

Equipe abnT_EX2

**Modelo Canônico de
Trabalho Acadêmico com abnT_EX2**

Brasil

2015, v<VERSION>

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Modelo Canônico de Trabalho Acadêmico com abnT_EX2

Modelo canônico de trabalho monográfico
acadêmico em conformidade com as normas
ABNT apresentado à comunidade de usuários
L^AT_EX.

Universidade do Brasil – UBr
Faculdade de Arquitetura da Informação
Programa de Pós-Graduação

Orientador: Lauro César Araujo
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Brasil
2015, v<VERSION>

*Este trabalho é dedicado às crianças adultas que,
quando pequenas, sonharam em se tornar cientistas.*

Agradecimentos

Os agradecimentos principais são direcionados à Gerald Weber, Miguel Frasson, Leslie H. Watter, Bruno Parente Lima, Flávio de Vasconcellos Corrêa, Otavio Real Salvador, Renato Machnievscz¹ e todos aqueles que contribuíram para que a produção de trabalhos acadêmicos conforme as normas ABNT com L^AT_EX fosse possível.

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¹ Os nomes dos integrantes do primeiro projeto abnT_EX foram extraídos de <<http://codigolivre.org.br/projects/abntex/>>

² <<http://www.cpai.unb.br/>>

³ <<http://groups.google.com/group/latex-br>>

⁴ <<http://groups.google.com/group/abntex2>> e <<http://www.abntex.net.br/>>

*“Não vos amoldeis às estruturas deste mundo,
mas transformai-vos pela renovação da mente,
a fim de distinguir qual é a vontade de Deus:
o que é bom, o que Lhe é agradável, o que é perfeito.
(Bíblia Sagrada, Romanos 12, 2)*

Resumo

Segundo a [ABNT \(2003, 3.1-3.2\)](#), o resumo deve ressaltar o objetivo, o método, os resultados e as conclusões do documento. A ordem e a extensão destes itens dependem do tipo de resumo (informativo ou indicativo) e do tratamento que cada item recebe no documento original. O resumo deve ser precedido da referência do documento, com exceção do resumo inserido no próprio documento. (...) As palavras-chave devem figurar logo abaixo do resumo, antecidas da expressão Palavras-chave:, separadas entre si por ponto e finalizadas também por ponto.

Palavras-chave: latex. abntex. editoração de texto.

Abstract

This is the english abstract.

Keywords: latex. abntex. text editoration.

Lista de ilustrações

Lista de tabelas

Lista de abreviaturas e siglas

ABNT	Associação Brasileira de Normas Técnicas
abnTeX	ABsurdas Normas para TeX

Lista de símbolos

Γ	Letra grega Gama
Λ	Lambda
ζ	Letra grega minúscula zeta
\in	Pertence

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1 Introduction

This thesis is essentially about open data. Given the growing importance of the topic, open data is analysed through several points of views. Although looking at it from the Computer Science perspective, it was not possible to skip political, social and economical aspects while presenting the topic. This work should thus be regarded as a multidisciplinary effort to describe a topic that is heavily related to Computer Science, but far from being restricted to it.

This introductory chapter explains the motivations behind the topic of open data, highlighting some problems observed in the literature. The objective of the thesis is posed, alongside the hypothesis from where we start, and the methodology for dealing with it. Finally, we describe the structure of the rest of the thesis.

1.1 Motivation

Current numbers about the open data scene leaves no doubt about the central importance of this topic in today's society. The [Open Data Index](#) monitored in 2015 datasets published by 122 countries all over the world, on topics related to budget, national statistics, procurements, maps and others. Regarding the European landscape, the [Open Data Monitor](#) counts 173 catalogues in the continent, which sums an amount of 1472 GB of data.

The movement towards opening datasets is based in a series of access to information laws. According to the [right2info.org](#) platform, these are laws that “establish the right and procedures for the public to request and receive government-held information”. ([VLEUGELS, 2012](#)) presents a comprehensive list of 273 Freedom of Information Acts (FOIA), being 93 of national, 180 of sub-national and 3 of international scope. Even though the first occurrence of this kind of law dates from 1766, in Sweden, the vast majority of them were created after the year 2000.

It is no coincidence that 9 years later, United States and United Kingdom launched their Open Data Portals (ODPs), a one-stop-shop for publishing and consuming government data. Nowadays, several countries already implemented their ODPs, together with numerous states and municipalities. Universities and research centres are also joining strategies for putting data available on the Web. More than 1600 ODPs were surveyed by [OpenDataSoft](#). This movement is growing so fast and potentially disruptive that the United Nations has called the attention for a “Data Revolution” ([Data Revolution Group, 2014](#)).

On the opposite direction of the open data enthusiasts, there is a perception that

the promises brought by it are still for being concreted.

1.2 Open data impediments

Despite its recent popularity, Open Data and Open Data Portals still face significant impediments, as richly described by Zuiderwijk et al [Zuiderwijk et al. \(2012\)](#). The authors collected 118 socio-technical impediments for use of open data from interviews, workshops and literature. Some cited impediments were “absence of commonly agreed metadata”, “insufficiency of metadata”, “the lack of interoperability” and “difficulty in searching and browsing data”, showing that a great challenge for ODPs is the organization of data.

The open data organization challenge can be subdivided into two aspects: 1) structuring and organizing the datasets themselves and 2) providing well-structured and organized metadata for the datasets. The first aspect was, for example, tackled by approaches for semantic lifting of data by ([ERMILOV; AUER; STADLER, 2013](#)) and ([DING et al., 2011](#)), who tried to build general strategies for putting large open government datasets in the Link Data cloud. For the standardized structuring metadata, the Data Catalog Vocabulary (DCAT)¹ ([CYGANIAK; MAALI; PERISTERAS, 2010](#)) was developed. However, the cross-portal metadata alignment and reconciliation can not be addressed by DCAT.

Besides the data organization challenge, another very much cited impediment to the use of open data is the lack of capacity of individuals and groups for dealing with open data. There has been a recently growing consensus on defining this individual and collective capacity for dealing with data under the concept of *Data Literacy*.

As observed by Bhargava and D’Ignazio ([BHARGAVA; IGNAZIO, 2015](#)), one of the first mentions of the term *Data Literacy* called the attention for its importance on the context of evaluation of information, together with Information literacy and statistical literacy. In 2004, Schield reinforced the important of teaching these three literacies for “students who need to critically evaluate information in arguments” ([SCHIELD, 2004](#)).

Although not mentioning directly the term Data Literacy, the above cited collection of impediments of open data dedicates a section for problems related to *understand ability*. Among them we find, for example, “Lack of skills and capabilities to use the data and” and “Lack of knowledge about how to interpret the data”, which relates directly to the topic of Data Literacy.

¹ Available at <http://www.w3.org/TR/vocab-dcat/>

1.3 Hypothesis

In the light of the theoretical benefits of open data, and the impediments that hinder the achievement of these benefits, we formulate two hypothesis in order to guide the development of this thesis:

H1 Enhancing the organization of open data repositories leads to better use of open data;

H2 Increasing the level of data literacy on the society leads to better use of open data (which in turn motivates better publishing).

1.4 Objective

To develop approaches both from user perspective and from publisher perspective in order to advance towards the benefits of open data. Specifically:

- From the publisher perspective, and recognizing that the lack of organization of ODPs is a problem, to develop an approach for cleaning, reconciliation, and semantic lifting of metadata;
- From the user perspective, and recognizing the lack of abilities for dealing with data, to develop a data literacy approach

1.5 Methodology

The methodology used to develop this thesis is composed by several steps.

- Literature revision, described in chapter [2](#)
- Participatory research, described in chapter [3](#)
- Objective alignment
- New and deeper literature revision, described in chapter [4](#)
- System development
- Validation: In order to validate our approach, experiments and objective metrics were developed. Specifically:
 - Hypothesis [1](#) was validated by measuring the ODP metadata related parameters;
 - Regarding Hypothesis [2](#), the developed data literacy method was applied and results were analysed.

1.6 Structure of the thesis

This thesis is organized as follows:

1. Motivation;
2. Open data – an overview;
3. Data literacy – towards popularizing the use of open data.²
 - a) Motivation
 - b) Literature Revision
 - c) Proposed Approach
 - d) Validation
 - e) Conclusions
4. Cleaning up open data through metadata reconciliation ³.
 - a) Motivation
 - b) Literature Revision
 - c) Proposed Approach
 - d) Validation
 - e) Conclusions
5. Conclusions
6. Bibliography

² This Section will be an extension of (TYGEL; CAMPOS; ALVEAR, 2015)

³ This Section is expanded from (TYGEL et al., 2016b) and (TYGEL et al., 2016a)

2 Open Data

Open data has recently become a very popular concept. As discussed in the previous chapter, open data is currently part of an important political debate related to transparency, citizen participation, and essentially to improving democracy. In this chapter, we drive an overview about open data, focusing on the technologies supporting open data, on its fields of application, and on the problems and challenges collected from the literature.

2.1 Historical Notes

Although present in the scientific world for a long time, the concept and term “open data” started to be used in the Web context only since 2006. The open source software movement fights since the 1980’s for the source code of software to be open and free¹. However, with the popularization of the Web, the increased speed in transmission rates, and the widely spread concept of Web Application, it was recongnized that opening the source code was not enough for the unrestricted flow of knowledge through the Web. It was necessary that, beyond the code, public data could also be open, and also considered a common good, a thus not subject to private appropriation.

According to Chignard ([CHIGNARD, 2013](#)), in 2007, a meeting between thinkers and activists in Sebastopol, USA, defined some concepts about open data, and some strategies in order to effectively apply it. The basic idea is that public data are of common property, as well as in the scientific world.

2.2 Technology for Open Data

2.3 Open Data Applications

2.3.1 Open Data for Government

2.3.2 Open Data for Research

2.3.3 Open Data for Civil Society Organizations

2.4 The Problems of Open Data

([ZUIDERWIJK et al., 2012](#)), ([ZUIDERWIJK; JANSSEN, 2014](#))

¹ Richard Stalman always remembers that this “free” has the sense of “free speech”, and not the sense of “free beer”

2.4.1 Data Divide?

([Data Revolution Group, 2014](#)): “There are huge and growing inequalities in access to data and information and in the ability to use it” “risks of harm and abuses of human rights will grow”

([GURSTEIN, 2011](#))

2.5 Open Data Impacts

2.6 Open Data Value

3 Data Literacy

The growing tendency of liberating large amounts of data into the Web is so strong that has recently being named as “Data Revolution” ([Data Revolution Group, 2014](#)). Meanwhile, the necessary skills for dealing with data – both from the consuming and publishing sides – are still to be developed by the interested stakeholders. These stakeholders can be government servants and academic researchers, but also members of social movements and civil society, community or grassroots organizations. It is fundamental to guarantee equal opportunities for learning data skills in order to avoid enlarging the data divide mentioned in Section 2.4.1. In this chapter, we present theoretical and practical contributions to data literacy.

Our main contributions are:

- A literature revision about data literacy and related areas;
- Theoretical considerations on the application of popular education principles to data literacy; and
- A methodology and the research associated with the development of an open data course for social movements.

In the following, we first provide an overview of the Data Literacy field, which is currently being developed. Being a very recent field of academic studies, we propose in Section 3.2 some theoretical contributions, adapting the work of the Brazilian pedagogue Paulo Freire to the Data Literacy field, and defining the concept of Critical Data Literacy. Finally, in Section 3.3, we present a method for teaching Data Literacy for social movements, which was applied and evaluated.

3.1 An overview on Data Literacy

3.2 Contributions of Paulo Freire for a Critical Data Literacy

3.3 Teaching Open Data for Social Movements: action and research for open data engagement

4 Semantic Metadata for Open Data Description

4.1 Tagging

The vast majority of scientific works about tagging and semantics focus on a different kind of context in relation to ours. Grubbers seminal paper ([GRUBBER, 2007](#)), and others such as ([HALPIN; ROBU; SHEPHERD, 2007](#); [MARCHETTI; ROSELLA, 2007](#); [KNERR, 2006](#); [MIKA, 2007](#); [KIM et al., 2008](#); [KIM et al., 2011](#)) give interesting perspectives about the tagging activity and its relation to semantics, but always in the folksonomy (or collaborative tagging) context. In this case, tags are attributed to resources by the crowd, passing through a crowd-selection mechanism, which can enhance the tagging quality, but inserts some inherent noise. This is applicable to platforms such as del.icio.us or flickr, where several users can tag the same resource. However, in the open data portals context, tags are only attributed by system managers. Although less noisy, this procedure is biased by few taggers. The tag server approach described in this paper adds collaborative reconciliation layer over the ODPs.

In relation to the metrics for tagging environments, some related ideas could be found in the literature. For example, ([UMBRICH; NEUMAIER; POLLERES, 2015](#)) presents a framework to evaluate the quality of ODPs. Among the applied quality metrics, three of them – *Usage*, *Completeness* and *Accuracy* – are related to metadata keys, which tags are part of. *Usage* establishes which metadata keys are actually used in a portal; *Completeness* evaluates the presence of non empty values; and *Accuracy* checks if metadata adequately describes the data. However, this metric is not applied for tags.

Laniado and Mika did a similar analysis over hashtags on Twitter ([LANIADO; MIKA, 2010](#)). Their work is focused in answering if Twitter hashtags constitute *strong identifiers* for the semantic web. To achieve this, four metrics are used: frequency of hashtags; specificity, which is the deviation from the use of them without being a hashtag; consistency; and stability over time.

The problem of semantic lifting in ODPs was tackled by ([ERMILOV; AUER; STADLER, 2013](#); [DING et al., 2011](#)). In ([WAAL et al., 2014](#)), a strategy for lifting datasets in ODPs to the Linked Data cloud is presented. In all these works, however, the semantic lifting refers to the datasets, and not to metadata.

There also has been some work done with regard to metadata reconciliation ([LAWLER et al., 2012](#); [HOOLAND et al., 2012](#)). However, to the best of our knowledge none of them has been specifically applied to open data portals or leverages tag curation as

proposed by STODaP.

5 Semantic Tags for Open Data Portals

As observed in the previous chapter, one of the main problems related to open data lies in the poor organization of open data portals. According to studies ([ZUIDERWIJK et al., 2012](#)), the lack of useful metadata affects the find ability of data inside open data portals. In order to tackle this issue, we describe in this chapter the Semantic Tags for Open Data Portals - STODaP approach for improving the tag curation within and across ODPs.

Our main contributions are:

- A comprehensive analysis of tag usage in 90 ODPs, which justifies the need and benefits of better tools for managing tags;
- An approach for cleaning and reconciliation of tags in ODPs; and
- An approach for collaboratively connecting ODPs through meaningful shared tags.

In the first section, some considerations about metadata in open data portals are derived. In the following, the different concepts of tagging are put into perspective, in order to characterize tags in ODPs. Section 5.4 presents an analysis of the use of tags in several Open Data Portals, both from government and civil society side, and from various countries and languages. The main part of this chapter lies in Section 5.5, where our approach for semantic tags in open data portals is explained. Following sections presents some aspects about the implementation, the validation of the approach, and a conclusion.

5.1 Open Data Portals

Analysing large amounts of data plays an increasingly important role in today's society. However, new discoveries and insights can only be attained by integrating information from dispersed sources.

One approach for addressing the problem of data dispersion are data catalogues, which enable organizations to upload and describe datasets using comprehensive metadata schemes. Similar to digital libraries, networks of such catalogues can support the description, archiving and discovery of datasets on the Web. Recently, we have seen a rapid growth of data catalogues being made available to the public. The data catalogue registry datacatalogs.org, for example, already lists 285 data catalogues worldwide.

Data catalogues where data is supposed to be open, at least in the licensing sense, are usually called Open Data Portals (ODPs). Implementations that show the increasing

popularity of ODPs can be seen, for example, in open government data portals, data portals of international organizations and NGOs, as well as scientific data portals.

These ODPs comprise large amounts of structured data, mostly in the form of tabular data such as CSV files or Excel sheets. They aim to be a one-stop-shop for citizens and companies interested in using public data produced by governments or civil society organisations. Examples are the [US' data portal](#), the [UK's data portal](#), the [European Commission's](#) portal as well as numerous other local, regional and national data portal initiatives.

In the research domain ODPs also play an important role. An example of a popular scientific open data portals is the [Global Biodiversity Information Facility Data Portal](#). Also many international and non-governmental organizations operate ODPs such as the [World Bank Data Portal](#) or the data portal of the [World Health Organization](#).

Despite its recent popularity, Open Data and Open Data Portals still face significant impediments, as richly described in ([ZUIDERWIJK et al., 2012](#)). The authors collected 118 socio-technical impediments for use of open data from interviews, workshops and literature. Some cited impediments were “absence of commonly agreed metadata”, “insufficiency of metadata”, “the lack of interoperability” and “difficulty in searching and browsing data”, showing that a great challenge for ODPs is the organization of data.

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The metadata used to organize datasets in an ODP comprises categories or groups and most importantly labelling with free-text words or sets of words – the tags. The concept of tagging became popular within Web 2.0 services and aggregation tools like [del.icio.us](#). The main advantages of tagging are the ease of classifying, and the crowd effect – resulting in the so called folksonomies – because all users were allowed to tag and share their contents. Tagging datasets in an ODP cannot be considered as folksonomies, because the process is mainly driven by portal managers and data publishers, and not by the actual users. As a result of this, the structuring effect of crowd-tagging and folksonomies is missing in ODPs.

¹ Available at <http://www.w3.org/TR/vocab-dcat/>

A quick look over some ODPs reveals that most of them suffer from a very confusing organization of datasets. The first level of categorization uses the concept of groups. In general, they are stable and meaningful, but normally contain a large number of datasets. A more detailed classification should be done via tags, whose use in ODPs has the following issues:

- *Synonyms:* In most ODPs, there exists large number of synonymous tags, e.g., **crops** and **seeds**;
- *Different spellings of the same word:* Several tags are incorrectly written, or have differences in capitalization or accents, e.g., **baden-wuerttemberg** and **Baden-Württemberg**;
- *Lack of relationships:* There is no explicit relationships between the tags, e.g., **Community Centres** is clearly a specialization of **Community**, but this is not explicit;
- *Ambiguity:* As tags are written as pure text, ambiguity is prevalent in ODPs, e.g., the tag **apple**, which could refer to the fruit or to the company; and
- *Incoherence:* Tags do not allow any connection between different portals that use the same or equivalent tags, e.g., two datasets tagged with **budget** in different portals are not connected.

As a result, the navigation, exploration and search within individual, but in particular also across ODPs is significantly hampered.

5.2 Metadata in ODPs

5.3 The Concept of Tagging

5.4 An analysis of metadata in ODPs

5.5 STODaP Approach

5.5.1 Local Part - Cleaning up tags

5.5.2 Global Part - Semantifying tags and Interlinking Portals

5.6 STODaP Implementation

5.7 Use Case and Results

5.8 Conclusions

Introdução

Este documento e seu código-fonte são exemplos de referência de uso da classe `abntex2` e do pacote `abntex2cite`. O documento exemplifica a elaboração de trabalho acadêmico (tese, dissertação e outros do gênero) produzido conforme a ABNT NBR 14724:2011 *Informação e documentação - Trabalhos acadêmicos - Apresentação*.

A expressão “Modelo Canônico” é utilizada para indicar que `abnTEX2` não é modelo específico de nenhuma universidade ou instituição, mas que implementa tão somente os requisitos das normas da ABNT. Uma lista completa das normas observadas pelo `abnTEX2` é apresentada em Araujo (2015a).

Sinta-se convidado a participar do projeto `abnTEX2`! Acesse o site do projeto em <http://www.abntex.net.br/>. Também fique livre para conhecer, estudar, alterar e redistribuir o trabalho do `abnTEX2`, desde que os arquivos modificados tenham seus nomes alterados e que os créditos sejam dados aos autores originais, nos termos da “The L^AT_EX Project Public License”².

Encorajamos que sejam realizadas customizações específicas deste exemplo para universidades e outras instituições — como capas, folha de aprovação, etc. Porém, recomendamos que ao invés de se alterar diretamente os arquivos do `abnTEX2`, distribua-se arquivos com as respectivas customizações. Isso permite que futuras versões do `abnTEX2` não se tornem automaticamente incompatíveis com as customizações promovidas. Consulte Araujo (2015b) par mais informações.

Este documento deve ser utilizado como complemento dos manuais do `abnTEX2` (ARAUJO, 2015a; ARAUJO, 2015c; ARAUJO, 2015d) e da classe `memoir` (WILSON; MADSEN, 2010).

Esperamos, sinceramente, que o `abnTEX2` aprimore a qualidade do trabalho que você produzirá, de modo que o principal esforço seja concentrado no principal: na contribuição científica.

Equipe `abnTEX2`

Lauro César Araujo

² <http://www.latex-project.org/lppl.txt>

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Apêndices

APÊNDICE A – List of Publications

A.1 Peer-reviewed conferences

- TYGEL, A. F.; AUER, S.; DEBATTISTA, J., ORLANDI, F.; CAMPOS, M. L. M. . Towards Cleaning-up Open Data Portals: A Metadata Reconciliation Approach. To be presented at the 10th International Conference on Semantic Computing, Laguna Hills, California. February 3-5 2016.
- TYGEL, A. F.; ATTARD, J.; ORLANDI, F.; CAMPOS, M. L. M. ; AUER, S. . "How much?"Is Not Enough - An Analysis of Open Budget Initiatives. To be presented at ICEGOV 2016, Montevideo, March 1-3 2016.
- TYGEL, A. F. ; KIRSCH, R. . Contributions of Paulo Freire for a Critical Data Literacy. In: Data Literacy Workshop, 2015, Oxford. Proceedings of the Data Literacy Workshop, 2015.
- CARVALHO, L. ; RODRIGUES, F. ; FERREIRA, R. ; BRAGA, P. ; TYGEL, A. F. ; ALVEAR, C. A. S. ; PRIMO, R. . Software Livre e Metodologias Participativas - ensino e extensão em uma disciplina da Engenharia. In: Encontro Nacional de Engenharia e Desenvolvimento Social - ENEDS, 2015, Salvador. Anais do XII ENEDS, 2015.

A.2 Peer-reviewed journals

- TYGEL, A. F. ; LUIZA MACHADO CAMPOS, MARIA ; ALVEAR, C. A. S. . Teaching Open Data for Social Movements: a Research Strategy. Journal of Community Informatics, v. 11, p. 1, 2015.
- TYGEL, ALAN ; GONÇALVES, LEONARDO GONÇALVES ; SANTOS, MAYARA ; MARQUES, GABRIEL ; LUIZA MACHADO CAMPOS, MARIA . Informação para Ação: Desenvolvimento de um Portal de Dados Abertos Sobre Agrotóxicos. Revista Tecnologia e Sociedade, v. 11, p. 99-119, 2015.

A.3 Book chapters

- TYGEL, A. F. ; Tecnologias da Informação e Comunicação e Movimentos Sociais: o Caso da Cooperativa EITA. In: Felipe Addor e Flávio Chedid. (Org.). Tecnologia,

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