Typesetting bibliographies compliant with the ISO 690 standard in \LaTeX

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Abstract

The preparation of bibliographic references and citations compliant with the international standard ISO 690 is required by many institutes worldwide. However, the typesetting of bibliographies conforming to the respective standard is not yet supported in the \LaTeX document preparation system. The \texttt{biblatex-iso690} package has been revised and improved to fully meet the requirements of the international standard and thus greatly simplifies the typesetting of bibliographies for all kinds of information resources.

1 Introduction

Writing an article, paper or any other kind of work requires incorporating other resources which need to be referenced and cited properly. The preparation of bibliographic references and citations is mainly required to comply with the international standard ISO 690 in Czech academia (Kratochvíl et al., 2011). This article briefly introduces the standard \texttt{ISO 690} and then describes various existing software implementations that incorporate the standard. It then details the typesetting of bibliographies in the \LaTeX preparation system and finally describes the package \texttt{biblatex-iso690}, the first complete implementation in \LaTeX that is compliant with the latest version of the standard ISO 690.

2 International standard ISO 690


2.1 Terminology

There are two key terms regarding the standard (ISO 690, 2010) which need to be explicitly defined for clear understanding of this paper. They are:

- **citation** an indication within the text or other form of content of a relevant reference;
- **reference** data describing a resource or part thereof, sufficiently precise and detailed to identify it and to enable it to be located.

2.2 Consistency principle

The international standard ISO 690 does not prescribe a particular style of reference or citation. The examples used in the standard are not prescriptive as to style and punctuation. These facts embrace two findings:

1. the separation of form and content is preserved,
2. the standard cannot be considered as a citation style (Hála, 2013).

At the same time, it is recommended that a uniform style, format and punctuation scheme be used for all references in a document, regardless of the particular style being used. It is up to the creator of the references to meet this requirement, drawing on examples shown in the standard itself, in various national interpretations, or in typical typesetting of bibliographies.

3 Typesetting of bibliographies in \LaTeX

The \LaTeX document preparation system provides three possibilities for typesetting bibliographies (Talbot, 2013). The first approach is to use \LaTeX itself to generate the bibliographies, while the other two adhere to the principle of separation of form and content and benefit from creating an external database of bibliographic data and using an application to generate the output.

3.1 Standard \LaTeX

The \texttt{thebibliography} environment for references and the \texttt{\cite} command family for citations are available in \LaTeX. Each single reference is then mentioned as \texttt{\bibitem} with its unique identifier in the \texttt{thebibliography} environment.

\begin{verbatim}
\documentclass{...}
\begin{document}
... \texttt{\cite{label01}} ... \\
\begin{thebibliography}{⟨widest label⟩}
\bibitem{label01}
Author. \textit{Title: subtitle}. ... \\
\end{thebibliography}
\end{document}
\end{verbatim}

This snippet of code shows the basic syntax of this approach and reveals how impractical it is for a large number of citations (Talbot, 2012). The main drawbacks are:

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1. all entries listed in the `thebibliography` environment are typeset, regardless of whether they are cited,
2. every bibliography entry has to be entered and formatted manually for every desired bibliography style,
3. bibliography references are not sorted, but output in the order in which they are listed in the `thebibliography` environment.

ISO 690 does not prescribe any guidelines for dealing with the first disadvantage, but such results do not follow the general recommendations for bibliographies (Talbot, 2013). Regarding the second limitation, it is very difficult to ensure the consistency of references; regarding the third drawback, it is impossible to output references in the correct order for any method of citation introduced in the standard.

What is missing from this approach is reusability of the bibliographic entries and scalability of the list. On the other hand, one of its great strengths is relatively fast document compilation, as it only needs to be compiled twice using the TeX engine.

### 3.2 BibTeX

The preferred method of generating a bibliography is to create an external bibliography database (see section 3.4) and use an application to generate the output (Talbot, 2013). Such applications can deal with typesetting references in the correct order, solving the third issue. Also, based on the selected bibliography style, solving the second issue, they generate the `thebibliography` environment which can then be input into the document. One typical representative of this method is BibTeX, which adheres to the principle of separating the form and content.

The \texttt{\bibliographystyle} command is used to define the desired bibliography formatting style; the \texttt{\bibliography} command specifies an external bibliography database to use and also the location where the list of references is to be printed. The \texttt{\cite} family commands are used to create citations within the document text pointing to the desired references. It is also possible to use the \texttt{\nocite} command to add the bibliography entry to the list of references without printing a citation within the text, addressing the first problem.

\begin{verbatim}
\documentclass{...}
\bibliographystyle{[formatting style]}
\begin{document}
\cite[additional info]{[list of labels]} \ldots
\bibliography{[list of database files]}
\end{document}
\end{verbatim}

While this brief introduction to BibTeX seems promising, it conceals a raft of problems, not least of which is that development of the BibTeX program is stagnant (Patashnik, 1994; Patashnik, 2003). The main disadvantages and limitations are as follows:

1. input encoding problems (“BibTeX”, 2010) (although an alternative solution is available),
2. designing your own BibTeX styles is rather difficult (Patashnik, 1988) (although an alternative solution for making BibTeX styles is available),
3. a shortage of citation customizations (Shell et al., 2007) (although more flexible solutions are available),
4. absence of contemporary fields widely used nowadays, e.g. the \texttt{url} field (although an alternative solution is available),
5. lack of translations and multilingual bibliographies (Harders, 2002) (although an alternative solution is available).

To typeset your document properly, it is necessary to compile your document at least three times using the TeX engine and at least once more with the BibTeX program. The overall procedure to be applied (Markey, 2009) is as follows:

\texttt{\LaTeX} (\texttt{BibTeX} \texttt{LaTeX}) $^+$ \texttt{LaTeX}

Generating a bibliography using BibTeX in comparison with the plain \LaTeX introduces more complexity, but it does successfully mitigate most of the aforementioned limitations.

### 3.3 BibMTEX

Another option for generating a bibliography via an external database and an application for compiling it is the BibMTEX package of\LaTeX. This package is a complete reimplementation of the bibliographic facilities provided by \LaTeX, usually referred to as a successor of an ancient BibTeX package (“BibTeX”, 2010; Hufflen, 2011). Formatting the bibliography is entirely controlled by TeX macros, while processing a bibliography database file (see also section 3.4) can use the new \texttt{biber} backend program (Lehman et al., 2016).

The usage of BibMTEX differs slightly from traditional BibTeX since it provides more advanced bibliographic facilities for use with \LaTeX. From the user’s perspective, a different syntax is noticeable. Formatting styles are specified as a load-time package option in the optional argument to \texttt{\usepackage}.

\footnote{1 https://www.ctan.org/pkg/bibtex8bit}
\footnote{2 https://www.ctan.org/pkg/custom-bib}
\footnote{3 https://www.ctan.org/pkg/natbib, https://www.ctan.org/pkg/cite}
\footnote{4 https://www.ctan.org/pkg/natbib, https://www.ctan.org/pkg/babelbib}
\footnote{5 https://www.ctan.org/pkg/babelbib}

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Bibliography database files are specified in the document preamble with the `\addbibresource` command using the full name of the file (including .bib extension). The list of references is generated with the `\printbibliography` command; it is output at the position of this command in the document. To create citations within a text of a document, the `\cite` command and its variants are used. The basic structure is as follows:

```latex
\begin{document}
\addbibresource{database01.bib}
\addbibresource{database02.bib}
\cite{...}
\printbibliography
\end{document}
```

Bib\LaTeX\ succeeds in overcoming many of the limitations found in Bib\TeX, the most important of which are ("Bib\LaTeX", 2016):

1. full Unicode support,
2. highly customizable sorting and bibliography labels,
3. polyglossia and babel support for automatic language switching for bibliographic entries and citations,
4. more entry types and fields,
5. ease of designing new bibliography and citation styles.

This list could be extended to cover more of the rich functionality provided by the Bib\LaTeX package (Lehman et al., 2016). There are very few drawbacks to this package, a notable exception being the incompatibility of Bib\LaTeX auxiliary files when submitting to a journal ("Biblatex: submitting to a journal", 2011).

Document compiling is analogous to the Bib\TeX approach. First, a document is compiled by \TeX engine, followed by running biber on a generated auxiliary .bcf file, and then compiled by the \TeX engine once again. Thus, the Bib\LaTeX schema for compiling a document is as follows:

```latex
latex document[.tex]
biber document[.bcf]
latex document[.tex]
```

The file extensions are optional.

### 3.4 Bibliography database (.bib file)

For the sake of completeness, it is necessary to introduce the bibliography database .bib file as well. This file contains bibliography entries: each entry has a specific type (the word after @), a unique label and a number of tags (key–value pairs) defining resource data. The general schema of an entry looks like the following ("Bib\TeX Format Description", 2006):

```latex
@\{entry type\}@\{\label\},
\langle field \rangle = \{\langle value \rangle\},
\ldots
\langle field \rangle = \{\langle value \rangle\},
```

All of the entry types supported by Bib\LaTeX can be used directly, or via an alias also supplied with the Bib\LaTeX package. Bib\LaTeX introduces more types in addition to the traditional ones, with the possibility of defining completely new ones.

The same situation applies to entry fields. The Bib\LaTeX package provides backward compatibility with all of the Bib\TeX fields and adds extra ones. In addition to regular fields, there are so-called special fields which can contain additional settings related to an entry, e.g. to specify the language on a per-entry basis for multilingual bibliographies.

### 3.5 Summary

The basic functionality of \LaTeX for generating a bibliography can be appropriately used for a small number of citations in a document. However, in the case of a large number of citations, it is best to use an external bibliographic application. This approach adheres to the principle of separating the form and content, which results in high scalability and reusability of bibliography entries and makes working with references more flexible and efficient.

Besides Bib\LaTeX — the traditional representative of this method — many other applications based on it are in existence. However, all of them inherit the limitations of Bib\LaTeX. This is mainly the case with the formatting styles used, although some applications work towards replacing the BST (Bib\LaTeX Style) language with more modern languages — mostly XML (Hufflen, 2011; Hufflen, 2008).

It emerges from the large variety of options for typesetting a bibliography in \LaTeX (Talbot, 2013; Mittelbach et al., 2004) that the best choice nowadays is the Bib\LaTeX package with its backend application biber (Hufflen, 2011; Kime et al., 2016).

### 4 ISO 690 implementations

This section introduces existing software products, tools and services which incorporate the ISO 690 standard. The first two mentioned here are designed to be used with the \LaTeX document preparation system; the CSL language is covered thanks to its newfound popularity and the OPMac-bib package because it is a rare example among all available packages which delivers full support for this particular standard. A
more comprehensive overview of the available solutions can be found in the author’s bachelor’s thesis — written in Slovak (Lupták, 2016).

4.1 czechiso

For the Czech versions of the standard — ČSN ISO 690:1996 (ČSN ISO 690, 1996) and ČSN ISO 690-2:2000 (ČSN ISO 690-2, 2000) — there is an unofficial formatting style, `czechiso`, created by David Martinek in 2006 (Martinek, 2006). This implementation does not meet the requirements of the standard precisely, as it lacks some of the required fields for bibliographic entries. Many of the functions responsible for printing out a reference correctly are in need of rewriting to fully conform to the standard.

4.2 biblatex-iso690

The first version of the bibliography and citation style for Bib\LaTeX{} conforming to the standard ISO 690 dates back to 2011. This implementation was based on the previous versions of the standards (ČSN ISO 690, 1996; ČSN ISO 690-2, 2000) and on its Czech interpretation (Bratková, 2008). The package was created by Michal Hoftich (Hoftich, 2011). As with czechiso, this solution did not precisely adhere to the standards. Many issues related to the functionality of the package as well as the usage of this style were reported on the homepage of the project. Thanks to completely revamping the style in 2016, the package fully meets the requirements of the standard at its current stage of development (see also subsection 5).

4.3 The CSL language

The Citation Style Language (CSL) is an open XML based language for working with bibliographies. It became popular with the release of the Zotero reference manager in 2006 (Fenner, 2010).

The main advantage of this language is its XML syntax, closely followed by its popularity, open source initiative and the versatility of CSL (Ansorge et al., 2013). Another undisputed benefit is its almost universal application, as testified to by the extensive list of products using CSL styles that appears on the official web page of the CSL project (Zelle, 2016a). The best known are Zotero, Papers and Mendeley.

The CSL style repository has over 8000 styles, including 15 styles for the ISO 690 standard. These styles differ in their localization and methods of citation, hence the vast number of styles for just one standard. All of them contain minor deviations from the standard ISO 690. CSL is not, however, without its limitations (Zelle, 2016b):

- limited support for customizing the label format,
- limited support for legal styles (Multilingual Zotero can be used as an alternative),
- limited support for citing items in multiple languages within a single document (Multilingual Zotero can be used as an alternative),
- limited support for entering date ranges into the date field (no entry is generated).

It should be added that Bib\LaTeX{} does not suffer from these limitations (Lehman et al., 2016).

4.4 OPmac-bib

The OPmac package defines additional macros on top of plain \TeX{}, providing functionality similar to core \LaTeX{}. The additional package, OPmac-bib, comes with it and is available for bibliography functionality. No external program for generating a bibliography is needed, as everything is handled by \TeX{} macros and the librarian.tex package created by Paul Isambert. The OPmac package was created by Petr Olsák and has been shipping with the cspplain package since 2015. More details about the OPmac package can be found in another article (Olsák, 2016).

OPmac-bib can process all of the traditional types and fields of Bib\LaTeX{} and furthermore, it introduces new fields which are commonly needed when working with bibliographies nowadays. These fields are, for example, `url`, `doi` or `lang`, which eliminate the need of using a `note` field for providing such data. Hence it is possible to output this data in the correct order in accordance with the standard.

While Bib\LaTeX{} lacks many needed types and fields, OPmac-bib has improved the situation considerably. But still, the standard is so complex that even OPmac-bib does not handle all of the requirements that the standard introduces. OPmac-bib can, however, deal with this very reasonably. The package provides some versatile fields which can be used for entering bibliographic data along with the formatting macros to customize the field. Hence one can achieve the desired output: option and ednote are examples of such fields.

The `option` field can be used for entering other titles, translations of titles, etc. This field allows the correct output conforming to the latest version of the standard to be achieved.

The `ednote` field can be used for entering secondary authors or other additional information. The formatting of this field is not further processed, so the entered value is output as is. Hence one has to be careful to conform to the standard when entering the data. Typical examples of such data are translators or originators of multiple editions.

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The availability of these additional fields and full customization allows for generating a bibliography that conforms to the standard ISO 690.

5 The biblatex-iso690 package

Of all the implementations incorporating ISO 690 mentioned in the previous section, only one is relevant to typesetting a bibliography in \LaTeX, namely the biblatex-iso690 package. The original implementation deviated from the standard, but since its review, the biblatex-iso690 package is fully compliant with the latest version of the international standard ISO 690.

The original biblatex-iso690 package contained the following defects and drawbacks:

- followed outdated editions of the standard,
- incorrect order of elements,
- redundant or missing punctuation,
- missing some types of resources,
- missing some required elements,
- missing creator secondary responsibility,
- obsolete and deprecated code.

An analysis of the original state of biblatex-iso690 resulted in its complete reimplemention. Printing the bibliography elements in the correct order in a reference was crucial, but not the only change. Almost all macros, commands and definitions for parsing fields from the .bib database file were refactored. Many requirements of the standard could be met simply by using the author interface of the \BibTeX package. For other requirements, it was necessary to refine some of the low-level macros, and still others were left to the programmer of the bibliography database as they could not be solved algorithmically. The known limitations are:

- lack of support for the running notes citation method,
- url addresses wrapping,
- algorithmic solution for (not) printing a first edition of a resource,
- algorithmic solution for (not) printing only the first publisher,
- algorithmic solution for (not) printing only the first location (e.g., of publication),
- the term Anon for anonymous works,
- localization string nodate for no date.

5.1 Methods of citation

The ISO 690 standard prescribes three citation methods of information resources. The first is the aforementioned running notes method, then there is the so-called Harvard system (also known as author-date), and lastly the numeric system. In the biblatex-iso690 package they are available as iso-author-year and iso-numeric. The formatting style is specified as a package option when loading \BibTeX, e.g., \usepackage[style=iso-numeric]{biblatex}

5.2 Package options — customization

ISO 690 does not prescribe any particular style, format or punctuation scheme for the references to be used. Frequently requested customizations (to style, format or punctuation scheme) are available as biblatex-iso690 package options. These are:

- \texttt{spacecolon=[true|false]} changes the printing of colons in subtitles and publication information:
  - Place : Publisher
  - Place: Publisher
- \texttt{pagetotal=[true|false]} prints a total number of pages of a resource as optional information in square brackets:
  - Place : Publisher, 2008 [60 p.]
  - Place : Publisher, 2008
- \texttt{shortnumeration=[true|false]} distinguishes volumes and pagination typographically:
  - ... 2011, 32(3), 289–301
  - ... 2011, vol. 32, no. 3, pp. 289–301
- \texttt{thesisinfoinnotes=[true|false]} to specify the position of thesis information:
  - ... Available from: ⟨\url⟩. BT. MU, FI, Brno. Supervisor Petr SOJKA
  - ... BT. MU, FI, Brno. Supervisor Petr SOJKA. Available from: ⟨\url⟩

5.3 Integration into the fithesis3 class

fithesis3 is the official document class for the typesetting of theses at Masaryk University (Brno, Czech Republic) in \LaTeX (Novotný et al., 2015). This class has been designed for easy style extensibility and for local files from other academic institutions. It was also an obvious request to integrate the biblatex-iso690 package into the fithesis3 template. This integration has been done in cooperation with the maintainer of the fithesis3 package — Vít Novotný — and consists of the following steps:

- the \texttt{bib} key added to the package metadata section, which can be used to specify a list of .bib database files,
- the citation method is loaded automatically based on the selected faculty,
- the list of references is printed automatically at the end of a document,
all bibliography management can also be set up manually (see section 3.3).
\documentclass{fithesis3}
\thesissetup{
... 
    bib = \{database.bib\}
... }
\begin{document}
... \cite{...} ...
\end{document}

5.4 Availability

As already mentioned, until now there was no official support for the ISO 690 standard in \LaTeX. However, \texttt{biblatex-iso690} package has acquired official status after the revision and is now available from CTAN as the package \texttt{biblatex-iso690}. Under the same name it is also available in the \TeX{} Live distribution since \TeX{} Live 2016.

6 Summary

This paper describes typesetting a bibliography in \LaTeX{}, compliant with the international standard ISO 690. The standard was introduced at the beginning, followed by considerations of three methods of typesetting a bibliography in \LaTeX{}. There are many implementations incorporating the standard ISO 690 but the \texttt{biblatex-iso690} package holds the most interest: after its initial implementation in 2011, it was revised in 2016 to fully meet the requirements of the most recent version of the standard. References in this article are generated using the reimplemented package \texttt{biblatex-iso690}, to serve as a demonstration.

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References

\texttt{BibTeX}: Process bibliographies for \LaTeX{}, etc. 2010. \texttt{CTAN}: The Comprehensive \TeX{} Archive Network [online] [visited on 2016-05-14]. Available from: https://www.ctan.org/pkg/bibtex.

\texttt{BibLaTeX}: Sophisticated Bibliographies in \LaTeX{}, 2016. \texttt{CTAN}: The Comprehensive \TeX{} Archive Network [online] [visited on 2016-05-14]. Available from: https://www.ctan.org/pkg/biblatex.


\texttt{BibTeX Format Description}, 2006. \texttt{BibTeX.org} [online] [visited on 2017-05-08]. Available from: http://www.bibtex.org/Format.


\texttt{HOFTICH}, Michal, 2011. The \texttt{biblatex-iso690} package: ISO 690 style for \texttt{\LaTeX} [GIT] [visited on 2016-12-29]. Available from: https://github.com/michal-h21/biblatex-iso690.


ZELLE, Rintze. 2016a. *CitationStyles.org* | *The Citation Style Language: open and free citation styles* [online] [visited on 2016-05-17]. Available from: http://citationstyles.org/.

ZELLE, Rintze. 2016b. *CitationStyles.org* [online] [visited on 2016-05-17]. Available from: http://citationstyles.org/styles/.

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