ICT in the printing processes normative standardization of the printing processes by the use of ICT

Dijana Posavec
Faculty of Graphic Arts
University of Zagreb
Getaldićeva 2, 10000 Zagreb, Croatia
dmarcius@yahoo.com

Abstract. *Information and communication technology in the printing processes opens up new areas of improvement of the standardization of the entire graphic production.*

Normative bases, which include graphic prepress, printing and post press process control, are being established in order to efficiently manage information flow in the entire graphic production.

Prerequisite for normative standardization of the printing processes by the use of ICT is to create a digital printing dictionary.

Keywords. ICT, JDF, XML, standardization of the printing processes, digital dictionary.

1 Introduction

Process standardization in the printing processes has not been adequately carried out yet, and one of the key reasons for that is the lack of describing newly formed standards and norms in a suitable way. That became possible with the introduction of the XML technology.

XML technology presents a medium for exchanging data and describing their mutual interacting, which enable standard and knowledge integration from different sources in printing, in a unique form of an XML document, as shown in picture 1.

One example is the **CIP4** association (International Cooperation for Integration of Processes in Pre-press, Press and Post-press), which introduces **XML** data format called **JDF** (Job Definition Format). Implementing integration and automation into complex systems of printing production is necessary in order to reduce the time required for the entire work, which with time becomes more complicated, complex and demanding. [1].

Automation standardization of the printing production with the use of XML data format and JDF enables the process of continuous automatic production, work analysis and its constant monitoring. Setting quality standards in a form of different normatives is a fundamental prerequisite for the automation of the printing production.

The process of establishing the standard of a printing production can be separated into three categories:

1. defining normatives of the machine park (including manual labour as well),
2. defining normatives of processes and their resources
3. defining mutual relations.

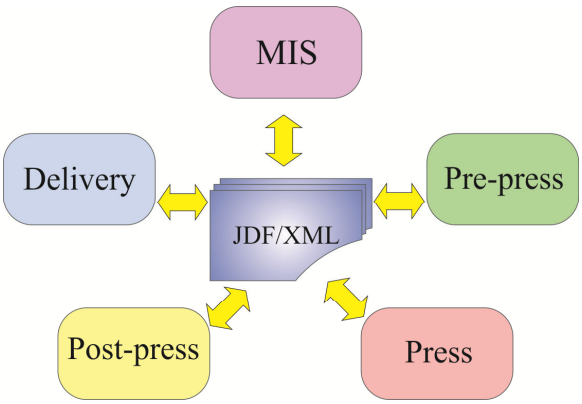

Figure 1. Integration of all elements of a printing production by XML and JDF files

Every production process can be improved with normative variables. In a certain period the defined normatives, when necessary, can and must change and adjust. The established normatives and mutual relations can be optimized with the use of advantages of the relational database technology, and

XML technology. The two technologies do not exclude one another; on the contrary, they complement each other.

The goal of digital data standardization in the printing process is the implementation of the XML technology within printing, so that the communication of people and machines can be coordinated with the production plan.

The use of XML technology enables the integration of all the elements of a printing production, starting from the calculation and the offer, and continuing with the pre-press and the production itself, then all the way to the storage, logistics, workflow processes and delivery.

2 Network connecting in the printing processes

Network connecting of workflow in all stages of the production is the direction that the modern printing has taken. New data and process organization, as well as changes of the existing data formats, is a reality that is present daily in printing companies. Norm digitalization and format standardization that consolidate all production processes into simple digital files enable faster and better quality reproduction. That way predisposition is created for the introduction of the unique code format, JDF, which sustains all printing work stages [2].

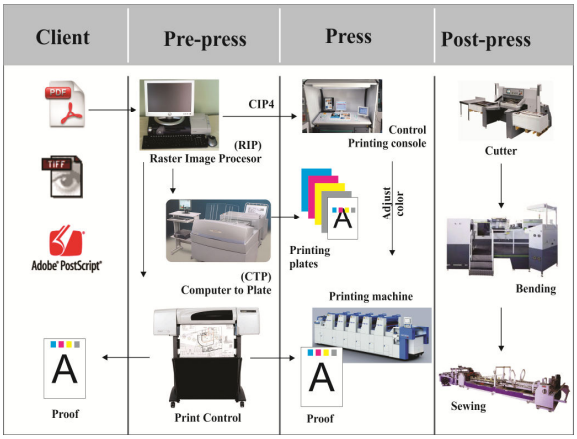

Figure 2. Workflow within the production stages

Figure 2. shows network connections between all stages and workflow of the production. The starting point is The Client, which implies the order agreement about the product, the making and approval of the design and printing preparation; after that the connection proceeds to Pre-Press, which means creating printing plates and checking the test print. By the use of CIP4 technology communication moves forward to the control print console and further to the printing machine, and eventually the printed edition goes to final processing where it is cut, creased and sewn.

The very workflow of the production process is a logical sequence of both digital and conventional production, but there are many stages within the printing processes themselves which have been accelerated or skipped by the implementation of information technology.

3 The need for digital standardization of the printing production

Changes in printing processes, caused by the introduction of information and communication technologies, require that we change the way we manage these processes. Internet and computer networking completely change the way the printing processes are managed because all information and technology data within the production processes are connected and communicate by XML technology.

The emergence of the JDF format based on XML language greatly propelled the development of the standardization of the printing process. It won't be possible to properly carry out the standardization until all the norms and processes have been clearly explained in a way acceptable to everyone, and that is by a formalized dictionary. Writing the dictionary is the beginning of the standardization, and the very XML structure demands development of a communicative vocational dictionary.

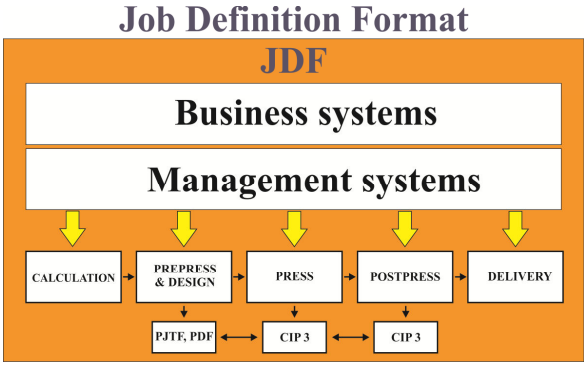

Figure 3. Integration of the printing production by JDF format

Files based on XML present the groundwork for improvement of managing sequence order of printing processes and products.

Surveys conducted in the twenty year period show that the use of information technology doubles for a short period of time every two years. The result of that are complete changes in the stage of knowledge of using digital processes which indicates that it is necessary to implement constant and continuous education. It is also necessary to make changes in the education system itself so that new technologies could be put to profitable use [4].

Global changes and innovations through implementation of highly sophisticated and automated machines, lead to total evolution in the printing process. Concept models with the accompanied standardized dictionary of the production itself must be developed to adequately reach the changes in informatization, and these models should include the existing production capacities, future computer capacities and a new way of management.

The analysis conducted within the print and graphic design companies in Croatia has shown existing results about the state and changes of computer technology in printing processes. They have pointed out the fact that without systematic examination of the printing processes it is not wise or economically justifiable to move into partial informatization.

Creating normatives and digital knowledge bases within the printing profession present the foundation for standardization of the printing processes. This is the first condition that has to be met in order to adequately take further steps on the road of informatization of the printing processes [5].

A dictionary of the printing profession must be agreed upon and implemented to create an informational data base. It is the only way that workers in the printing facilities will use highly automated machines with data bases because they understand exclusively technical terms of their profession. These terms in most cases are a part of a regional dialect, and are not and cannot be a part of the standard Croatian language.

The suggestion of the related dictionary of the printing profession represents the basis for the introduction of the XML technology into every stage and work process within our printing facilities.

Normatives of printing production set up in digital form for the need of creating data bases, enable further modelling of printing systems and progress in production process management.

Implementing and using new information and communications technology in the printing processes in an adequate way, imposes the need to create a standardized dictionary of the printing profession and everything connected with printing. XML technology enables that such dictionary is accommodated to different dialects and that one can choose to work on some of the foreign languages as well.

4 Proposition of the printing dictionary for introduction of an XML data base

Printing a dictionary opens the road of bringing together printing methods of production organization, calculation, storage management, and exhausting the collective machine capacity in the printing offices. Internet technology applied in printing must rely on a language that is independent both from the machine makers and the end user in a printing office.

The dictionary is the beginning of a serious cooperation of the competition, with the goal of improving printing production. "Integration" through the new printing dictionary becomes a reality. The emphasis is on the presence of a national language, and that expresses the need for thorough education about the new standards that are being announced with JDF and CIP4.

The area of printing terminology covers hundreds of technical terms and words, which are specific and understandable only to the people from the profession. That is why it is allowed to import a national language into the very JDF terminology, and not solely one of the world languages. One of the possibilities that XML and JDL can offer in the printing processes, is the option to choose a language that a certain machine will use (Figure 4).

```
<?xml version='1.0' encoding='UTF-8'?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:dt="urn:schemas-microsoft-com:datatypes"
xmlns:sql="urn:schemas-microsoft-com:mapping-schema">
<xsd:annotation>
 <xsd:appinfo>
    <sql:relationship name="STRANICA_PRIJEVOD_PRIJEVOD"
          parent="STRANICA_PRIJEVOD"
          parent-key="prijevod_id"
          child="PRIJEVOD"
          child-key="prijevod_id" />
  </xsd:appinfo>
</xsd:annotation>


<xsd:element name="STRING" sql:relation="STRANICA_PRIJEVOD" sql:key-fields="id" >
    <xsd:complexType>
        <xsd:attribute name="stranica" sql:field="stranica" type="xsd:string"  sql:hide="true"/>
        <xsd:attribute name="id" sql:field="prijevod_id" type="xsd:int"/>
        <xsd:attribute name="parametar" sql:field="parametar" type="xsd:string"/>
        <xsd:attribute name="value" sql:field="engl"  sql:relation="PRIJEVOD"
sql:relationship="STRANICA_PRIJEVOD_PRIJEVOD"/>
                                                  /  \
    </xsd:complexType>                          hrv   slo
</xsd:element>

</xsd:schema>
```

Figure 4. XML presentation of an option to choose between English, Croatian and Slovenian language

A dictionary for describing printing procedures entails thousands of notions (words) that don't even belong to standard Croatian language but have their roots in German, Latin or English speaking areas. That depends on the geographical origin of a company where the research was conducted and the communication within the printing facilities was recorded.

In many printing facilities machines that have JDF base based on English language tend to partially shut down just because of language misunderstanding; thus the expensive machines are left unused which creates inefficient product. The solution lies in creation of a dictionary of the printing profession which can easily be implemented into every machine working with JDF technology. So in the printing profession the value of the JDF is based exactly on the fact that it can easily implement even certain dialects through the computer system of a highly automated machine. That way such machines can be operated and be understood by even those workers who before had trouble understanding a foreign language that the machine was using, usually English or German. Examples of such XML files are shown in Figure 5. and Figure 6. Words in the data base have their English translation to

provide easier communication between the programmer and the printer.

```
<?xml version="1.0" encoding="utf-8" ?>
- <xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
  <xsl:param name="araka">(sheets)</xsl:param>
  <xsl:param name="araka_papira_za_stroj">Sheets of paper for the
machine</xsl:param>
  <xsl:param name="araka_skladiste">Warehouse sheets</xsl:param>
  <xsl:param name="araka_skladiste_kg">Warehouse (kg)</xsl:param>
  <xsl:param name="bez_prve_pripreme">WITHOUT 1ST.
PREPARATION</xsl:param>
  <xsl:param name="boja_kg">Color (kg)</xsl:param>
  <xsl:param name="Boje">Colors</xsl:param>

  <xsl:param name="broj_boja">Number of colors</xsl:param>

  <xsl:param name="broj_stranica">NUMBER OF PAGES</xsl:param>
  <xsl:param name="broj_stranica_plan">Number of planned page</xsl:param>
  <xsl:param name="cijena_kom">Price/pc</xsl:param>
  <xsl:param name="cijena_troska_boje">Price of the cost of color</xsl:param>
  <xsl:param name="cijena_troska_laka">Price of the cost of
varnish</xsl:param>
  <xsl:param name="cijena_troska_papira">Price of the cost of
paper</xsl:param>
  (mm)</xsl:param>
  </xsl:stylesheet>
```

Figure 5. XML display of a translation of The Croatian-English dictionary of printing profession

```
<?xml version="1.0" encoding="utf-8" ?>
- <xsl:stylesheet version="1.0"
xmlns:xsl="http://www.w3.org/1999/XSL/Transform">
  <xsl:param name="araka">(pol)</xsl:param>
  <xsl:param name="araka_papira_za_stroj">Pol papirja za stroj</xsl:param>
  <xsl:param name="araka_skladiste">Pol v skladišču</xsl:param>
  <xsl:param name="araka_skladiste_kg">Skladišče (kg)</xsl:param>
  <xsl:param name="bez_prve_pripreme">BREZ 1. PRIPRAVE</xsl:param>
  <xsl:param name="boja_kg">Barve (kg)</xsl:param>
  <xsl:param name="Boje">Barve</xsl:param>
  <xsl:param name="broj_boja">Število barv</xsl:param>
  <xsl:param name="broj_stranica">ŠTEVILO STRANI</xsl:param>
  <xsl:param name="broj_stranica_plan">Število strani plan</xsl:param>
  <xsl:param name="cijena_kom">Cena/kos</xsl:param>
  <xsl:param name="cijena_troska_boje">Cena stroška barve</xsl:param>
  <xsl:param name="cijena_troska_laka">Cena stroša laka</xsl:param>
  <xsl:param name="cijena_troska_papira">Cena stroška papirja</xsl:param>
paper</xsl:param>
  (mm)</xsl:param>
  </xsl:stylesheet>
```

Figure 6. XML display of a translation of The Croatian-Slovenian dictionary of printing profession

5 Experimental frame, experience and results

Communication among the workers in big printing facilities in Croatia and Slovenia were recorded in order to create the dictionary of printing profession. Conversations were recorded in the printing facilities, form one process to another, from one stage of production to another, with all their accompanying elements. The completed dictionary that was created that way consists of 720 words that describe printing terminology used by both young and old graphic engineers.

Looking into the created dictionary, one can conclude that the words for certain processes and stages in the printing profession haven't changed since the use of hot lead typesetting. This proves that there aren't any big changes or that there is no need to rework the dictionary, it works well just as it is. Of course, new printing processes and new stages of work also introduce new words so the dictionary is constantly being updated and expanded. Normatives that have been gathered based on these methods include not just the numbers, but the words of the profession as well.

Going around and recording everyday conversation within both Croatian and Slovenian printing facilities, it turned out there were certain communication differences while using technical terms among particular companies, and these differences were marked by dialect and geographical position.

The problem of formalizing the printing dictionary is difficult to solve and it is going to take a lot of time to completely formalize it and to introduce it through education system as the standard to be used in printing facilities. Therefore it is much easier and quicker to create a dictionary of the printing profession with the accompanying dialects. A big and vast informatization and standardization in the printing processes force companies to keep up with the trends in the computer technology, so that they could maximize their machines' capacity and stay competitive on the market. Workers have to know how to use those highly automated machines, and exactly because of this it is necessary to create your own printing dictionary as a general dictionary, with certain sub variants, depending on the geographical position and the dialects being communicated in individual printing companies.

Today that type of printing dictionary, to a certain extent formalized, is being installed in the command system of the JDF format which functions within the XML structure. It wasn't until the XML structure had been defined that way that the highly automated machines were being used adequately. Only then when the programmers translated the dictionary into algorithms and set the XML base file, whose structure set up was based on the proposed dictionary (which is the standard of the printing profession), there was noticeable progress in the use of automated machines in the printing facilities.

Highly automated technology hadn't been used in the printing processes until a standardized, JDF implemented dictionary with the language and dialect option select was created. Such standardized dictionary enabled a proper work of highly sophisticated and automated machines in the printing branch of business.

The created dictionary has been completed and includes the entire domain of printing profession, from calculation to post-press, so its application can be witnessed in the school system on the one hand, and on the other hand, printing machines with JDF technology and its advantages are being used in printing facilities.

Regardless of the quality and the high computer development of the printing press, a person can not fully exploit its capability if he or she doesn't know the machine's language.

It is important to note that the formalization and the standardization isn't something that began yesterday. The dictionary of the printing profession is five hundred years old and without it you won't be able to operate CTP, nor any other modern machine.

Desk Top Publishing, as a technological novelty that emerged twenty years ago, could be utilized in pre-press only after the digitalization of the lead typesetting. With the existence of DTP there hasn't been any new typography; most of the rules and relations that have been developed and improved for hundreds of years are still being used today, only in a slightly different form or file. Old rules about letter legibility and typography that have been remediated for centuries are still in power today in the digital age to improve printed information transfer.

The age of old printing branch of business created not only letters but also a visual representation of characters (bold, italic, underline), which represents one of the elements of a dictionary for further communication. In the digital age it has merely been translated into a new form of writing, a new milieu.

Connecting conventional printing terminology with the algorithms for making the normative data base is the first step toward introducing JDF-based information systems. There are number of variables with a very technical meaning. It is a dictionary not being used in textbook conversations and thus it allows the use of national terms. Such technical dictionary presumes hiring expert teams of people who know the machine park, printing vocabulary, products, and the vocabulary of the publisher, the designer and the graphic artist. The JDF method and its application is a great way of explaining the necessity of team work. Maybe that is the reason why the best quality of work can be seen in big facilities. Small printing offices still resort to hybrid solutions.

prijevod_id	hrv	slo	engl
1	Adresa	Naslov	Address
3	Aktiviraj	Aktiviraj	Activate
11	Araka iz skladišta	Pol iz skladišča	Sheets from warehouse
12	Araka iz tiska	Pol iz tiska	Sheets from print
13	Araka papira za stroj	Pol papirja za stroj	Sheets of paper for the machine
17	Boja	Barva	Color
40	Broj ploča	število plošč	Number of plates
41	Broj ploča plan	Število plošč plan	Number of planned plates
42	Broj ponude	Številka ponudbe	Offer number
43	Broj priprema stroja	Število priprav stroja	Number of machine setups
46	Broj različitih araka	Število različnih pol	Number of various sheets
47	Broj različitih setova	Število različnih kompletov	Number of various sets
48	BROJ RN	ŠTEV. DN	WO NO.
49	Broj stranica	Število strani	Number of pages
53	Broj verkova	Število tisk. Členov	Number of printing stations
54	Brzina	Hitrost	Speed
55	Brzina/h	Hitrost/h	Speed/h
56	cijena	cena	price
57	CIJENA	CENA	PRICE
616	TISAK-DODATAK	TISK-DODATEK	PRINT-ADDITION
622	Tiskarski stroj	Tiskarski stroj	Printing machine
623	TR (tisak roto)	TR (tisk roto)	WF (web-fed print)
625	Trošak	Strošek	Expenses
626	Trošak izmjene ploča	Strošek menjave plošč	Cost of changing plates
627	Trošak materijala	Strošek materiala	Expenses for material
628	Trošak pranja	Strošek pranja	Cost of washing
629	Trošak pripreme	Strošek priprave	Cost of preparation
630	Trošak stroja	Strošek stroja	Machine expenses
631	Trošak tiska	Strošek tiska	Cost of printing
645	Ukupna težina	Skupna teža	Total weight
646	Ukupni dodatak	Skupni dodatek	Total number of additions
.			
.			
.			

Figure 7. Depiction of a part of the dictionary of printing profession for describing procedures in printing with English and Slovenian translation