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# TOPIC CURATION: MANUAL VS. AUTOMATED

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# CONTENTS



- I. Conceptual Introduction

Topic, Curation, and Cleaning

- II Two real world applications:

Tax Information and Academic Books

- III A Practical Approach



# I. CONCEPTUAL INTRODUCTION



# BIG DATA

- Data Analytics:
  - Text, Voice, Image, Sentiment Analysis
- Search Engine  
Proprietary  
Technologies
- Artificial Intelligence,  
Machine Learning
- You are lucky to find what you need.
- There is so much out there that you practically always find something.
- Cleaning not relevant.



# SMALL DATA

- Information owners know their content.
- They want their users to make the best of it.
- Good content is key to success.
- Data usually structured
- Sometimes unstructured



# STRUCTURED DATA

- Databases
  - XML Schemas
  - Taxonomies
  - Ontologies
  - Controlled Vocabularies
  - Authority Keywords
  - Agreements required.
  - Anything that doesn't fit can't be entered.
- => Data cleaning mandatory.

# CORPORATE INFORMATION CHALLENGES



- Information models are often too rigid. Creating new fields may be either impossible, too costly, or too resource intensive.
- When data doesn't fit the existing silos, the whole silo is discarded and a new one is designed.
- The same story starts again....



# WHAT ABOUT DATA THAT DOESN'T FIT?

- Misspelled
- New, unheard of
- Ambiguous
- Uses non-authoritative terms
- Innovative
- Complex
- Foreign
- Creative
- Nuanced
- Original
- Implicit
- Unexpected
- Controversial



# HOME SWEET HOME



- New Year Resolution Syndrome: When entering a new house, we organize our stuff into drawers, shelves, armoires, closets. Everything fits.
- As time goes by, mess starts to accumulate. Things are not put where they should be, there is a little bit of everything everywhere.

# WHAT IF MESS IS A FEATURE, NOT A BUG?

- Information is diverse, and constantly changing.
- Individuals have different opinions, and deserve to be heard.
- We need hospitable, flexible, adaptable information systems.

Graph Databases now trending vs. Relational/  
Object Databases.

# CLEANING VS. CURATION



CLEANING	CURATION
MANDATORY	OPTIONAL
CHORE	INTERESTING
LOW-WAGE WORKERS	EXPERTS
SYSTEM-DEPENDENT	ADDS VALUE

# TOPIC MAPS



- “Topic”: Computer representation of a unique meaning.
- “Map”: Graph-based navigation between topics.
- Standards: ISO 13250, RDF, Open Linked Data, DITA, OpenCypher...



## II. TWO REAL-WORLD APPLICATIONS

# CURATING COMPLEX DATA SETS



- IRS Tax Map: Latest Available Tax Information for Taxpayers
- NYU Enhanced Networked Monographs: Humanities Books' Indexes

# THE IRS TAXMAP STORY



- Started as a way to help call centers' assistants to provide more accurate responses to taxpayers' questions.
- Still up, 15 years later, after 3 attempts at taxonomies, and web site overhaul
- Secret: It doesn't have to be 100% cleaned.
- Available at: **<https://taxmap.irs.gov>**

## Form 941--Employer's Quarterly Federal Tax Return

View

Forms

Publications

Tax Topics

## Related Topic Links

Tax Map Search:

GO

[Search Help](#)  
[Navigation Help](#)[Tax Map Index](#)  
[A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#)  
[J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#)  
[S](#) [T](#) [U](#) [V](#) [W](#) [X](#) [Y](#) [Z](#) <#>[International  
Tax Topic Index](#)[Affordable Care Act  
Tax Topic Index](#)[Exempt Organization  
Tax Topic Index](#)[FAQs](#)  
[Forms](#)  
[Publications](#)  
[Tax Topics](#)  
[Worksheets](#)[Comments](#)  
[About Tax Map](#)[IRS.gov Website](#)

## Useful Links

## Popular Publication Links

[Reporting Adjustments to Form 941 or Form 944](#)[Filing Form 941 or Form 944](#)

## Related Topic

[Employment Taxes](#)[Prior Year Form 941](#)

## Forms and Instructions

## Form 941 Employer's Quarterly Federal Tax Return

[Instructions for Form 941, Employer's Quarterly  
Federal Tax Return](#)

## Related Forms

## Form W-2 Wage and Tax Statement (Info Copy Only)

MORE

[Instructions for Forms W-2 and W-3, Wage and  
Tax Statement and Transmittal of Wage and Tax  
Statements](#)

## Form 720 Quarterly Federal Excise Tax Return

MORE

[Instructions for Form 720, Quarterly Federal  
Excise Tax Return](#)

## Form 720-X Amended Quarterly Federal Excise Tax Return

MORE

Form 940 Employer's Annual Federal Unemployment  
(FUTA) Tax Return

MORE

[Instructions for Form 940, Employer's Annual  
Federal Unemployment \(FUTA\) Tax Return](#)

- > [Employer](#)
- > [Employment Tax](#)
- > [Federal Insurance  
Contributions Act \(FICA\)](#)
- > [Federal Tax Deposit \(FTD\)](#)
- > [Filing Form 941 or Form  
944](#)
- > [Medicare](#)
- > [Prior Year Form 941](#)
- > [Quarterly Tax Payments](#)
- > [Reporting Adjustments to  
Form 941 or Form 944](#)
- > [Social Security and  
Medicare Taxes](#)
- > [Withholding of Tax](#)



# TAXMAP CURATION



- Application of automatic rules
  - Containment, 3 words, remove topics with no occurrences and no relations.
- Maintenance of a knowledge base
  - Merge topics by setting synonyms, Related topics, Rejected topics
- Currently done using custom configuration settings.

# BOOK INDEXES: A STORY



- Indexes: A must for professionals.
  - Human work: author or professional indexer
- Can we create indexes through algorithms?
  - Yes, if entries are occurrences of words in text, or if information is very strictly structured.
  - No, in any other case.

# INTEGRATING BOOK INDEXES

- Idea: Integrate indexes of many books into a master index
- Goal: Provide the readers with direct access to any index entry.
- Project with NYU Library, 3 academic publishers: NYU Press, U of Michigan Press, U of Minnesota Press. Founded by Carnegie Mellon. Still ongoing.

# INDEXES ARE COMPLEX...

Categorical imperative, [31](#), [37](#), [48](#) n. 39, [48](#) n. 40, [72–73](#)  
Chamberlain, Lindy and Michael, [124–25](#)  
*Charter of Rights and Freedoms* (Canada), [209](#)  
Citizenship, [203](#), [207](#). *See also* Socrates  
Civil disobedience, [175](#)  
*Civil Rights Act* (1866), [308](#)  
*Civil Rights Act* (1875), [244](#)  
Clay, Henry, [326](#)  
Cognitive authority, [4](#), [125–26](#), [139–42](#)  
Cognitive individualism, [139–42](#), [149–50](#)  
    as regulative ideal, [140–42](#)  
Cold fusion, [119](#), [121](#), [131](#)  
Columbia University Oral History Project, [161–64](#), [166–67](#)  
Commitment, [77](#)  
Conflicts of interest, [146](#)  
Congress (U.S.), [164](#), [179](#)  
Conscience, [1–3](#), [13–40](#), [169–70](#)  
    as authority, [14](#), [17](#), [28–29](#)  
    as deflationary, [3](#), [15](#), [23](#), [60](#), [73–74](#)  
    democratic view, [187](#), [212](#)  
    as inner judge, [16](#), [32–33](#), [55](#), [62](#), [65–66](#), [70–71](#)  
    as justification, [21](#)  
    liberal view, [187–89](#)  
    narrow v. wide, [170–72](#)  
    of others, [14](#), [20](#), [24](#), [30](#), [36–37](#), [41](#) n. 1, [47](#) n. 35  
    public v. private, [169–72](#), [178–79](#)  
    as reflected moral judgment, [16](#), [27–31](#), [33](#), [38](#), [54–55](#)  
    religious view, [14–15](#), [17–21](#), [38–39](#), [54](#), [64](#), [70](#)  
Consensus, [66](#), [132](#)  
    injudicial interpretation, [318–22](#), [324–26](#)  
    in Kant, [37](#), [40](#), [44](#) n. 20  
    in liberalism, [191](#), [194–95](#), [204](#), [209–11](#)

## 48426 names found

- ☐ American Association of University Professors (AAUP) ✓ ✎
- ☐ American Association of University Women (AAUW), report on sexu
- ☐ American Automobile Association ✓ ✎
- ☐ American Bankers Association ✓ ✎
- ☐ American Bar Association ✓ ✎
- ☐ American Bar Association (ABA) ✓ ✎
- ☐ American Bible Society ✓ ✎
- ☐ American Blood (Nicholls) ✓ ✎
- ☐ American Broadcasting Company ✓ ✎
- ☐ American cartoons ✓ ✎
- ☐ American civilization ✓ ✎
- ☐ American Civil Liberties Union ✓ ✎
- ☐ American Civil Liberties Union (ACLU) ✓ ✎
- ☐ American civil religion ✓ ✎
- ☐ American Civil War ✓ ✎
- ☐ American colonies ✓ ✎
- ☐ American Committee to Save Bosnia ✓ ✎
- ☐ American Committee to Save Bosnia (ACSB) ✓ ✎
- ☐ American Constitution ✓ ✎
- ☐ American Council for Judaism ✓ ✎
- ☐ American Council of Learning Societies, Commission on Cyberinfra
- ☐ American culture, Jewish contribution to ✓ ✎
- ☐ Christian amendment (to Constitution) ✓ ✎
- ☐ constitution ✓ ✎
- ☐ Constitution ✓ ✎
- ☐ Constitutional analysis of gender ✓ ✎
- ☐ Constitutional change ✓ ✎
- ☐ Constitutional Convention ✓ ✎
- ☐ Constitutional Convention -- ambivalence toward presidential power ✓ ✎
- ☐ Constitutional Convention of 1787 ✓ ✎
- ☐ Constitutional Convention of 1787 -- and John Rutledge ✓ ✎
- ☐ Constitutional Convention of 1787 -- and Oliver Ellsworth ✓ ✎
- ☐ Constitutional Courant ✓ ✎
- ☐ Constitutional formalism ✓ ✎
- ☐ Constitutionalism ✓ ✎
- ☐ Constitutionalism -- and compromise ✓ ✎
- ☐ Constitutionality ✓ ✎
- ☐ Constitutional reform ✓ ✎
- ☐ Constitutional reform -- and John Jay ✓ ✎
- ☐ Constitutional reform -- and separation of powers ✓ ✎
- ☐ Constitutional reform -- and weakness of federal judiciary ✓ ✎
- ☐ Constitution -- and democracy ✓ ✎
- ☐ Constitution -- Christian amendments (proposed) ✓ ✎
- ☐ Constitution -- Color-blindness ✓ ✎
- ☐ Constitution -- Constitutional Convention ✓ ✎
- ☐ Constitution -- Copyright ✓ ✎
- ☐ Constitution -- Founding ideals ✓ ✎
- ☐ Constitution -- Freedom of Imagination ✓ ✎
- ☐ Constitution -- Segregation ✓ ✎
- ☐ Constitution, United States: 1787 ✓ ✎
- ☐ Constitution, U.S. ✓ ✎

# HOW DID WE WORK?



- We have built a tool to manage topic integration.
- NYU has hired a “Semantic Editor” who worked on curating the information and finding methods.

# INTEGRATION OF INDEXES



- For ~80 books: yielded 48,000 entries.
- 15,000 topics were curated.
- 3,000 entries were merged. Currently, 45,000 topics.



# AUTOMATIC PROCESSING TECHNIQUES

- Slugification
- Lemmatization
- Use of specialized dictionary containing predefined synonyms
- Automatic relationships:
  - See/See also, Entry/Subentries, Containment, 3 tokens



# EDITORIAL INTERFACE

The screenshot displays the Infoloom Editorial Interface. On the left is a sidebar with navigation options: Topics, Names By Letter, Topics by Letter (with an alphabetical index A-Z and # All), Add Topic, Scopes, Types, Reports, Sources, and Relation Types. The main content area is titled 'Topic Detail Page' and features a 'Topic Names' section with the text 'Labor market -- sectoral studies' and a green plus icon for adding more names. Below this is a 'Topic Types' section showing 'No Topic Types on this Topic' with a green plus icon. A red banner at the bottom of the main area states 'Topic Not Marked as Reviewed' with green checkmark and orange pencil icons. On the right, there are three panels: 'Relations' with a list of checkboxes for relationships like 'contains labor', 'Subentry of labor market', etc.; 'Occurrences' showing a list item 'Bill Ong Hing, TO BE AN AMERICAN, page 58'; and 'Weblinks'. The top right corner shows the user 'michel'.

Infoloom

michel

Topics

Search

Names By Letter

Topics by Letter

A B C D E F G H  
I J K L M N O P  
Q R S T U V W X  
Y Z # All

Add Topic

Topic Name

Scopes

Types

Reports

Sources

Relation Types

**Topic Detail Page**

**Topic Names**

Labor market -- sectoral studies

**Topic Types**

No Topic Types on this Topic

**Topic Not Marked as Reviewed**

**Relations**

- ☐ contains labor
- ☐ Subentry of labor market
- ☐ Multiple Tokens with Labor market -- regional studies
- ☐ contains Market
- ☐ contains Sectoral studies
- ☐ contains studies

**Occurrences**

- Bill Ong Hing, *TO BE AN AMERICAN*, page 58

**Weblinks**

# EBOOK PAGE



The Employment of English, page 38



## Topics at This Location

- [◀ Faculty -- and graduate student unionization ▶](#)
- [◀ Graduate Employees and Students Organization \(GESO\), Yale -- faculty response to ▶](#)
- [◀ Unionization of graduate students -- opposition to ▶](#)
- [◀ University of Kansas ▶](#)
- [◀ Yale University anti-union stance of -- faculty response to graduate student unionization at ▶](#)

## Indexes

[Index 1](#)

## Content

that they are in some sense “employees.” And if administrators and faculty at Yale or elsewhere want to claim that their graduate students’ wages are not “wages” because their teaching (which is not strictly “teaching”) is merely part of their professional training as apprentice professors, then it makes sense to call the bluff: take graduate students out of the classrooms in which they work as graders, assistants, and instructors; maintain their stipend support at its current levels; and give them professional development and training that does not involve the direct supervision of undergraduates. Then we’ll see how long Yale University can survive without the labor (which is not strictly “labor”) of its graduate student teaching assistants. At the time, I thought my support for graduate student unions—in a speech delivered to, among other people, unionized graduate students—amounted to endorsing candidates after they’d won their elections. To my surprise, however, I learned later that the graduate students were very pleased with my speech, and that some even considered it “courageous.” It seems that I had denounced as ridiculous Yale administrators’ claims that graduate students were not employees in front of a number of Kansas administrators who had claimed that graduate students were not employees. (I told the students I had had no idea that my audience included actual bad faith negotiators, and that my “courage” in

# Topic curation workflows



## Topic Curation Toolkit *automatically*:

- merges topics
- creates relations between topics



## Human editor *manually*:

- fixes processing errors
- removes certain relations
- merges synonyms and splitting up homonyms
- adds relations tool did not find
- adding new data, sometimes from external sources like Wikidata

Table showing topic completeness and link scores

Tct Id	Topic Name	Completeness	Completeness (weighted)	Number of relations	Number of occurrences	Number of books	Number of words in topic name	Link score (relations)	Link score (occurrences)	Link score (books)	Overall link score (average)
14034	Freud, Sigmund	1.00	1.00	203	105	22	2	0.35	0.89	0.79	67%
9640	Foucault, Michel	1.00	1.00	11	73	20	2	0.02	0.52	1.00	55%
11928	United States of America	1.00	1.00	468	96	7	4	0.80	0.56	0.25	54%
22256	Woman	1.00	1.00	585	52	3	1	1.00	0.44	0.11	52%
7672	feminism	1.00	1.00	101	118	8	1	0.17	1.00	0.29	49%
826	The New York Times	1.00	1.00	35	89	18	4	0.06	0.75	0.64	49%
25141	Clinton, William Jefferson	1.00	1.00	259	61	12	3	0.44	0.52	0.43	46%
7907	race	1.00	1.00	165	99	7	1	0.28	0.84	0.25	45%
62	culture(s)	1.00	1.00	224	96	8	1	0.38	0.47	0.29	39%
11204	gender	1.00	1.00	146	63	9	1	0.25	0.53	0.32	37%
250	internet	1.00	1.00	21	105	5	1	0.04	0.89	0.18	37%
11796	self	1.00	1.00	510	10	4	1	0.87	0.08	0.14	37%
278	Google	1.00	1.00	26	85	9	1	0.04	0.72	0.32	36%
277	globalization	1.00	1.00	25	97	6	1	0.04	0.82	0.21	35%
3131	World War II	1.00	1.00	25	99	15	3	0.04	0.50	0.54	35%
5789	sexuality	1.00	1.00	100	69	9	1	0.17	0.58	0.32	35%
11138	Families	1.00	1.00	299	36	6	1	0.51	0.31	0.21	34%
17941	Kant - Immanuel	1.00	1.00	13	67	12	2	0.02	0.57	0.43	34%
871	racism	1.00	1.00	98	62	9	1	0.17	0.53	0.32	34%
13522	power	1.00	1.00	196	57	5	1	0.34	0.48	0.18	33%
2822	King, Martin Luther, Jr.	1.00	1.00	19	44	16	4	0.03	0.37	0.57	33%
4071	Reagan, President Ronald	1.00	1.00	50	50	13	3	0.09	0.42	0.46	32%
11728	School(s)	1.00	1.00	408	18	3	1	0.70	0.15	0.11	32%
9541	values	1.00	1.00	83	74	5	1	0.14	0.63	0.18	32%
25738	American	1.00	1.00	501	4	1	1	0.86	0.03	0.04	31%
19416	Law, the	1.00	1.00	360	15	5	2	0.62	0.13	0.18	31%
7777	stata, the	1.00	1.00	368	26	2	2	0.63	0.22	0.07	31%

Overall link score



Overall link score



Number of occurrences



Number of distinct books in which topic appears



Number of relations



Number of words in topic name



Metric based on Ochoa, X., & Duval, E. (2009). Automatic evaluation of metadata quality in digital



**Facet / Filter** [Undo / Redo](#) 163

[Refresh](#) [Reset All](#) [Remove All](#)

**4493 rows**

Extensions:

Show as: [rows](#) [records](#) Show: [5](#) [10](#) [25](#) [50](#) rows

« first < previous **1 - 50** next > last »

**WikidataRecon: judgment** [change](#)

3 choices Sort by: [name](#) [count](#)

[matched](#) 993

[new](#) 1

[none](#) 3499

[Facet by choice counts](#)

**WikidataRecon: best candidate's types match?** [change](#)

2 choices Sort by: [name](#) [count](#)

[\(unreconciled\)](#) 1192

[false](#) 3301

[Facet by choice counts](#)

**WikidataRecon: best candidate's types** [change](#)

542 choices Sort by: [name](#) [count](#)

[\(unreconciled\)](#) 1192

[Q1002697](#) 10

[Q1007311](#) 1

[Q101352](#) 12

[Q1021128](#) 1

[Q10417670](#) 1

[Q1047113](#) 1

[Q1057504](#) 1

[Q1058914](#) 1

[Q1060829](#) 1

[Q1061197](#) 1

[Q106259](#) 1

All	Tot Id	Tot_link	Topic Name	WikidataRecon	Completeness	Completeness (%)	Number
	1.	381	<a href="http://nyu.infoloom.nyu/basket/381">http://nyu.infoloom.nyu/basket/381</a>	Addams, Jane <a href="#">Jane Addams</a> <a href="#">Choose new match</a>	0.67	0.52	0
	2.	467	<a href="http://nyu.infoloom.nyu/basket/467">http://nyu.infoloom.nyu/basket/467</a>	Chicago Reader <a href="#">Chicago Reader</a> <a href="#">Choose new match</a>	1.00	1.00	1
	3.	595	<a href="http://nyu.infoloom.nyu/basket/595">http://nyu.infoloom.nyu/basket/595</a>	Harvard University - Kennedy School of Government <a href="#">Harvard Kennedy School</a> <a href="#">Choose new match</a>	1.00	1.00	1
	4.	735	<a href="http://nyu.infoloom.nyu/basket/735">http://nyu.infoloom.nyu/basket/735</a>	Lupton, Julia Reinhardt <a href="#">Lupton, Julia Reinhardt</a> <a href="#">Create new topic</a> <a href="#">Search for match</a>	0.67	0.52	0
	5.	831	<a href="http://nyu.infoloom.nyu/basket/831">http://nyu.infoloom.nyu/basket/831</a>	Austin, Texas <a href="#">Austin</a> <a href="#">Choose new match</a>	1.00	1.00	1
	6.	1004	<a href="http://nyu.infoloom.nyu/basket/1004">http://nyu.infoloom.nyu/basket/1004</a>	Williams, Tennessee <a href="#">Tennessee Williams</a> <a href="#">Choose new match</a>	1.00	1.00	1
	7.	1017	<a href="http://nyu.infoloom.nyu/basket/1017">http://nyu.infoloom.nyu/basket/1017</a>	Yúdice, George <a href="#">Yúdice, George</a> <a href="#">Create new topic</a> <a href="#">Search for match</a>	0.67	0.52	0
	8.	1034	<a href="http://nyu.infoloom.nyu/basket/1034">http://nyu.infoloom.nyu/basket/1034</a>	Asahi Shimbun <a href="#">Asahi Shimbun</a> (100) <a href="#">Asahi Shimbun Company</a> (90) <a href="#">Asahi Shimbun Digital</a> (76) <a href="#">Asahi Shimbun Building</a> (74) <a href="#">Asahi Shimbun Publications</a> (67) <a href="#">ヘラルド朝日</a> (64) <a href="#">Asahi Shimbun Fukuoka Office</a> (63) <a href="#">Asahi Shimbun Hokkaido Office</a> (62) <a href="#">Asahi Shimbun Tokyo Head Office</a> (59) <a href="#">Asahi Shimbun Osaka Head Office</a> (59) <a href="#">Asahi Shimbun Seibu Head Office</a> (59) <a href="#">Asahi Shimbun Nagoya Head Office</a> (58) <a href="#">Kamikaze</a> (23) <a href="#">Create new topic</a> <a href="#">Search for match</a>	0.67	0.52	0
	9.	1049	<a href="http://nyu.infoloom.nyu/basket/1049">http://nyu.infoloom.nyu/basket/1049</a>	Batman <a href="#">Batman</a> (100) <a href="#">Batman in film</a> (100)	0.67	0.52	0



# III. A PRACTICAL APPROACH TO TOPIC CURATION

Ingest - Curate - Publish

# INGEST - CURATE - PUBLISH

- Ingest Information - Automated with customized configuration
- Curate Information - Manual with User interface
- Publish Information - Automated with customized configuration



# HUMAN CURATION

- Merge (Synonyms)
- Detach (Homonyms)
- Categorize (Taxonomy)
- Connect with controlled vocabularies
- Relate Topics
- Map Topics to Sources



# EXAMPLE OF CURATED TOPICS

- A name does not uniquely identify a topic.
- Example: "New York, New York"

## 10 names found



Movie New York, New York  
New York  
New York  
New York  
New York City  
New York, New York  
New York, New York  
New York, New York  
New York State  
Theme of New York, New York

+ Type


 [Movie](#)

## New York, New York

+ Relation

-  [Liza Minelli](#) Plays In [New York, New York](#)
-  [New York, New York](#) Theme of [New York, New York](#)

+ Name

-    [Movie](#) [New York, New York](#)
-    [New York, New York](#)

+ Weblink




 Description

+ Type







 [Song](#)

## New York, New York

+ Relation

-  [Frank Sinatra](#) Sings [New York, New York](#)
-  [Liza Minelli](#) Sings [New York, New York](#)
-  [New York, New York](#) Theme of [New York, New York](#)

+ Name

-    [New York, New York](#)
-    [Theme of New York, New York](#)





+ Weblink

 Description

[Luciano Pavarotti e Liza Minnelli - New York, New York \(YouTube\)](#)

## New York, New York

+ Relation

-  [Greenwich Village](#) Neighborhood [New York, New York](#)
-  [New York, New York](#) Borough of [New York](#)
-  [Upper East Side](#) Neighborhood [New York, New York](#)
-  [Upper West Side](#) Neighborhood [New York, New York](#)

+ Name

-    [Manhattan](#)
-    [New York](#)
-    [New York, New York](#)

# THE TAKEAWAY

- Curation is optional. It improves quality and accuracy.
- Curation is human intelligence used to improve results provided by artificial intelligence.

Michel Biezunski, Infoloom. Gilbane Digit





Q & A

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