HBSKnowledge

A Knowledge Graph and Semantic Search for HBS

INCONECSS
May 17, 2022

Harvard Business School
Baker Library
Information Products
& Technical Services

HBSK: What is it?

Problem Solution	•Baker Library's answer to breaking down HBS data silos
Knowledge Graph	•For integration and discovery of HBS data across silos
Semantic Search Application	•For ease of entity identification and findability
Vocabularies	•For consistent, unambiguous language and entity identification

HBSK: Who is it?

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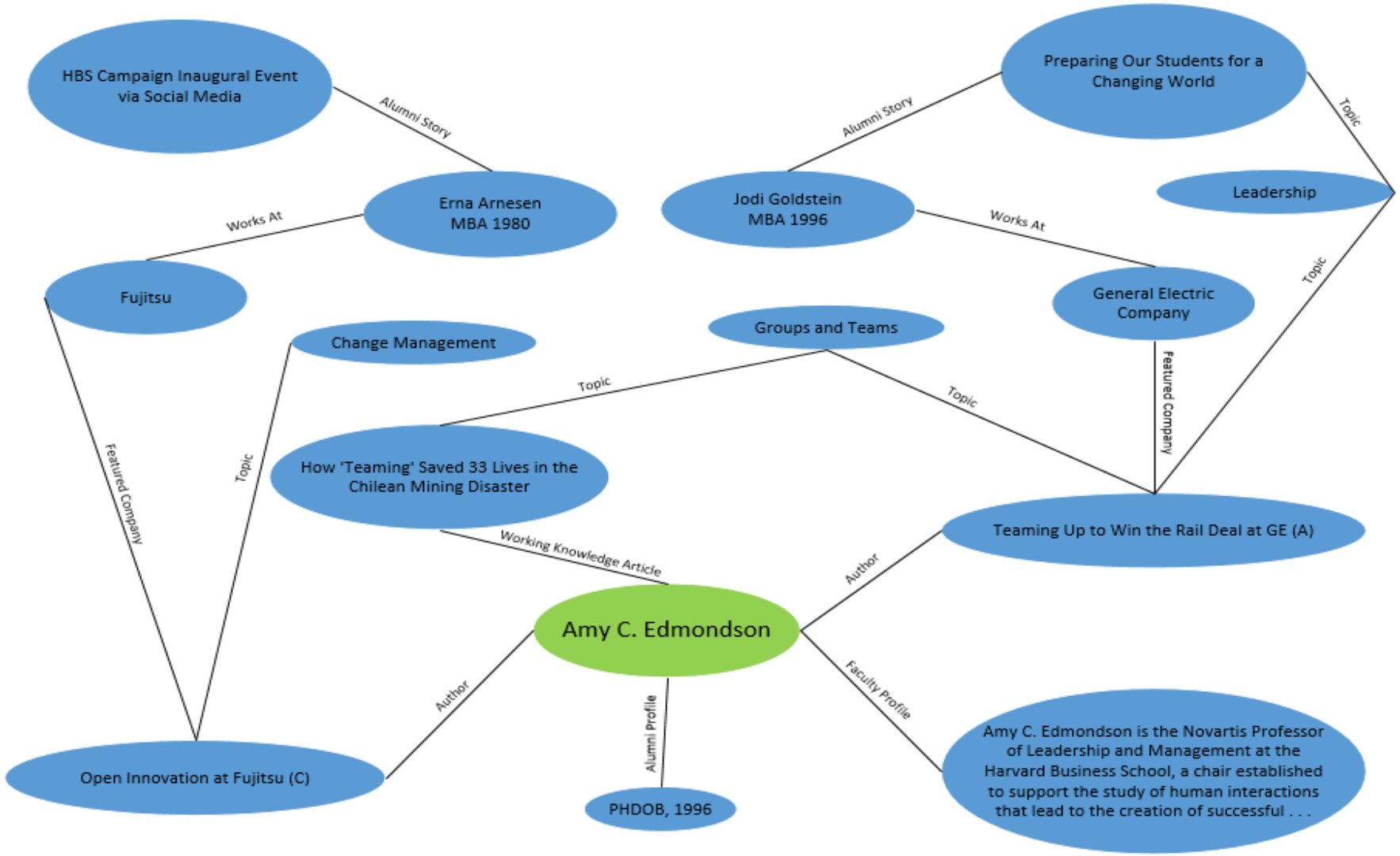
What is a Knowledge Graph?

- A model of a **specific domain** created by subject-matter experts with the help of machine learning algorithms
- Provides a common structure and interface for data and enables the creation of multifaceted relations across databases
- Allows for an entity-centric view



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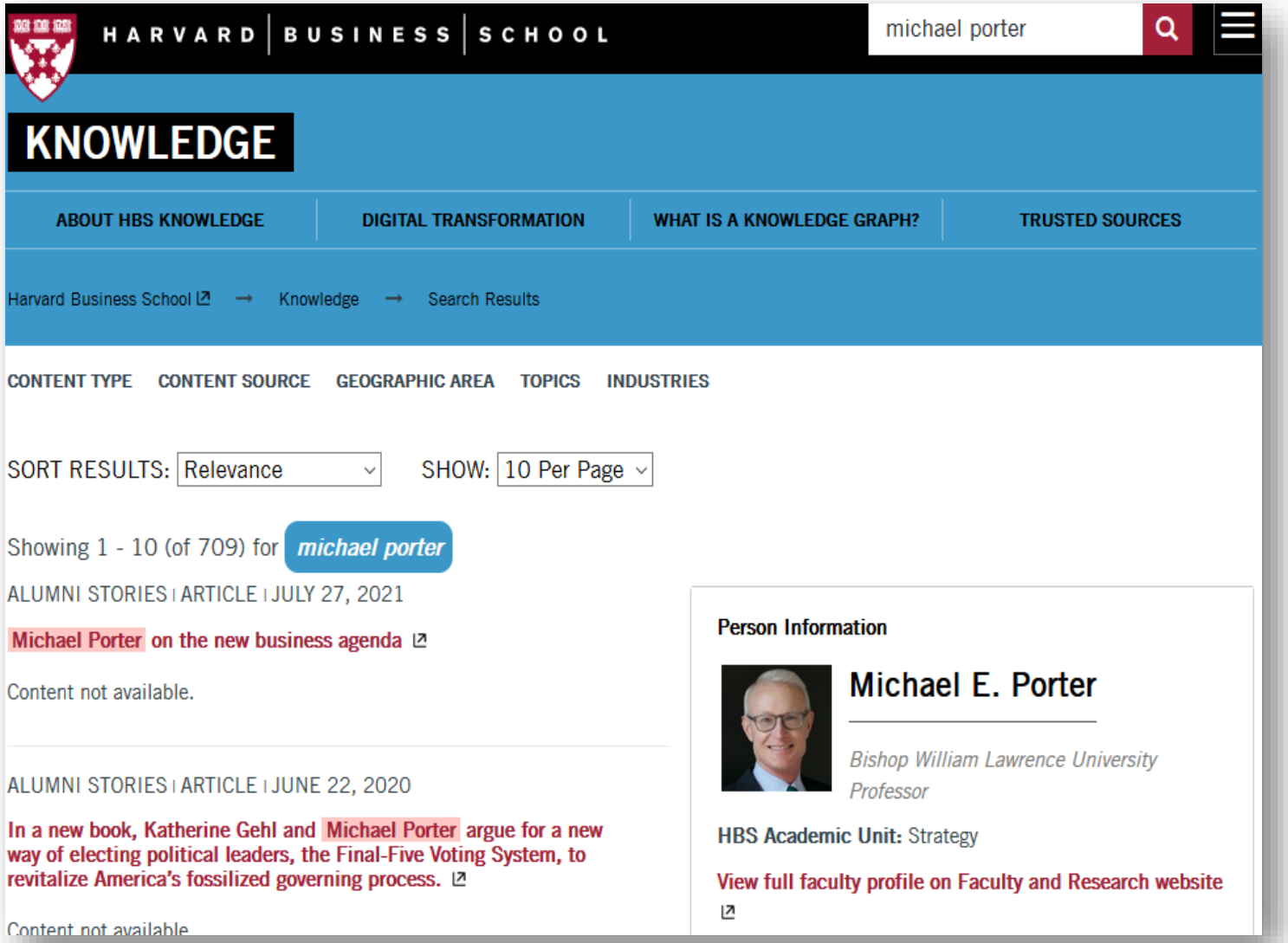
What is Semantic Search?

Search with Meaning

- Uses our vocabularies and ontology to understand the intent of queries (“Michael Porter”)
- Not literal matches on query strings (Michael + Porter)



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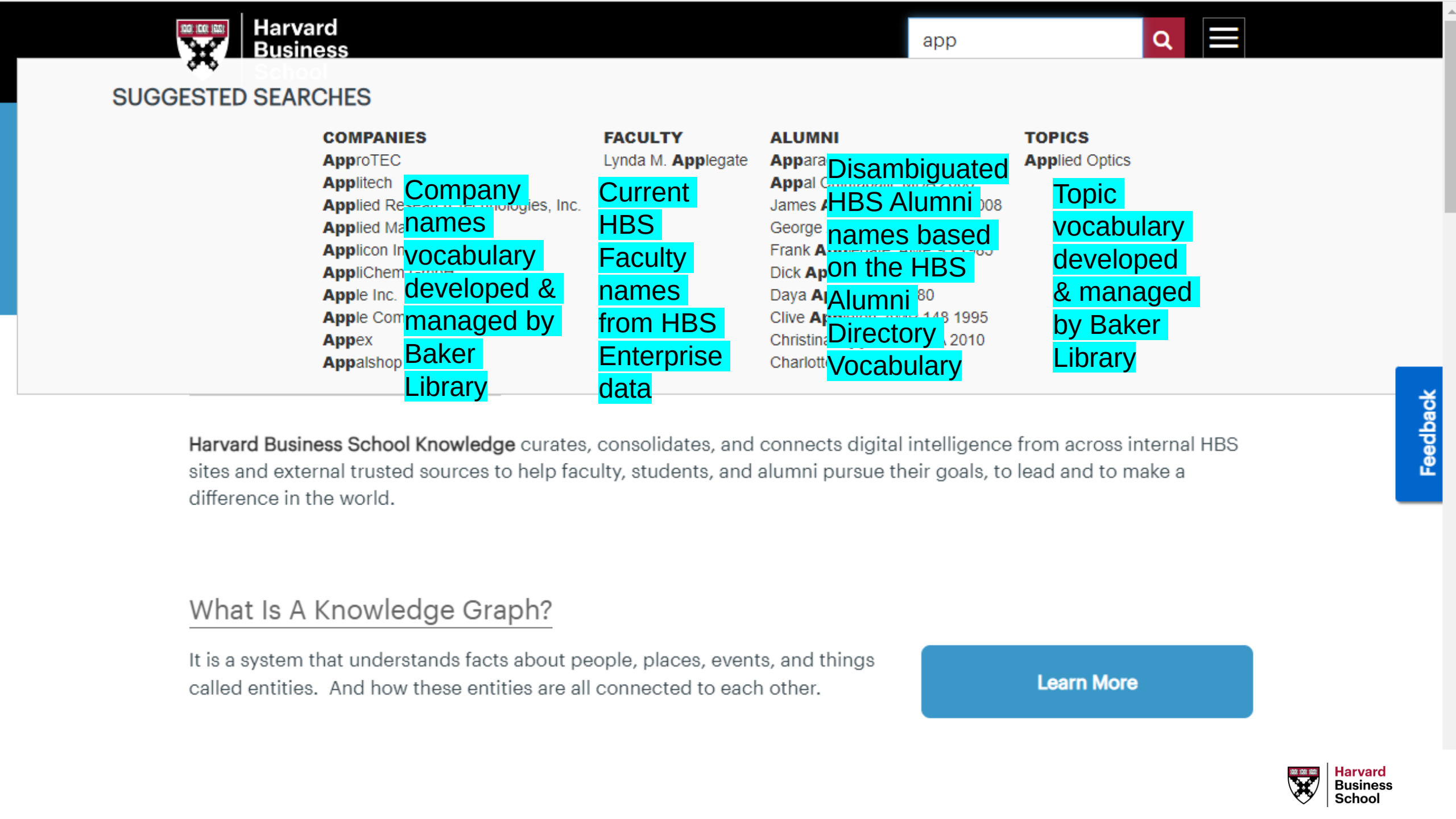
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Applied Re
Applied Ma
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AppliChem
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Apple Com
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Appalshop
FACULTY
Lynda M. Applegate
ALUMNI
Appara
Appal
James
George
Frank
Dick Ap
Daya
Clive
Christina
Charlott
TOPICS
Applied Optics
Company names vocabulary developed & managed by Baker Library
Current HBS Faculty names from HBS Enterprise data
Disambiguated HBS Alumni names based on the HBS Alumni Directory Vocabulary
Topic vocabulary developed & managed by Baker Library
Harvard Business School Knowledge curates, consolidates, and connects digital intelligence from across internal HBS sites and external trusted sources to help faculty, students, and alumni pursue their goals, to lead and to make a difference in the world.
What Is A Knowledge Graph?
It is a system that understands facts about people, places, events, and things called entities. And how these entities are all connected to each other.
Learn More
Feedback
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FACULTY & RESEARCH WORK | CASE MATERIAL | AUGUST 5, 2016

Apple's Future: Apple Watch, Apple TV, and/or Apple Car?

In 2015, Apple CEO Tim Cook knew that Apple, despite its phenomenal success, needed to continue to innovate in new product areas in order to continue its momentum into the future. This case explores three new (actual or potential) product offerings from Apple ...Show More

FACULTY & RESEARCH WORK | CASE MATERIAL | MAY 1, 1998

Apple Computer 1996, Apple Computer 1997, and Apple Computer 1998 TN

Teaching Note for (9-796-126), (9-797-098), and (9-798-099).

FACULTY & RESEARCH WORK | CASE MATERIAL | JUNE 16, 2016

Apple's Future: Apple Watch, Apple TV, and/or Apple Car?

Teaching note for "Apple's Future," HBS no. 716-401.

FACULTY & RESEARCH WORK | CASE MATERIAL | FEBRUARY 1, 2005

Apple Computer 2002 and Apple Computer 2005 (TN)

Teaching Note for (9-702-469).

FACULTY & RESEARCH WORK | CASE MATERIAL | MARCH 30, 1995

Apple Computer 1995 (A) and (B) and Apple Computer in China,1993 TN

Teaching Note for (9-795-061), (9-795-073), and (9-794-100).

FACULTY & RESEARCH WORK | CASE MATERIAL | FEBRUARY 15, 2018

Amazon, Google, and Apple: Smart Speakers and the Battle for the Connected Home

Amazon, Google, and Apple all offer their own smart speaker. The devices represent each firm's entry point into the connected home market. All three companies come into the space with their own strengths and weaknesses. Who will win?

ALUMNI STORIES | ARTICLE | MAY 31, 2007

Charting Apple's Ups and Downs

In the context of the computer industry at large, Professor David Yoffie explores the ups and downs of a company that's always been a bit different in "Apple Computer, 2006." The case poses this

ALUMNI STORIES | ARTICLE | NOVEMBER 30, 2020

How Apple Is Organized for Innovation

Content not available.

Company Snapshot Expand

Apple Inc.

Public Company

NasdaqGS:AAPL

1977

Apple Inc. designs, manufactures, and markets smartphones, personal computers, tablets, wearables, and accessories worldwide. It also sells various related services. In addition, the company offers iPhone, a lin... Show More

Source: S&P CapitalIQ

Past Company Name(s): Apple Computer, Inc.

CEO: Cook, Timothy

CFO: Maestri, Luca

Treasurer: Paxton, Nancy

Company Status: Operating

Headquarters: One Apple Park Way, Cupertino, California, 95014, United States

Industry Sector: Information Technology

Industry: Technology Hardware and Equipment

Exchanges: NasdaqGS

Website: http://www.apple.com

Company Metadata

Alumni:

- Carl
- Amir
- John
- Jay K
- Meg
- Jarad
- Cam A 23 2018

HBS Alumni currently employed by the company

Formerly Employed MBA Students:

- Allis

MBA students previously employed by the company

Faculty Publications

Meg Rithmire
F. Warren McFarlan Associate Professor of Business of Administration

Publications
Snapp: Scaling Under Sanctions in Iran (A)

HBS Faculty publications about the company

Feedback

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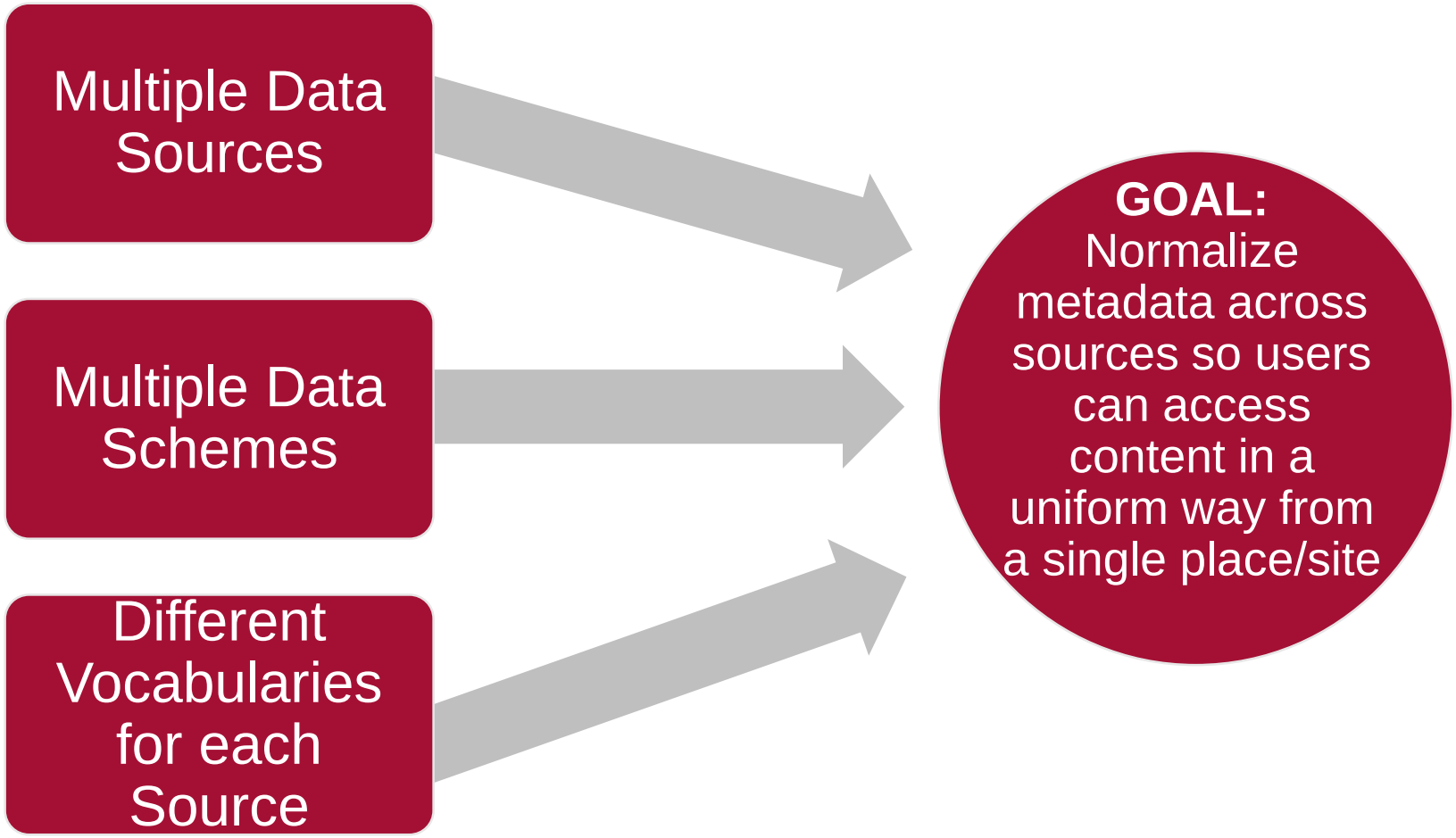
Why did we do this?



We’re essentially cataloging HBS assets in a consistent/systematic/controlled way.

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Challenge: Need to Resolve Identity & Context

Different metadata for the same entity: Faculty

Working Knowledge	Faculty & Research		Alumni Stories	
WK	**F&R**	**F&R**	**AS**	**all**
WKFacultyName	**HBSSuggestion**	**RISContributorName**	**HBSStoryFeaturedFacultyJson**	**HBSFaculty**
Elizabeth A. Keenan	Arthur C. Brooks	Thomke, Stefan	{"id":"17441","name":"Ethan S. Bernstein","title":"Edward W. Conard Associate Professor of Business Administration"}	jmacomber
James L. Heskett	general management	Macomber, John	{"id":"1175257","name":"Jon M. Jachimowicz","title":"Assistant Professor of Business Administration"}	abrooks
David A. Moss	Antonio Moreno	Brooks, Arthur	{"id":"10650","name":"Boris Groysberg","title":"Richard P. Chapman Professor of Business Administration"}	amoreno
Karen Mills	technology and operations management	Moreno, Antonio		
	operations			
	management			
	supply chain management			
	supply chain			
	operations			
	business model			
	business ventures			
	organizational change and adaptation			
	organizations			
	omnichannel			
	omnichannel retail			
	retail			
	operations			
	Michael Luca			
	negotiation, organizations & markets			
	Max H. Bazerman			

Challenge: Need to Resolve Meaning

Different interpretations of one attribute: HBSContentType

Faculty & Research	External Relations	Working Knowledge
F&R	**ER**	**WK**
Book	News	Cold Call Podcast
Book Chapter		Working Paper Summaries
Article		Research & Ideas
Other		Sharpening Your Skills
Working Paper		Book
Case		What Do You Think?
Teaching Material		Op-Ed
Presentation		In Practice
		Research Event
		Lessons from the Classroom
		HBS Case
		First Look

How did we do it?

➢Selected HBS Entity Types and Content Sources

- People, Publications, Organizations
- Faculty & Research, HBS Working Knowledge, External Relations

Modeled the HBS Domain with an Ontology

- Classes
- Attributes
- Relations

Minted URIs

- To uniquely identify entities across repositories

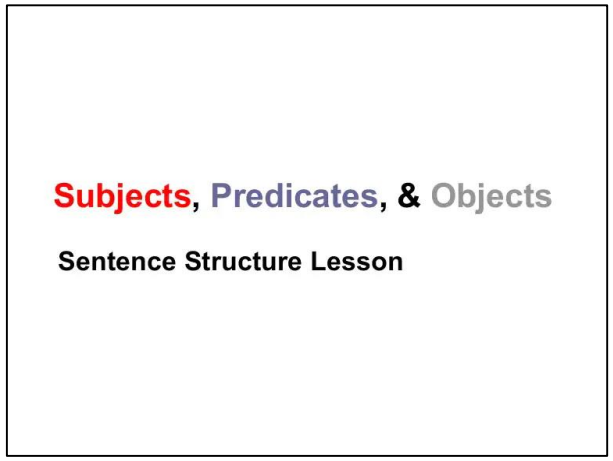
Converted Data into Triples

Ingested Tripled Data

- Ingested into solr (schema), representing relationships among data

Front End Processing

- For structured display of data



- "Amy C. Edmondson is author of *Teaming up to Win the Rail Deal at GE*"
  - <https://librarydata.hbs.edu/HBSKOntology/Person/hbsfac#6451> hbsko:authorOf <https://librarydata.hbs.edu/HBSKOntology/CreativeWork/rispub#ris-56787>
- "*Teaming up to Win the Rail Deal at GE* has featured company General Electric Company"
- "General Electric Company is employer of Jodi Goldstein MBA 1996"

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Sample HBS Use Cases

MBA view into what cases are being taught in the Required Curriculum

HBS Initiatives view into faculty & school activity in a subject area over time

Faculty view into MBA student employment at an organization featured in a case

Research Computing Services view into staff working on faculty projects and skills used

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Some Takeaways

Cataloging Principles, Practices are Key

Vocabularies
- Relationships
- Roles
- Label changes over time

Description
- Choose your source, don't make stuff up, stay close to the 'truth'
- Literary warrant

Scoped Process: target specific use cases & data sets

It's all about unique identifiers

Thank you.

ewise@hbs.edu