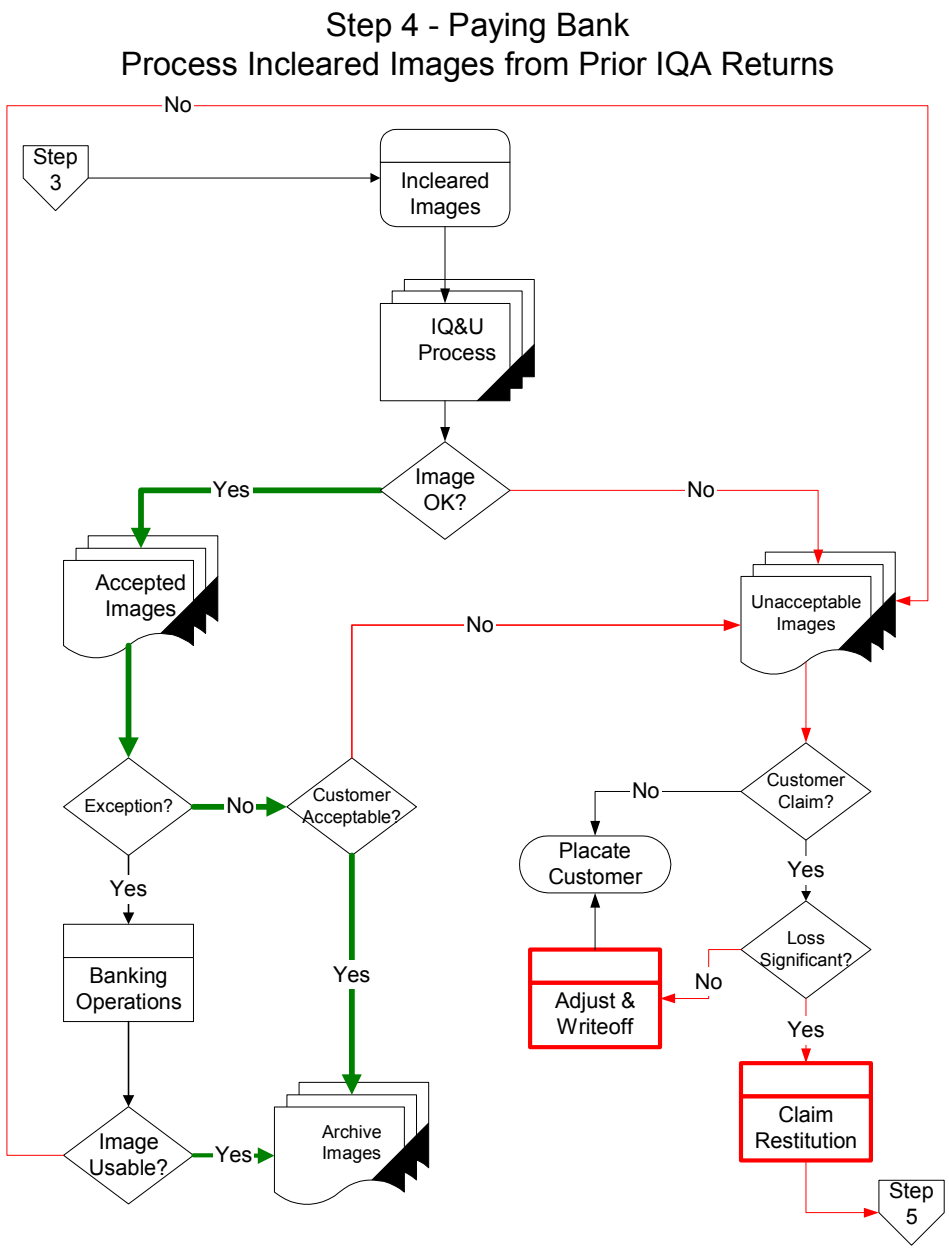

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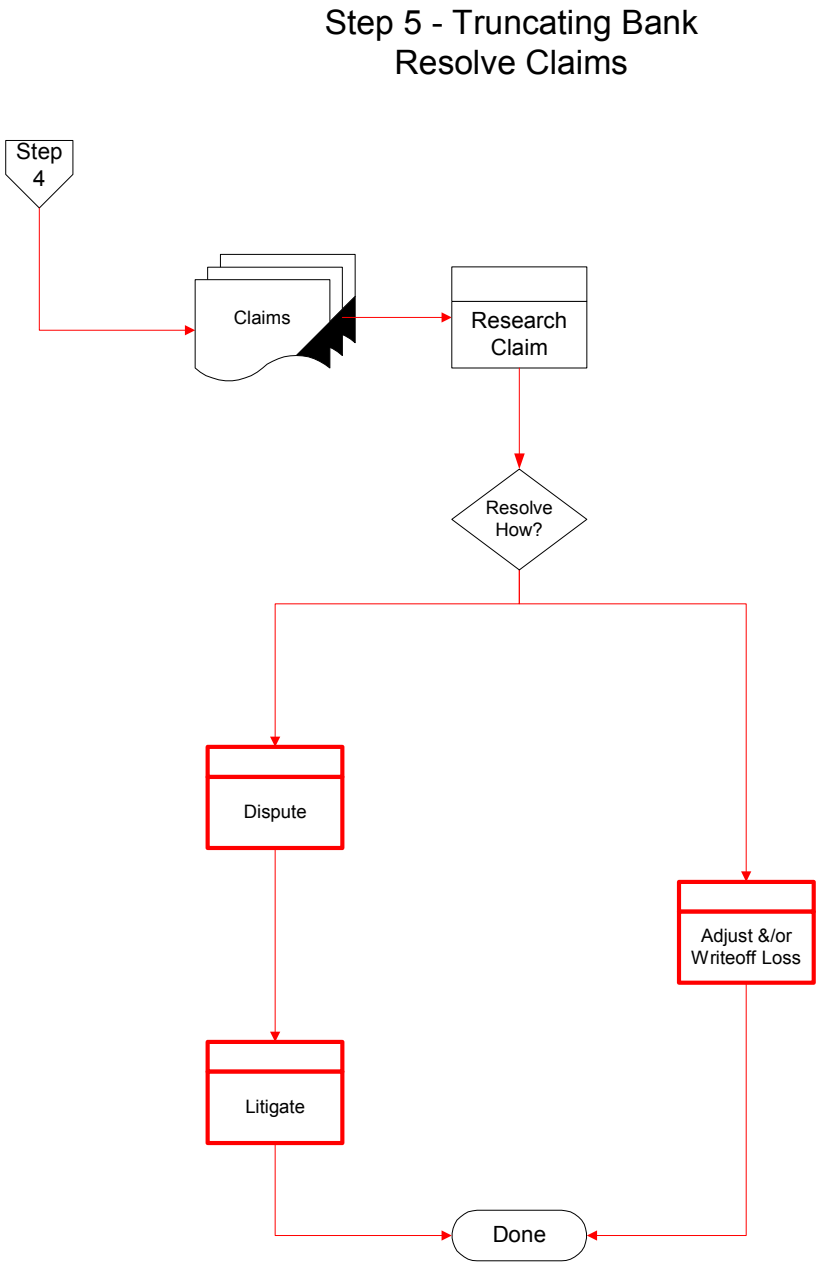
Figure 9. Step Five Process Flow



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Conclusions

After in-depth analysis, the team concluded that it would be misleading if too many assumptions regarding unknown costs, indirect impacts, and image exchange rates were incorporated into the model. To provide a complete picture of the impact of poor image quality to the financial industry, it is essential to quantify and aggregate a host of direct and indirect cost elements that are currently not quantified. These cost elements include:

- reduced employee productivity,
- reduced customer satisfaction,
- lost customers,
- increased customer support,
- increased risk of losses,
- increased check costs, such as costs associated with transit bulk files,
- erroneous returns, and
- increased legal activity.

Given the importance of these essential, but as yet unquantified elements, the model that the team defined was determined to be too narrow to provide specific, useful, and defensible information on the economic impact of poor quality on the industry.

The project team was, however, able to draw some significant conclusions from the modeling effort. The most important of these conclusions are:

- If truncating banks do not provide good quality images, costs related to poor quality are expected to increase dramatically for both truncating and paying banks.
- Direct image quality related costs for the industry increase by at least two times if a paying bank receives poor quality images or cannot trust its exchange partners' image quality.
- Adopting common image quality and defect metrics and definitions is the key first step in establishing verifiable and trustable image exchange quality standards.

If a truncating bank lacks image quality assurance capabilities, it forces its paying bank partners to compensate by performing image quality testing later in the exchange process. The later in the process that image quality testing is performed, the higher the ultimate costs are to all concerned. Discovering and correcting image quality problems soon after truncation, averts costly consequences.

With image quality assurance in place at truncating banks, the team's work predicts that a number of benefits will accrue. These benefits include:

- lowering the amount and cost of duplicate testing,
- more rapid adoption of image exchange,
- acceleration of posting and handling of exceptions,
- higher rates of customer satisfaction,
- reduced need for paper document retention,
- increased employee productivity,
- reduced risk of loss and probability of legal disputes.

In summary, even in the absence of exact numbers, it is clear from Phase I project work that costs associated with poor quality check images will be significantly higher without image quality standards and testing in place, and that the benefits image quality standards and testing will deliver will more than justify the effort to implement them.

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Summary of Key Points of Agreement

In addition to the explicit project goals and objectives, as revised by the team, there were a number of other issues which came up and were addressed, either directly or indirectly. This section of the document identifies some of the key points discussed during the project, and the team agreements that were reached on these issues.

Financial Institution Requirements

- Financial institutions in the project want to understand the **uses** and **risks** associated with fields on an image to guide requirements for usability
- The financial institutions want to be able to express quality in a way that allows them to speak a common language, independent of the vendor whose solution they use or the techniques that the vendor uses to measure image quality
- Financial institutions, through bilateral agreements or clearing house rules, will establish their own specific image quality and usability requirements. This group needs to establish the "language" in the form of terminology and metrics that the financial institutions can use as the basis for these agreements
- Financial institutions require more than just a way to identify and communicate the presence or absence of defects in an image, they would like to communicate the severity as well
- Everything proposed by the group must be "commercially reasonable" from both a business and a technical perspective. For example, it is not commercially reasonable to expect that MicroPrint will be discernable exclusively from an image captured at typical bank settings
- The group must accommodate widely deployed image technologies (e.g. BW & GS), and should not rule out the use of color
- The metrics should not prohibit or make more difficult advancements in technology and innovation.

Rules and Standards Related Issues

- FSTC does not directly write rules, regulations, or formal standards. This project will provide input to those processes, with the goal of ensuring consistency
- In order to ensure maximum adoption, most or all of the project materials will need to be made available to non-participants
- The various legal background documents provide guidance only to the extent of:
    - Requiring accurate representation
    - Warranting "all information"
- Clearing house rules go further, and at least some require representation that the image is of "good quality"
- The existing definitions (e.g. from clearing house rules) were generally considered not sufficiently detailed

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- A presenting/ re-converting bank may breach their warranties if they forward an unusable image or an image which is missing information contained on the source document
    - The financial institutions want an objective set of measures to determine if an image is, in fact, usable, so that disputes will not be "opinion" based
    - This group will not vary its determination of a breach based on an underlying cause of the information not being contained within an image (i.e., for our purposes it does not matter if a breach results from the deliberate actions (such as printing in drop-out ink) of another party)
    - (Parenthetically, the check vendors would like a similar set of objective measures so that they are not caught in an argument with the image capture vendors over the "fault" of poor quality images.)

- If a field is absent on the source document, it is not a defect that it is absent in the image
    - It may not be possible to determine the presence or absence of a field on the source document just by looking at the image
- Missing check notices (also known as "Sorry" documents) are not expected to be exchanged in place of a check image in a truncated environment. The project team is not directly addressing these documents as an image metric
- The common terminology and measurement for metrics and defects is important to help us achieve the goals of the financial institutions in establishing and enforcing exchange standards and factually resolving disputes
- The project will recommend areas of potential changes for consideration to the rule making organizations. This may include:
    - Improved definitions
    - Improved lists of specific metrics
    - Other changes as appropriate
- Some quality issues are related to the source document. The project will note these conditions and any associated metrics. The project will not necessarily seek to further define source document metrics. Source document requirements are described in a number of ANSI Standards. It may be useful to be able to identify the cause of a poor image as due to a source document issue
- The group will forward its results to ASC X9, along with recommendations as appropriate for changes to draft or approved standards.

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Metrics Objectives and Usage Framework

- The group needs to make recommendations on what should be measured to the extent possible. The first priority is to identify the attributes of quality that may be appropriate to measure. In addition, if possible, to identify aspects of Usability that can be measured in an interoperable way (short of full recognition). Next in priority is to identify and recommend the highest value items to measure These recommendations may be based on a number of factors, including:
    - What can be measured
    - The cost or processing time of measurement
    - The impact of the attribute on image quality
    - The impact of the attribute on usability

  Since it may require significant testing to determine which items yield the most reliable results from testing, finalizing the list of metrics to recommend for regular measurement may become a phase II activity

- The project is focused on what to measure, and what units of measure to use in common to express what is measured. How any system measures these things, either directly or indirectly, is considered the proprietary intellectual property of the vendors and is therefore out of scope for the project
- The metrics must support all types of checks and image capture methods, and must accommodate jacketed items and items with correction strips
- Agreed on the following categorization of usage requirements
    - Manual Operational Support
    - Automated Operational Support
    - Manual Loss Prevention and Detection
    - Automated Loss Prevention and Detection
    - Legal Proofs
    - Delivery to Customer
    - Printing (potentially as a separate use)

- Consolidated the usage requirements into four groupings with increasing minimum information needs:

  A. Collections, Exchange, and Posting
  B. Exceptions and Returns
  C. Fraud Detection and Loss Prevention
  D. Customer Usage.

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Usability Requirements

Following are definitions for check image usability requirements covering: collection, exchange and posting; exceptions and returns; fraud detection and loss prevention; and customer use.

Requirements for Collection, Exchange and Posting

To support collection, exchange and posting, a check image shall have the following attributes:

- All fields in the MICR line are legible
- If the amount is not encoded in the MICR line, then either the courtesy or legal amount on the check image is legible.

Requirements for Exceptions and Returns

To support exceptions and returns, a check image shall have the following attributes:

- All payment-related information on the front and back check image is legible.

Requirements for Fraud Detection and Loss Prevention

To support fraud detection and loss prevention, a check image shall have the following attributes:

- All payment-related information on the front and back check image is legible
- Any security features on the original check designed to survive black and white imaging are usable
- Non-informational characteristics of payment-related data are sufficiently legible to allow identification and comparison of fonts and other attributes
- All authentication data is legible.

Requirements for Customer Use

To support customer use, a check image shall have the following attributes:

- All information on the front and back check image is legible.

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Analysis of the Elements and Information on a Check

The project team spent a considerable amount of time analyzing the contents of a check to better understand the criticality of the various elements in an image exchange and Check 21 environment. One key aspect of this was to understand the difference between "information" and "non-information" elements on a check. The reason the team felt that this was important was due to the language used in the Check 21 legislation. Under that legislation, a reconverting bank warrants that the substitute check (which is produced from an image) contains "all information" from the original check. The team felt that this requirement would extend to the image exchange world.

The project team divided the elements into information and non-information groups. The team further analyzed each element to determine if that element occurred frequently in typical checks, and what the element was used for. Further, the team looked at the elements to determine if the absence of an element from an image, when present on the source document, was likely to increase the risk of a claim for a loss.

By performing this analysis, the project team was able to identify and confirm which information elements on a check are likely to be the most important to examine to determine usability within the image. These are:

- MICR Line
- Payee Name
- Courtesy and/or Legal Amount

The three fields above are considered the minimum fields necessary to support the basic collection, clearing, and posting processes. The additional fields listed below are generally found on almost all checks and are among the most important in supporting additional business uses.

- Issue Date
- Signature
- Bank of First Deposit Indorsement
- Payee Endorsement

The fields represented in the two lists above appear to be the most likely candidates for regular usability testing for financial institutions. The project team has not made a specific recommendation regarding usability testing as the team believes that individual institutions will establish their own risk based guidelines for determining which items to test.

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Description of Columns

Frequency	An assessment of how often, by percentage of checks, an element of design or a data field appears on checks. This will help to prioritize the importance of elements.
Check Design Element	Various non-informational aspects of a check, including background patterns, size, color, borders, embedded security features and optional text
Expected to Survive Black and White Imaging	Data which is present and printed on the check in such a manner that the printing exceeds the requirements established in X9.7 for image survivability, even if the data is not printed in an "area of interest" defined by that standard.
Required for Negotiability	Fields which are required to make a check a legal negotiable instrument as defined in UCC §3-104. It is important to note that a check may be paid, and correctly so, without all of these elements being present.
Required by FI Payment Process	Fields which are required for payment and handling by banking operations and/or Regulation CC or an appropriate government circular. FSTC defined three broad categories where banking functions require payment related data. These were: A. Collections, Clearing and Posting; B. Exceptions and Returns; C. Fraud Detection and Loss Prevention.
Needed to Prove Payment	Information on or added to the check which, if present, can be used by a customer to prove payment to a beneficiary, or for a beneficiary to properly identify how it processed a payment that it received. **Note:** This column documents a working set of assumptions. It has not been vetted with legal opinions.
Breach of Reconverting Bank/ Truncating Bank Warranty?	If a field is present on the source document, and is not present or usable in the image of the document, would the absence of this field result in a breach of the warranty made under Check 21 by the Reconverting bank, or by a truncating bank assuming that similar warranty requirements applied to them? **Note:** This column documents a working set of assumptions. It does not represent validated legal opinions. **Note:** Under Check 21 a breach of warranty requires a loss. The requirement for a loss may not exist under other arrangements, such as clearing house rules.
Would Affect Claims?	If a field is present on the source document, and is not present or usable in the image of the document, would the absence of this field result in either increased probability of a claim, or the paying bank (and any indemnifying bank) losing a claim that it might otherwise win. **Note:** This column documents a working set of assumptions. It does not represent validated legal opinions.

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	Frequency[1]	Check Design Element[2]	Expected to Survive BW Imaging[3]	Required for Negotiability[4]	Required by FI Pay Process?[5]	Needed to Prove Payment	Breach of RB/TB Warranty	Would affect Claims[6]
Data Elements on Front of Check								
Check (Serial) Number	VH	✓	✓		✓	✓	✓	
Issue Date Label	VH	✓	✓				✓	
Issue Date	VH		✓	✓	✓	✓	✓	✓
Maker Name	VH	✓	✓		✓	✓	✓	
Maker Address	VH	✓	✓		✓		✓	
Fractional Transit Number[7]	VH	✓	✓		✓		✓	
Pay to the Order of label	VH	✓	✓	✓			✓	✓
Payee Name	VH		✓	✓	✓	✓	✓	✓
$ (symbol) or Dollars (word)	VH	✓	✓				✓	
Other Payee Descriptive Data (e.g. Account, Policy, etc.)	H		✓		✓	✓	✓	
Payment Expiration Info (e.g. Void after 90 days)	L	✓	✓				✓	✓
Account Verification Number[8]	L	✓	✓		✓		✓	
Amount			✓					✓
Courtesy	VH		✓	✓	✓	✓	✓	
Legal (Amount in words)	VH		✓	✓	✓	✓	✓	
MICR Line			✓					✓
Amount	VH		✓		✓		✓	✓
On Us Field								
Bank Account Number	VH	✓	✓		✓		✓	✓
Serial Number (Consumer)	VH	✓	✓		✓		✓	
Routing and Transit Number (ABA)	VH	✓	✓		✓		✓	✓

[1] Low = Less than 25% of the checks, Medium = 25 – 75% of checks, High = 75 – 90%, Very High = 90%+; All numbers are best estimates.
[2] X9.7 Defines a Print Contrast Signal (PCS) requirement which should result in the $ sign, convenience amount, and MICR line remaining visible in the image. It defines the maximum background reflectivity and/or PCS for areas of interest described in the next footnote.
[3] X9.7 Defines Areas of Interest (AOI) on the check, generally ¼ inch high. These are: MICR Line, Convenience Amount box, Date Line, Pay to the Order of Line, Dollar line, Signature Line. An ✗ contained in this column indicates that this attribute is not expected to survive in a black and white image.
[4] A Negotiable Instrument is defined in UCC §3-104
[5] Per Reg. CC and Bank Operational requirements
[6] These claims are exclusive to determining whether or not an item was properly payable. This does not include claims between a maker and a beneficiary over quality of goods and services, lack of delivery, or other non-payment related issues.
[7] This document addresses survivability in an image of a full-sized check. This field is usually in very small print. The legibility of the field improves with an increase in resolution. It may, however, be printed in too small a font to be legible in a substitute check or an image of a substitute check.

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	Frequency[1]	Check Design Element[2]	Expected to Survive BW Imaging[3]	Required for Negotiability[4]	Required by FI Pay Process?[5]	Needed to Prove Payment	Breach of RB/TB Warranty	Would affect Claims[6]
Processing/ Trans Code Field	M	✓	✓		✓		✓	
External Processing Code (Pos. 44)	L	✓	✓		✓		✓	✓
Auxiliary On-Us Field			✓					
Serial Number (Commercial)	VH	✓	✓		✓		✓	✓
Signature	VH		✓	✓	✓		✓	✓
Bank (or Bank Branch) Name	VH	✓	✓		✓		✓	
Return Item Reason (on returned items)	VH		✓		✓		✓	
Memo Line label	H	✓					✓	
Bank Address	M	✓	✓		✓		✓	
ACH Routing Code	M	✓	✓		✓		✓	
Misc. Handwritten data	M		✓				✓	✓
Signature Requirements Label (e.g. 2 sigs req. over $x,xxx)	L	✓	✓		✓		✓	✓
Second Signature	L		✓		✓		✓	✓
Memo Line Contents	L		✓				✓	
Customer Added Processing Stamp	L		✓				✓	✓
Automated Security Symbol [8] (e.g. bar code, secure seal, text)	L	✓	✓		✓		✓	
Registered Sequence Number	L	✓	✓		✓		✓	
Payor Authentication data (e.g. Drivers License #)	L		✓		✓		✓	✓
Payment Voucher labels	L	✓					✓	
Payment Voucher data	L		✓				✓	✓
Bank product name	L	✓	✓				✓	
Non-Informational Fields on Front of Check								
Lock Icon & Security Feature Notification text[9]	VH	✓	✓					
Decorative or safety background	VH	✓	✗					
Bank Logo	H	✓	✓				✓	

[8] May be printed on check stock at Personalization time or when a check is issued by the maker, but is not currently widely deployed.

[9] This document addresses survivability in an image of a full-sized check. This field is usually in very small print. The legibility of the field improves with an increase in resolution. It may, however, be printed in too small a font to be legible in a substitute check or an image of a substitute check.

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	Frequency[1]	Check Design Element[2]	Expected to Survive BW Imaging[3]	Required for Negotiability[4]	Required by FI Pay Process?[5]	Needed to Prove Payment	Breach of RB/TB Warranty	Would affect Claims[6]
Check printer name[10]	H	✓	✓				✓	
True or Artificial Watermarks	H	✓	✗					
MP (MicroPrint) label	M	✓	✓				✓	
MicroPrinting	M	✓	✗					
Warning Band	M	✓	✓				✓	
Decorative Borders	M	✓	✗					
Special Inks	M	✓	✗					
Pantographs	M	✓	✗					
Check style[10]	L	✓	✓				✓	
Chemical Treatments	L	✓	✗					
Paper Treatments	L	✓	✗					
Textural Printing (e.g. Embossing, Intaglio)	L	✓	✗					
Hard to copy imagery (e.g. holograms, portraiture)	L	✓	✗					
Fibers and Threads	L	✓	✗					
Data Elements on Back of Check								
Payee Endorsement label	VH	✓					✓	
Payee Endorsement							✓	✓
Payee Signature or Stamp	VH		✓	✓			✓	
Payee Account Number	H		✓				✓	
Endorsement Terms	L		✓			✓	✓	✓
Bank of First Deposit Indorsement	VH		✓				✓	
Bank Name	VH		✓		✓	✓	✓	
BoFD mark ►◄ or ><	VH		✓		✓	✓	✓	
ABA Number	VH		✓		✓	✓	✓	
Processing Date	VH		✓		✓	✓	✓	
Sequence Number	VH		✓		✓	✓	✓	
Processing Center	H		✓				✓	
Location	H		✓				✓	
Second Bank Indorsement	VH		✓		✓		✓	
Bank Name	VH		✓				✓	
ABA Number	VH		✓				✓	
Processing Date	VH		✓				✓	

[10] This document addresses survivability in an image of a full-sized check. This field is usually in very small print. The legibility of the field improves with an increase in resolution. It may, however, be printed in too small a font to be legible in a substitute check or an image of a substitute check. This feature may also be printed very close to the edge of the check.

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	Frequency[1]	Check Design Element[2]	Expected to Survive BW Imaging[3]	Required for Negotiability[4]	Required by FI Pay Process?[5]	Needed to Prove Payment	Breach of RB/TB Warranty	Would affect Claims[6]
Sequence Number	VH		✓				✓	
Processing Center	H		✓				✓	
Location	H		✓				✓	
Third Bank Indorsement	L		✓		✓		✓	
Bank Name	VH		✓				✓	
ABA Number	VH		✓				✓	
Processing Date	VH		✓				✓	
Sequence Number	VH		✓				✓	
Processing Center	H		✓				✓	
Location	H		✓				✓	
Registered Sequence Number	L	✓	✓				✓	
Payee Processing Data (e.g. cash register print)	L		✓				✓	✓
Misc. handwritten data	L		✓				✓	
non-Informational Elements on Back of Check								
Security Text Block	VH	✓	✗					
Endorsement Notice	VH	✓	✗					
Original Document Screen	H	✓	✗					
Backgrounds	H	✓	✗					
True or Artificial Watermarks	M	✓	✗					
Special Inks	L	✓	✗					
Chemical Treatments	L	✓	✗					
Paper Treatments	L	✓	✗					

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Appendices

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Key Legislative and Rules Citations

In order to properly understand the legal and regulatory implications for establishing quality and usability standards and guidelines for check images, the FSTC project team identified a number of legislative and regulatory citations. The most relevant of these are listed in this section as a convenience to the reader.

These citations were used to guide the project team in its work, particularly in gaining a better understanding of the usability requirements for a check image. FSTC requested information from the participating bank law departments regarding specific, on-point legal cases which might clarify the requirements and liabilities for check image quality and/or usability. None were identified, other than the expectation that a check image would fall under the "best evidence" rules.

None of these citations are definitive and universally accepted as to any specific requirements regarding quality and usability for check images. Rather these citations generally refer to a requirement that the image be an accurate representation.

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Exhibits VIII Electronic Image Quality Standards

Definition

Image Quality is that characteristic defined as a faithful digital representation of the source document

Image Usability is that characteristic defined by the degree of legibility and readability necessary to perform a specific function. For this purpose, legibility is defined as the quality of a letter or numeral that enables a reasonable observer to identify it positively and quickly to the exclusion of all other letters or numerals. For this purpose, readability is defined as the quality of a group of letters or numerals being recognized to a reasonable observer as words or complete numbers.

The distinction between Image Quality and Image Usability is made to avoid problems with terminology. The term good image is unfortunately used to refer to both quality and usability. For example, given two checks one of which is a bad source document, the image capture equipment could likely produce a "good" image and a "bad" image. Both images could be good quality images but one is usable while the other is not. Therefore in setting the standard for Image Quality, the conditions are limited to problematic cases where the image capture equipment may potentially be the cause. A presenting bank transmitting an Electronic Image that satisfies the Image Quality standards specified in this Appendix but is not usable because of a bad source document for purposes of Section XVI has provided an Electronic Image meeting the minimum required quality standards prescribed in this Exhibit.

Minimum Required Quality Standards Necessary To Qualify As An ELECTRONIC Image For Purposes Of Section XIX Of The Rules.

Full image or a partial image satisfying the above Image Usability definition
Image of a single check (not a piggyback)
Not skewed or a skewed image satisfying the above Image Usability definition
No streaks or bands or an image with streaks or bands satisfying the above Image Usability definition
Within tolerance of a compressed image size (The tolerance range is not specified since it varies for every capture platform and future technological advances in compression may alter it.)

A missing image condition is not a question of quality and therefore not included in the standard specifications. However, since it is detected by the image capture platform, this condition must be flagged in the image file by the sending institution.

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Check 21

SEC. 4. GENERAL PROVISIONS GOVERNING SUBSTITUTE CHECKS.

(a) NO AGREEMENT REQUIRED.—A person may deposit, present, or send for collection or return a substitute check without an agreement with the recipient, so long as a bank has made the warranties in section 5 with respect to such substitute check.

(b) LEGAL EQUIVALENCE.—A substitute check shall be the legal equivalent of the original check for all purposes, including any provision of any Federal or State law, and for all persons if the substitute check—

(1) accurately represents all of the information on the front and back of the original check as of the time the original check was truncated; and

(2) bears the legend: "This is a legal copy of your check. You can use it the same way you would use the original check.".

SEC. 5. SUBSTITUTE CHECK WARRANTIES.

A bank that transfers, presents, or returns a substitute check and receives consideration for the check warrants, as a matter of law, to the transferee, any subsequent collecting or returning bank, the depositary bank, the drawee, the drawer, the payee, the depositor, and any endorser (regardless of whether the warrantee receives the substitute check or another paper or electronic form of the substitute check or original check) that—

(1) the substitute check meets all the requirements for legal equivalence under section 4(b); and

(2) no depositary bank, drawee, drawer, or endorser will receive presentment or return of the substitute check, the original check, or a copy or other paper or electronic version of the substitute check or original check such that the bank, drawee, drawer, or endorser will be asked to make a payment based on a check that the bank, drawee, drawer, or endorser has already paid.

SEC. 6. INDEMNITY.

(a) INDEMNITY.—A reconverting bank and each bank that subsequently transfers, presents, or returns a substitute check in any electronic or paper form, and receives consideration for such transfer, presentment, or return shall indemnify the transferee, any subsequent collecting or returning bank, the depositary bank, the drawee, the drawer, the payee, the depositor, and any endorser, up to the amount described in subsections (b) and (c), as applicable, to the extent of any loss incurred by any recipient of a substitute check if that loss occurred due to the receipt of a substitute check instead of the original check.

(b) INDEMNITY AMOUNT.—

(1) AMOUNT IN EVENT OF BREACH OF WARRANTY.—The amount of the indemnity under subsection (a) shall be the amount of any loss (including costs and reasonable attorney's fees and other expenses of representation) proximately caused by a breach of a warranty provided under section 5.

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(2) AMOUNT IN ABSENCE OF BREACH OF WARRANTY.—In the absence of a breach of a warranty provided under section 5, the amount of the indemnity under subsection (a) shall be the sum of—

(A) the amount of any loss, up to the amount of the substitute check; and

(B) interest and expenses (including costs and reasonable attorney's fees and other expenses of representation).

(c) COMPARATIVE NEGLIGENCE.—

(1) IN GENERAL.—If a loss described in subsection (a) results in whole or in part from the negligence or failure to act in good faith on the part of an indemnified party, then that party's indemnification under this section shall be reduced in proportion to the amount of negligence or bad faith attributable to that party.

(2) RULE OF CONSTRUCTION.—Nothing in this subsection reduces the rights of a consumer or any other person under the Uniform Commercial Code or other applicable provision of Federal or State law.

(d) EFFECT OF PRODUCING ORIGINAL CHECK OR COPY.—

(1) IN GENERAL.—If the indemnifying bank produces the original check or a copy of the original check (including an image or a substitute check) that accurately represents all of the information on the front and back of the original check (as of the time the original check was truncated) or is otherwise sufficient to determine whether or not a claim is valid, the indemnifying bank shall—

(A) be liable under this section only for losses covered by the indemnity that are incurred up to the time that the original check or copy is provided to the indemnified party; and

(B) have a right to the return of any funds it has paid under the indemnity in excess of those losses.

(2) COORDINATION OF INDEMNITY WITH IMPLIED WARRANTY. —The production of the original check, a substitute check, or a copy under paragraph (1) by an indemnifying bank shall not absolve the bank from any liability on a warranty established under this Act or any other provision of law.

(e) SUBROGATION OF RIGHTS.—

(1) IN GENERAL.—Each indemnifying bank shall be subrogated to the rights of any indemnified party to the extent of the indemnity.

(2) RECOVERY UNDER WARRANTY.—A bank that indemnifies a party under this section may attempt to recover from another party based on a warranty or other claim.

(3) DUTY OF INDEMNIFIED PARTY.—Each indemnified party shall have a duty to comply with all reasonable requests for assistance from an indemnifying bank in connection with any claim the indemnifying bank brings against a warrantor or other party related to a check that forms the basis for the indemnification.

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SEC. 7. EXPEDITED RECREDIT FOR CONSUMERS.

(a) RECREDIT CLAIMS.—

(1) IN GENERAL.—A consumer may make a claim for expedited recredit from the bank that holds the account of the consumer with respect to a substitute check, if the consumer asserts in good faith that—

(A) the bank charged the consumer's account for a substitute check that was provided to the consumer;

(B) either—
(i) the check was not properly charged to the consumer's account; or
(ii) the consumer has a warranty claim with respect to such substitute check;

(C) the consumer suffered a resulting loss; and

(D) the production of the original check or a better copy of the original check is necessary to determine the validity of any claim described in subparagraph (B).

(2) 40-DAY PERIOD.—Any claim under paragraph (1) with respect to a consumer account may be submitted by a consumer before the end of the 40-day period beginning on the later of—

(A) the date on which the financial institution mails or delivers, by a means agreed to by the consumer, the periodic statement of account for such account which contains information concerning the transaction giving rise to the claim; or

(B) the date on which the substitute check is made available to the consumer.

(3) EXTENSION UNDER EXTENUATING CIRCUMSTANCES.—If the ability of the consumer to submit the claim within the 40-day period under paragraph (2) is delayed due to extenuating circumstances, including extended travel or the illness of the consumer, the 40-day period shall be extended by a reasonable amount of time.

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UCC 3 and 4

UCC §3-103. Definitions

(a) In this article

(4) "**Good faith**" means honesty in fact and the observance of reasonable commercial standards of fair dealing.

(6) "**Order**" means a written instruction to pay money signed by the person giving the instruction. The instruction may be addressed to any person, including the person giving the instruction, or to one or more persons jointly or in the alternative but not in succession. An authorization to pay is not an order unless the person authorized to pay is also instructed to pay.

(7) "**Ordinary care**" in the case of a person engaged in business means observance of reasonable commercial standards, prevailing in the area in which the person is located, with respect to the business in which the person is engaged. In the case of a bank that takes an instrument for processing for collection or payment by automated means, reasonable commercial standards do not require the bank to examine the instrument if the failure to examine does not violate the bank's prescribed procedures and the bank's procedures do not vary unreasonably from general banking usage not disapproved by this Article or Article 4.

(9) "**Promise**" means a written undertaking to pay money signed by the person undertaking to pay. An acknowledgement of an obligation by the obligor is not a promise unless the obligor also undertakes to pay the obligation.

(10) "**Prove**" with respect to a fact means to meet the burden of establishing the fact (Section 1-201(8)).

UCC §3-104. Negotiable Instrument

(a) Except as provided in subsections (c) and (d), "negotiable instrument" means an unconditional promise or order to pay a fixed amount of money, with or without interest or other charges described in the promise or order, if it:

(1) is payable to bearer or to order at the time it is issued or first comes into possession of a holder;

(2) is payable on demand or at a definite time; and

(3) does not state any other undertaking or instruction by the person promising or ordering payment to do any act in addition to the payment of money, but the promise or order may contain (i) an undertaking or power to give, maintain, or protect collateral to secure payment, (ii) an authorization or power to the holder to confess judgment or realize on or dispose of collateral, or (iii) a waiver of the benefit of any law intended for the advantage or protection of an obligor.

(b) "Instrument" means negotiable instrument

(c) An order that meets all of the requirements of subsection (a) except paragraph (1), and otherwise falls within the definition of "check" in subsection (f) is a negotiable instrument and a check

(d) A promise or order other than a check is not an instrument if, at the time it is issued or first comes into possession of a holder, it contains a conspicuous statement, however expressed, to the effect that the promise or order is not negotiable or is not an instrument goverened by this Article.

(e) An instrument is a "note" if it is a promise and is a "draft" if it is an order. If an instrument falls within the definition of both "note" and "draft" a person entitled to enforce the instrument may treat it as either.

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(f) "Check" means (i) a draft, other than a documentary draft, payable on demand and drawn on a bank or (ii) cashier's check or teller's check. An instrument may be a check even though it is described on its face by another term, such as "money order".
(g) "Cashier's check" means a draft with respect to which the drawer and drawee are the same bank or branches of the same bank.
(h) "Teller's check" means a draft drawn by a bank (i) on another bank, or (ii) payable at or through another bank.
(i) "Traveler's check" means an instrument that (i) is payable on demand, (ii) is drawn on or payable at or through a bank, (iii) is designate by the term "traveler's check" or by a substantially similar term, and (iv) requires, as a condition to payment, a countersignature by a person whose specimen signature appears on the instrument.
(j) "Certificate of deposit" means an instrument containing an acknowledgment by a bank that a sum of money has been received by the bank and a promise by the bank to repay the sum of money. A certificate of deposit is a note of the bank.

UCC §4-406(b) (1990 Official Text)

If the items are not returned to the customer, **the person retaining the items shall** either retain the items or, if the items are destroyed, **maintain the capacity to furnish legible copies of the items** until the expiration of seven years after receipt of the items. A customer may request an item from the bank that paid the item, and that bank must provide in a reasonable time either the item or, if the item has been destroyed or is not otherwise obtainable, a legible copy of the item. [*emphasis added*]

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Other Somewhat Related Clearing House Rules

Canadian Payments Association

FSTC would like to gratefully acknowledge the contributions of the Canadian Payments Association in providing the FSTC Image Quality and Usability Project team with access to four memos regarding image quality and usability that had been developed during their own investigation into image quality and usability issues.

NCHA Rules

The Presenting Institution has no responsibility for determining whether an Imaged Item is properly payable, including whether: the Imaged Item bears the authorized signature of the drawer or any other signature; the Imaged Item is stale dated or post-dated; or the Imaged Item bears a legend restricting payment.

Note: The NCHA Rules do not speak directly to image quality; rather they speak to responsibilities of the Presenting Institution.

NCHA Definitions

d) "Eligible Imaged Item" A digital image of a demand draft or check processed by an IE Participant drawn on or payable through or at an office of another IE Participant whether negotiable or not, that is handled for forward collection or return, including a Substitute Check but does not include a non-cash item or an item payable in a medium other than United States Money or an item that does not meet the eligibility criteria for truncation.

g) "Imaged Item" A digitized reproduction of an original check or a Substitute Check

ECCHO Definitions (Section XIX(A)).

(4) **Electronic Image.** An Image conforming to applicable industry standards for Images.

(6) **Image**. An accurate representation of the front and back of the Related Physical Check. An Image refers to both an Electronic Image and a Paper Image.

(10) **Paper Image**. An Image that is a paper reproduction of the Related Physical Check created with image technology and is provided by the presenting bank to the paying bank in response to the paying bank's request for a Paper Image pursuant to Section XIX(J) or Section XIX(M).

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Uniform Photographic Copies of Business and Public Records Act

Title 28 United States Code Part V Chapter 115 – EVIDENCE, DOCUMENTARY - § 1732 Record Made in the regular course of business; photographic copies (28 USC § 1732)

> If **any business**, institution, member of a profession or calling, or any department or agency of government, in the regular course of business or activity has kept or recorded any memorandum, writing, entry, print, representation or combination thereof, of any act, transaction, occurrence, or event, and **in the regular course of business** has caused any or all of the same to be recorded, copied, or reproduced **by any photographic, photostatic, microfilm**, micro-card, miniature photographic, or other process which **accurately reproduces** or forms a durable medium for so reproducing the original, the original may be destroyed in the regular course of business unless its preservation is required by law. **Such reproduction**, when satisfactorily identified, **is as admissible in evidence as the original itself** in any judicial or administrative proceeding whether the original is in existence or not and an enlargement or facsimile of such reproduction is likewise admissible in evidence if the original reproduction is in existence and available for inspection under direction of court. The introduction of a reproduced record, enlargement, or facsimile does not preclude admission of the original. This subsection shall not be construed to exclude from evidence any document or copy thereof which is otherwise admissible under the rules of evidence. [*emphasis and underline added*]

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DELAWARE UNIFORM RULES OF EVIDENCE

Article X. Contents of Writings, Recordings, and Photographs

Rule 1001. Definitions.

For purposes of this article the following definitions are applicable:

(1) **Writings and recordings**. "Writings" and "recordings" consist of letters, words, sounds or numbers, or their equivalent, set down by handwriting, typewriting, printing, photostating, photographing, magnetic impulse, mechanical or electronic recording, or other form of data compilation.

(2) **Photographs**. "Photographs" include still photographs, X-ray films, video tapes and motion pictures.

(3) **Original**. An "original" of a writing or recording is the writing or recording itself or any counterpart intended to have the same effect by a person executing or issuing it. An "original" of a photograph includes the negatives or any print therefrom. If data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, is an "original."

(4) **Duplicate**. A "duplicate" is a ***counterpart*** produced by the same impression as the original, or from the same matrix, or by means of photography, including enlargements and miniatures, or by mechanical or electronic re-recording, or by chemical reproduction or by other equivalent techniques ***which accurately reproduce the original***. [emphasis added]

Rule 1002. Requirement of original.

To prove the content of a writing, recording or photograph, the original writing, recording or photograph is required, except as otherwise provided in these Rules or by statute.

Rule 1003. Admissibility of duplicates.

A duplicate is admissible to the same extent as an original unless (1) a genuine question is raised as to the authenticity of the original, or (2) in the circumstances it would be unfair to admit the duplicate in lieu of the original.

Rule 1004. Admissibility of other evidence of contents.

The original is not required, and other evidence of the contents of a writing, recording or photograph is admissible if:

(1) Originals lost or destroyed. All originals are lost or have been destroyed, unless the proponent lost or destroyed them in bad faith; or

(2) Original not obtainable. No original can be obtained by any available judicial process or procedure; or

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(3) Original in possession of opponent. At a time when an original was under the control of the party against whom offered, he was put on notice, by the pleading, or otherwise, that the contents would be a subject of proof at the hearing, and he does not produce the original at the hearing; or

(4) Collateral matters. The writing, recording or photograph is not closely related to a controlling issue.

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Project Participants

The following table lists the organizations and the individuals within those organizations who actively participated in the Image Quality and Usability Phase One project.

Organization	Participant
AFS	Tony Hebert
Bank of America	Dan Welch Kenneth Trice Matt Calman Wayne Johnson
Bank of New York	Lou Arkenau
Canadian Payments Association	Miles Hart
Carreker	Doug Halvorsen Gary Ernst Harry Hankla
Citigroup	Christian Riehl
CSC (CheckVision)	Jerry Blodgett
Deluxe Financial Services	Alain Rault Ralph Stolp
Diebold	Steve Grzymkowski
Digital Check Corporation	Harvey Spencer
ECCHO	David Walker Phyllis Meyerson
Federal Reserve	Dexter Holt
First Citizens	Charles Dail Kristie Mills
FSTC	Frank Jaffe John Fricke Lyman Chapin Rebecca Wetzel
IBM	Ravi Prakash Rod Moon
Inlite Research	Michael Salzman
JPMorgan Chase	David Gerspach Jackie Pagan Mae Liu
NCHA	Barbara Lozzi Glenn Wheeler Tom D'Aquisto
NCR	Ian Goodall Stewart Kelland
Orbograph	David Kliewer Joe Gregory
Pitney-Bowes	Brian Romansky

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Organization	Participant
SVPCo	Sue Goold
Unisys	David Concannon Robert Klein
US Bank	Glen Ulrich Gloria LeFebvre Tim Kent
VECTORsgi	Jim Fancher
Viewpointe	Chris Carter
Wachovia	Andy Garner
Wells Fargo	Al Hecht Kevin Mitchell Tim Keating
Zions Bank/NetDeposit	Bart Boster David Fleming Jan Walker

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