The Printer Working Group

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White Paper

IPP Custom Print Quality and Intent Extensions
(CUSTOMPQI**)**

Status: Initial

Abstract: This document is a white paper that defines extensions to IPP enabling Printers to offer support for a broader range of print quality and rendering color mode choices than were previously available via standard attributes, enabling Printer vendors and system integrators with ways to provide a normalized structure for print quality hint customization settings. This document also defines extensions to the Message Catalog file syntax to support localized help content, to support the additional print quality and rendering intent choices as well as other more general uses.

This document is a White Paper. For a definition of a "White Paper", see:
http://ftp.pwg.org/pub/pwg/general/pwg-process30.pdf

This document is available electronically at:

http://ftp.pwg.org/pub/pwg/ipp/white/white-hp-ipp-custompq-20190412.docx
http://ftp.pwg.org/pub/pwg/ipp/white/white-hp-ipp-custompq-20190412.pdf

Title: IPP Custom Print Quality and Intent Extensions (CUSTOMPQI)

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1. Introduction

Vendor-controlled print quality customizations are very important to demanding end users because they give the user finer control over the color rendering the printer provides. These customizations are also important to printer vendors and print service providers because they enable product and service differentiation and customized solutions to meet individual customer's needs. Historically these customizations were handled using model-specific drivers and vendor-unique mechanisms. As print ecosystems continue their move away from model-unique vendor-provided drivers and towards universal print solutions that rely upon printer self-description via IPP, some additions to standard IPP are needed to provide a framework that can satisfy printer vendors', print service providers' and demanding users' needs for vendor-controlled print quality controls while avoiding vendor-unique IPP attributes. This white paper defines several extensions to IPP that provide this framework to satisfy these needs.

2. Terminology

2.1 Conformance Terminology

Capitalized terms, such as MUST, MUST NOT, RECOMMENDED, REQUIRED, SHOULD, SHOULD NOT, MAY, and OPTIONAL, have special meaning relating to conformance as defined in Key words for use in RFCs to Indicate Requirement Levels [RFC2119]. The term CONDITIONALLY REQUIRED is additionally defined for a conformance requirement that applies when a specified condition is true.

2.2 Printing Terminology

Normative definitions and semantics of printing terms are imported from IETF Printer MIB v2 [RFC3805], IETF Finisher MIB [RFC3806], and IETF Internet Printing Protocol/1.1: Model and Semantics [STD92].

Administrator: An End User who is also authorized to manage all aspects of an Output Device or Printer, including creating the printer instances and controlling the authorization of other End Users and Operators [RFC2567].

Document: An object created and managed by an Imaging Service that contains the description, processing, and status information. A Document object may have attached data and is bound to a single Job object [RFC8011].

End User: A person or software process that is authorized to perform basic printing functions, including finding/locating a printer, creating a local instance of a printer, viewing printer status, viewing printer capabilities, submitting a print job, viewing print job status, and altering the attributes of a print job [RFC2567].

Job: An object created and managed by an Imaging Service that contains the description, processing, and status information. A Job object also contains zero or more Document objects [RFC8011].

Logical Device: a print server, software service, or gateway that processes jobs and either forwards or stores the processed job or uses one or more Physical Devices to render output [RFC8011].

Operator: An End User that also has special rights on the Output Device or Printer. The Operator typically monitors the status of the Printer and manages and controls the Jobs at the Output Device [RFC2567]. The Operator is allowed to query and control the Printer, Jobs, and Documents based on site policy.

Output Device: a single Logical or Physical Device [PWG5100.18].

Owner: The End User or Administrator who owns and manages (and typically created) a Job, Printer, Resource, Subscription, or System [PWG5108.06].

Physical Device: a hardware implementation of an endpoint device, e.g., a marking engine, a fax modem, etc.

2.3 Protocol Role Terminology

This document also defines the following protocol roles in order to specify unambiguous conformance requirements:

Client: Initiator of outgoing connections and sender of outgoing operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] User Agent).

Printer: Listener for incoming connections and receiver of incoming operation requests (Hypertext Transfer Protocol -- HTTP/1.1 [RFC7230] Server) that represents one or more Physical Devices or a Logical Device.

2.4 Other Terminology

Document Creation Operations: The operations that create documents: Print-Job, Print-URI, Send-Document and Sent-URI.

Job Creation operation: One of the operations that creates a Job object: Print-Job, Print-URI and Create-Job. The Restart-Job operation [STD92] is not considered a Job Creation operation, since the Printer re-uses the existing Job object. The Validate-Job operation is not considered a Job Creation operation because no Job object is created. Therefore, when a statement also applies to either the Restart-Job and/or the Validate-Job operation, they are mentioned explicitly.

2.5 Acronyms and Organizations

IANA: Internet Assigned Numbers Authority, http://www.iana.org/

IETF: Internet Engineering Task Force, http://www.ietf.org/

ISO: International Organization for Standardization, http://www.iso.org/

PWG: Printer Working Group, http://www.pwg.org/

3. Rationale for IPP Custom Print Quality and Intent Extensions

Existing specifications define the following:

1. IPP/1.1 Model and Semantics [STD92] defines the "print-quality" Job Template attribute that enables a Client to specify a requested output quality level.

2. IPP: Job and Printer Extensions – Set 3 (JPS3) [PWG5100.13] defines:

    a. the "print-color-mode" Job Template attribute that enables a Client to request a particular color mode be used when rendering the document to output;

    b. the "printer-icc-profiles" Printer Description attribute that enables the Printer to specify the ICC profiles it supports for color management;

    c. the Message Catalog content type ("text/strings") that defines mappings between attribute name and/or value keys and localized string value equivalents, made available at a URL specified by the "printer-strings-uri" Printer Description attribute.

End users and print system deployment administrators are increasingly demanding that clients and printers support customized print quality and fidelity capabilities even within universal print system ecosystems such as IPP Everywhere™ [PWG5100.14]. To enable Printers to support these demands, this specification should:

1. Extend the range of enum values for "print-quality" to support additional values that may have printer-specific meanings, and define the associated semantics when these are present;

2. Extend the range of possible keyword values for the "print-color-mode" attribute, or articulate the semantics of vendor-unique keywords, to enable Printers to specify vendor or deployment-specific color modes, and define the associated semantics when these are present;

3. Define attributes to support "soft proofing" ICC profiles to support Client presentation of a preview of the effect of the selected color mode;

4. Extend the Message Catalog syntax to support "tool tips" and "online help" for any attribute or attribute value provided;

5. Define attributes to allow a Printer to identify a number of vendor-specific attributes as "print quality hints" so that a Client can present them in a limited fashion without having to be aware of their semantic meaning.

3.1 Use Cases

The following use cases articulate the value that the extensions proposed later can provide to the IPP ecosphere.

3.1.1 Manufacturer-Deployed Print Quality Mode

X Printers, a printer manufacturer, has developed a new technology that provides significant customer benefit above and beyond that of the existing print quality modes available. It is exposed to the user as a new "X Magic" print quality mode. The "X Magic" print quality mode depends on the printer having a print engine mechanism that implements the requisite imaging technology.

The new print quality mode does not fit well in the context of the existing print quality modes, and the vendor does not want to cause customer confusion by remapping the use of existing print quality modes on devices that support the technology, and not on those that do not. Doing so would also prevent product differentiation.

In this case, the existing basic print quality modes (Draft, Normal, High) are preserved and the new print quality mode is added as a custom mode. A tooltip explains to the user the value provided by the “X Magic” print quality mode. The client drivers are unaware of the mode’s meaning. Since the custom PQ mode is defined on the device, the mode will only be shown when connected to a device supporting that mode.

3.1.2 Administrator-Deployed Print Quality Mode

A customer has agreed with its print service provider to pay for an additional print quality mode called "Eco-Draft", that is enabled through the service contract. This additional print quality mode will only be made available on select printers, facilitated by the print service provider's IT administration and deployment system.

This "Eco-Draft" print mode differs from the standard "Draft", "Normal" and "High" modes in that, when selected and indicated to the Printer, the Printer employs a unique combination of rendering selections to produce output generally comparable to "Draft" but with a significantly reduced ink or toner usage, and a corresponding reduction in per-page cost. In order to preserve the conventional definition and user perception of "Draft", the “Eco-Draft” is offered as a new print quality setting unique to this deployment. A unique name and quality value are important for two reasons: making it clear to end users they are using a different print quality, so they can make an informed choice; and for job accounting reasons so that the billing system can bill pages using this quality level differently than the other familiar quality levels.

The IT administrators have a print policy defined so that users from different departments or role families are given different print capabilities. Those in the Finance department will only be offered the “Eco-Draft” print quality option, while executives and those in the Marketing department will be offered "Eco-Draft" in addition to the standard “Draft”,

203 “Normal” and “High” options. The different quality levels factor into the billing cost the IT
204 administrators and their print service providers have negotiated.

205 **3.1.3 Manufacturer-Deployed Color Transformation Preferences**

206 X Printers, a printer manufacturer, has produced printers for many years. Its customers
207 have asked X Printers to provide a “color output mode” control with a “legacy color
208 compatibility mode” choice. X Printers implements this feature in its newer printers that
209 have more accurate color output, to cause them to produce output that appears as though
210 it was printed on an older printer whose output exhibited a different particular set of color
211 output characteristics. The customers want to be able to select this “color output
212 preference” on a per-job and/or per-Client basis, because some users have a need for this,
213 but only in certain applications, while others do not.

214 The customers have also asked for a "print preview" to show them what the color would
215 look like before printing. The printers that implement this new "legacy color compatibility
216 mode" also provide a special "soft proofing" ICC profile so that the client can present this
217 accurately to the user.

218 **3.1.4 Administrator-Deployed Color Transformation Preference**

219 Fred is a print administrator at an architecture firm. He has been tasked with finding a way
220 to provide a “blueprint output mode” to the architects in the office, that can be selected as
221 an option in the print dialog. When this option is selected, the submitted job will be output
222 as though it was printed from a blueprinting machine. To produce this, the document color
223 depth is flattened to a 1-bit monochrome, and then transformed so that the white
224 background is rendered in Prussian blue (Web color #003153 or sRGB 0,49,83), and the
225 "black" lines are rendered in white. Fred provisions the printer with settings and resources
226 to describe the desired color transformation to its users' systems using an administrative
227 interface to add this feature.

228 Lisa works in the office, and her laptop discovers this “Blueprint” color transformation
229 option when it interrogates the printer for its capabilities. Her client device presents the
230 “Blueprint” color transformation option in the print dialog. Lisa positions her mouse pointer
231 over the option and sees a “tool tip” (snippet of descriptive text) over the “Blueprint” option,
232 that describes what that will do. Lisa likes what the tool tip describes for the “Blueprint”
233 option and selects it. The print preview in the print dialog shows her what the output will
234 look like. She likes it more, so she clicks “Print”, and the job is printed as per the preview.
235 Lisa is happy, and thanks Fred.

236 **3.1.5 Print Quality Hints to Influence Printer Color Processing**

237 Juan is a graphic artist, and his team has a high-performance color printer. It has produced
238 high quality output for all of the applications from which he and his team are printing. But
239 then Juan encounters a problem. He is viewing a document in a particular application,
240 prints the document, and realizes that the output is not meeting his needs. He is unable to
241 find settings in the application that will allow it to produce satisfactory printed output

without either changing the document in unacceptable ways or affecting other users of the printer. He looks in the print dialog and finds a set of "print quality hints", and through a process of trial-and-error, is able to produce output that meets his needs.

Knowing he will need these settings in the future, and also knowing that his computer supports IPP Presets, he saves these settings as a Preset for future quick access.

3.2 Exceptions

There are no exception conditions for the use cases specified in section 3.1.

3.3 Out of Scope

The following are considered out of scope for this document:

1. Definition of specific color transformations
2. Specifying the user interface for controls that present the IPP options

3.4 Design Requirements

The design requirements for this document are:

1. Define attributes that allow a Client to specify a color transformation be performed by the Printer for a particular Job;
2. Define additional enum values for “print-quality” that allow site- or vendor-customizable print quality modes, that may or may not fit into the linear sequence provided by the existing "print-quality" attribute enum values;
3. Define additions to the IPP localization system that allow the Printer to provide additional descriptions for options in the strings catalog;
4. Register all attributes and operations with IANA

The design recommendations for this document are:

1. Consider the user experiences the IPP attributes might support

4. Custom Color Mode Feature

In addition to choosing “color” or “monochrome”, there are cases where customers want to be able to influence the character of how colors are rendered. This "transformation preference" or "color mode preference" happens before color management and color separation occurs.

The "print-color-mode" IPP Job Template attribute conveys a color mode selection to the Printer. Standard color mode keywords included "color", "monochrome", "process-monochrome", and others. While vendor-unique or printer-unique modes were syntactically

possible, their semantic implications were not previously considered. Some additional supporting elements are needed to support non-standard color modes properly. A sophisticated Client ought to have a way to present a "preview" illustrating the effects the color mode will have on their document. In addition to a localized name, tooltips and other help content can also help to educate the User on the unique color mode.

5. Printer Description Attributes

5.1 print-quality-hints-supported (1setOf keyword)

The “print-quality-hints-supported” Printer Description attribute specifies the set of Job Template attributes supported by the Printer that provide "hints" that can influence fine points relating to print quality. A Client supporting print quality hints implementing universal print solution such as IPP Everywhere™ to present a package of "advanced print settings" to the user. The named attributes can be vendor-specific or standard ones registered with IANA and the PWG. A Client could present these member attributes using the following UI control types:

Table 1: Attribute syntax and controls for "print-quality-hints-supported"

Syntax	Control
boolean	Checkbox
integer	Text box
type2 keyword	Pop-up menu or list
name	Pop-up menu or list

The attribute syntax for all Job Template attributes named in "print-quality-hints-supported" MUST use only the following attribute syntaxes:

- boolean
- integer
- type2 keyword
- name

The Printer MUST support "xxx-supported" and "xxx-default" Printer Description attributes for every attribute whose name is specified in "print-quality-hints-supported".

To illustrate how this attribute would be used, if a printer vendor named NotPWG defined vendor-unique print quality hint attributes "pwg-clever-x" and "pwg-magic-y", and wanted to flag those as print quality hint attributes to the Client, it could do it like so:


```
ATTR boolean notpwg-clever-x-supported true
ATTR boolean notpwg-clever-x-default false
ATTR keyword notpwg-magic-y-supported 'none','aguamenti','duro','episkey'
ATTR keyword notpwg-magic-y-default 'episkey'
ATTR keyword print-quality-hints-supported 'notpwg-clever-x','notpwg-magic-y'
```

A Client could present a checkbox for "notpwg-clever-x" and a pop-up menu or list for "notpwg-magic-y".

5.2 soft-proof-icc-profiles (1setOf collection)

The "soft-proof-icc-profiles" Printer Description attribute specifies the set of ICC profiles the Printer provides for soft proofing the color transformation the Printer will perform for a given particular print color mode. Similar to the "printer-icc-profiles" attribute [PWG5100.13], each collection value consists of "profile-name (name(MAX))" and "profile-uri (uri)" member attributes plus any Job Template attributes (as member attributes) that contribute to the selection of the profile.

These profiles MUST be used ONLY for soft proofing and MUST NOT be used for color management.

5.2.1 profile-name (name(MAX))

The REQUIRED "profile-name" member attribute provides a unique name for a given ICC profile. A given "profile-name" value MAY appear in multiple collection values but MUST always be paired with the same "profile-uri" value. That is, a "profile-name" of "Glossy Paper, High Quality" might be listed multiple times but will always refer to the same "profile-uri", for example "http://example.com/glossy-high.icc".

The "profile-name" value SHOULD be localized by the Printer based on the value of the "attributes-natural-language" operation attribute.

5.2.2 profile-uri (uri)

The REQUIRED "profile-uri" member attribute references an ICC color profile as a "http:" or "https:" URI. Standard vendor-supplied profiles SHOULD be Printer-resident so that Client printing does not require access to external networks. Printer-resident profiles SHOULD be made available on the same TCP port number used for IPP (default 631) to ensure resource availability.

6. Additional Values and Semantics for Existing Attributes

6.1 print-color-mode (type2 keyword)

The “print-color-mode” Job and Document Template attribute [PWG5100.13] specifies the color mode to use when printing a Job. If supported, the Printer MUST print the Job using

the requested color mode. The value MUST be one of those specified by the Printer's “print-color-mode-supported” Printer Description attribute.

6.2 print-color-mode-default (type2 keyword)

The "print-color-mode-default" Printer Description attribute [PWG5100.13] specifies the default color mode to be used to transform the document content before color management. The value MUST be one of those specified by the "print-color-mode-supported" Printer Description attribute.

6.3 print-color-mode-supported (1setOf type2 keyword)

The "print-color-mode-supported" Printer Description attribute [PWG5100.13] specifies the color modes the Printer supports to transform the document content when producing output.

Vendor-defined keywords SHOULD have the distinguishing prefix 'smiNNN-' [STD92] where NNN is an SMI Private Enterprise Number (PEN) [IANA-PEN]. Vendor-defined keywords SHOULD have either the '-monochrome' or '-color' suffixes to assist clients. For example, if the company Example Corp. had obtained the SMI PEN 32473, has a vendor-unique color mode "magic" that pertains to color, the Printer could specify the 'smi32473-magic-color'.

The Printer SHOULD provide localized user-presentable label strings in its message catalogs for all keywords specified in "print-color-mode-supported". The Printer makes its message catalog available at the URL specified by the "printer-strings-uri" Printer Description attribute [PWG5100.13]. The Printer SHOULD also provide "tooltips" strings, as specified in section 7, to provide lightweight contextual help content for its supported keywords.

If this attribute is supported, the Printer MUST also support the "soft-proof-icc-profiles" attribute (section 5.2) and SHOULD provide an ICC profile for each non-standard keyword, to allow a Client to present a soft proof preview for each supported print color mode.

As an example, a Printer that implements the 'smi32473-magic-color' and 'smi32473-blueprint' custom color modes ought to implement the following attributes and values (using "ipptoolfile" syntax):

```
ATTR keyword print-color-mode-supported auto,color,monochrome, smi32473-
   magic-color, smi32473-blueprint
ATTR uri printer-strings-uri https://myprinter.local.:631/strings/ipp-
   en.strings
ATTR uri soft-proof-icc-profiles {
    MEMBER name smi32473-magic-color
    MEMBER uri https://myprinter.local.:631/proofing/magic-color.icc
},{
    MEMBER name smi32473-blueprint
    MEMBER uri https://myprinter.local.:631/proofing/blueprint.icc
```



```
}
```

Its message catalog at /strings/ipp-en.strings would include the following (for en-us):

```
"print-color-mode" = "Print Color Mode";
"print-color-mode.auto" = "Automatic";
"print-color-mode.auto-monochrome" = "Auto Monochrome";
"print-color-mode.bi-level" = "Text";
"print-color-mode.color" = "Color";
"print-color-mode.highlight" = "Highlight";
"print-color-mode.monochrome" = "Monochrome";
"print-color-mode.process-bi-level" = "Process Text";
"print-color-mode.process-monochrome" = "Process Monochrome";
"print-color-mode.smi32473-magic-color" = "Magic Color";
"print-color-mode.smi32473-magic-color._tooltip" = "Makes the colors look
   magical";
"print-color-mode.smi32473-blueprint" = "Blueprint";
"print-color-mode.smi32473-blueprint._tooltip" = "Blue background with white
   foreground lines";
```

6.4 print-quality (type2 enum)

The following new enum values for the “print-quality” attribute allow a Printer to specify support for additional printer-specific print quality options that the Client can specify the Printer use for a Job. A Printer that supports any of the enum labels defined here MUST provide localized labels using the Localization Message Catalog available at the URL specified by “printer-strings-uri”. The Printer provides the localization and the meaning of that enum for its own implementation. A Printer SHOULD provide a localized “tool tip” using the “_tooltip” label extensions to the Localization Message Catalog defined in section 0.

Enum Value	Enum Label	Description
1	custom-1	Lowest custom print quality level
2	custom-2	Custom print quality level lower that 'draft'
3	draft	RFC 8011
4	normal	RFC 8011
5	high	RFC 8011
6	custom-6	Custom print quality level higher than 'high'
7	custom-7	Highest custom print quality level
10	custom-10	Non-linear custom print quality

11	custom-11	Non-linear custom print quality
12	custom-12	Non-linear custom print quality

The string catalog entries for each of these might look like this:

```
"print-quality.1" = "EcoWickedDrafty";
"print-quality.2" = "EcoDrafty";
"print-quality.3" = "Draft";
"print-quality.4" = "Normal";
"print-quality.5" = "High";
"print-quality.6" = "Max";
"print-quality.7" = "MegaMax";
"print-quality.10" = "Non-linear Happiness";
"print-quality.11" = "Non-linear Trepidation";
"print-quality.12" = "Non-linear Ennui";

"print-quality.1._tooltip" = "Usable only for rough layout";
"print-quality.2._tooltip " = "Lower quality with greatly reduced toner use";
"print-quality.3._tooltip " = "Low quality with less toner use";
"print-quality.4._tooltip " = "Average quality - best for everyday use";
"print-quality.5._tooltip " = "Higher quality";
"print-quality.6._tooltip " = "Maximum quality";
"print-quality.7._tooltip " = "Super Maximum quality";
"print-quality.10._tooltip " = "Produces output that makes you kinder";
"print-quality.11._tooltip " = "Produces output that makes you nervous ";
"print-quality.12._tooltip " = "Produces output that makes you bored";
```

7. Localization Message Catalog Format Extensions

The IPP Localization Message Catalog file format [PWG5100.13] can be used to provide localized string labels for IPP attributes and non-textual attribute values. In some cases, the user may want more information about a particular attribute or attribute value. This additional information, usually also being textual in nature, also requires localization. To preserve the existing semantics but create space for these new facilities, several keyword labels are defined below.

Label	Example	Value Contents Description
_tooltip	“attribute-name._tooltip” “attribute-name.enum-value._tooltip”	UTF-8 plain text content providing a brief description of the corresponding attribute or attribute value.
_helpurl	“attribute-name._helpurl” “attribute-name.enum-value._helpurl”	URL pointing to help content providing more detailed description of

the corresponding attribute or attribute value.

8. Internationalization Considerations

For interoperability and basic support for multiple languages, conforming implementations MUST support:

1. The Universal Character Set (UCS) Transformation Format -- 8 bit (UTF-8) [STD63] encoding of Unicode [UNICODE] [ISO10646]; and

2. The Unicode Format for Network Interchange [RFC5198] which requires transmission of well-formed UTF-8 strings and recommends transmission of normalized UTF-8 strings in Normalization Form C (NFC) [UAX15].

Unicode NFC is defined as the result of performing Canonical Decomposition (into base characters and combining marks) followed by Canonical Composition (into canonical composed characters wherever Unicode has assigned them).

WARNING – Performing normalization on UTF-8 strings received from Clients and subsequently storing the results (e.g., in Job objects) could cause false negatives in Client searches and failed access (e.g., to Printers with percent-encoded UTF-8 URIs now 'hidden').

Implementations of this specification SHOULD conform to the following standards on processing of human-readable Unicode text strings, see:

Unicode Bidirectional Algorithm [UAX9] – left-to-right, right-to-left, and vertical

Unicode Line Breaking Algorithm [UAX14] – character classes and wrapping

Unicode Normalization Forms [UAX15] – especially NFC for [RFC5198]

Unicode Text Segmentation [UAX29] – grapheme clusters, words, sentences

Unicode Identifier and Pattern Syntax [UAX31] – identifier use and normalization

Unicode Collation Algorithm [UTS10] – sorting

Unicode Locale Data Markup Language [UTS35] – locale databases

Implementations of this specification are advised to also review the following informational documents on processing of human-readable Unicode text strings:

Unicode Character Encoding Model [UTR17] – multi-layer character model

Unicode Character Property Model [UTR23] – character properties

Unicode Conformance Model [UTR33] – Unicode conformance basis

9. Security Considerations

The IPP extensions defined in this document require the same security considerations as defined in the Internet Printing Protocol/1.1 [STD92]

Implementations of this specification SHOULD conform to the following standard on processing of human-readable Unicode text strings, see:

Unicode Security Mechanisms [UTS39] – detecting and avoiding security attacks

Implementations of this specification are advised to also review the following informational document on processing of human-readable Unicode text strings:

Unicode Security FAQ [UNISECFAQ] – common Unicode security issues

10. IANA Considerations

10.1 IPP Attribute and Keyword Value Registrations

This section contains the exact registration information for IANA to update according to the procedures defined in [STD92].

The registry entries will contain the following information:

Job Template attributes:	Reference
print-color-mode (type2 keyword)	[PWG5100.13]
print-color-mode-default (type2 keyword)	[PWG5100.13]
print-color-mode-supported (1setOf type2 keyword)	[PWG5100.13]
print-quality	[RFC8011]
print-quality-hints-supported (1setOf keyword)	[CUSTOMPQI]
soft-proof-icc-profiles (collection)	[CUSTOMPQI]
profile-name (name(MAX))	[CUSTOMPQI]
profile-uri (uri)	[CUSTOMPQI]

10.2 Type2 enum Attribute Value Registrations

The enumerations defined in this document will be published by IANA according to the procedures in IPP/1.1 Model and Semantics [STD92] section 7.1 in the following file:

http://www.iana.org/assignments/ipp-registrations

The registry entries will contain the following information:

Attribute (attribute syntax)		
Enum Value	Enum Symbolic Name	Reference

print-quality		[RFC8011]
1	custom-1	[CUSTOMPQI]
2	custom-2	[CUSTOMPQI]
3	draft	[RFC8011]
4	normal	[RFC8011]
5	high	[RFC8011]
6	custom-6	[CUSTOMPQI]
7	custom-7	[CUSTOMPQI]
10	custom-10	[CUSTOMPQI]
11	custom-11	[CUSTOMPQI]
12	custom-12	[CUSTOMPQI]

11. References

11.1 Normative References

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13. Change History

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