



# Managing Knowledge with Semantics

## The “If we only knew what we know” – Syndrome

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Oil  
Natural Gas  
Downstream Products  
Power Generation  
Engineering & Construction  
Petrochemicals

Eni is active in 70 countries with a staff of about 76,000 employees.

Oil & Natural Gas production: 1,74 million boe/day

2007 Market capitalization: € 91.6 billion

2007 RESULTS

consolidated revenues: € 87.2 billion

net profit: € 10 billion

## › Semantic Processing Platform - Cogito

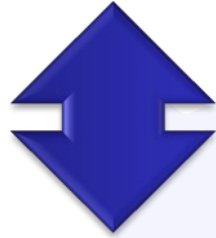
- › 100+ customers including large corporations, government in;
  - › business intelligence - enterprise search & data extensibility
  - › market sentiment - customer care
- › 100+ dedicated engineers focused on core semantic technology, applications, tools and services:
  - › 200 man/years in the development of COGITO over the last 10 years.
- › 15 years old, private & profitable
  - › FY2007: \$12M, 115+ employees, 40% growth each of last 2 years
  - › Offices in Connecticut, California, Florida, UK, Italy, & Germany

# Knowledge is the key for competitiveness

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TO BE FAST, EFFECTIVE AND EFFICIENT

THE MAIN REQUIREMENT



TO SEARCH FOR INFORMATION

THE FIRST TASKS



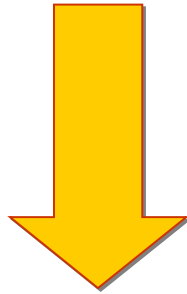
TO PROVIDE KNOWLEDGE

THE ULTIMATE IMPERATIVE

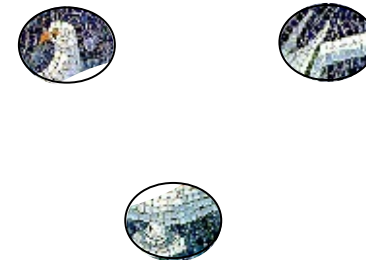
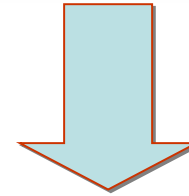


# Semantic Search: the “mosaic” metaphore

“What will be the nuclear strategy of China in the next 20 years?”



Keyword search

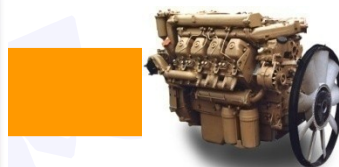


Semantic search

# Semantic Search: the “mosaic” metaphore

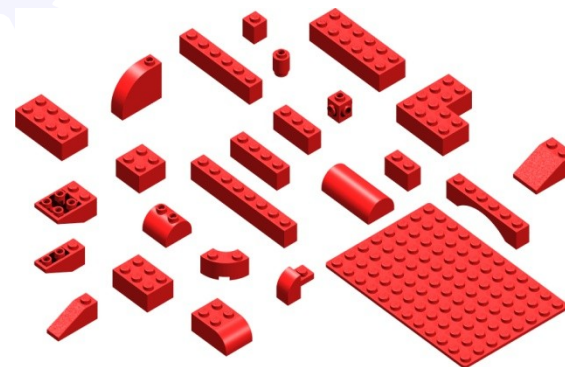


Semantic processing



Syntactic and Semantic tiles

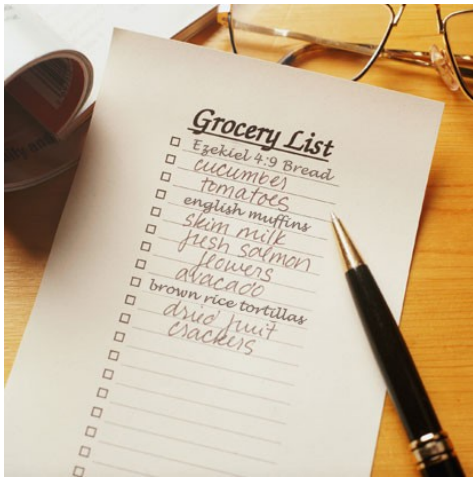
- main clause/subordinate clause
- subject-action-object (SAO)
- keywords - headwords
- related concepts
- name of people
- name of geographical site
- name of companies
- name of technologies
- phone numbers
- plate numbers
- investment figures
- date figures
- .....



## Knowledge is **connection**, not collection

Standard Information retrieval

*collection*

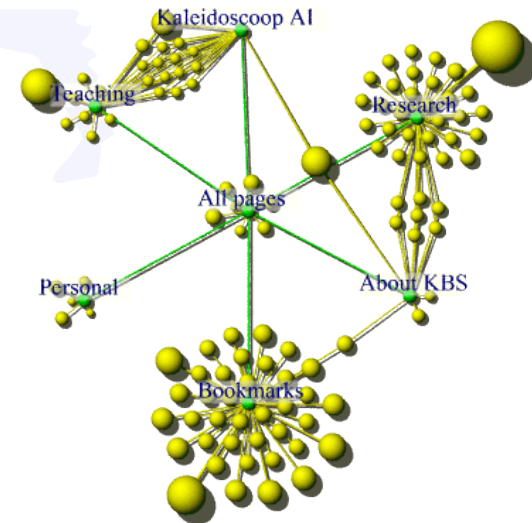


Semantic engine



Semantic search

**connection**



# Technology - Semantic Methods

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| 4 Methods                          | Definition                                 | Example  |
|------------------------------------|--|--|
| Morphological Analysis             | understand word forms                      | dog, dogs, and dog-catcher are closely related   |
| Grammatical Analysis               | understand the parts of speech             | "There are 40 rows in the table" uses rows as a noun, vs. "She rows 5 times a week" uses rows as a verb  |
| Logical Analysis                   | understand how words relate to other words | "Jeffrey Skilling, represented by Attorney Daniel Petrocelli, is married to Rebecca Carter". Rebecca is married to Jeffrey not Daniel.                         |
| Semantic Analysis (disambiguation) | understand the context of key words        | "I used beef broth for my soup stock" uses stock in the context of food, vs. "The company keeps lots of stock on hand" uses stock in the context of inventory. |



# Technology - Semantic Methods

The screenshot shows the COGITO Semantic Disambiguator interface. The main window title is "Untitled - COGITO - Semantic Disambiguator". The menu bar includes "File", "Edit", "Commands", "Show", "Flags", "View", and "Help". The toolbar contains icons for file operations and editing.

The main text area displays the sentence: "My car eats gas when I step on the gas." The words are color-coded: "My car" (red), "eats" (red), "gas" (red), "when" (green), "I" (green), "step" (green), "on the gas" (green), and "." (grey). A blue box labeled "Morphology / POS" has arrows pointing to the words "gas" and "on the gas".

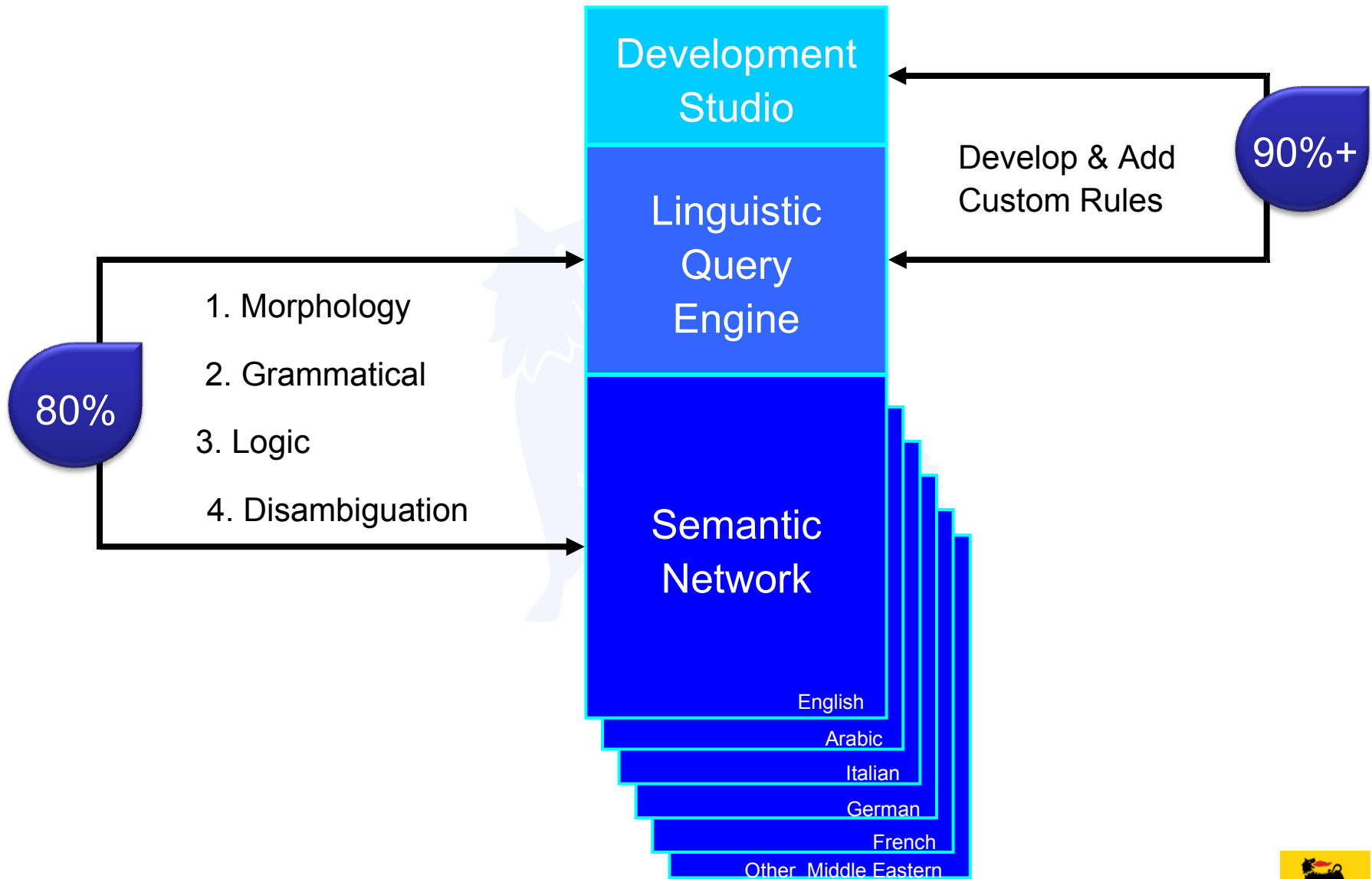
Below the text, there are statistics: "Adj: 3", "Noun: 7", "Verb: 10", "oun: 1:", "Adv: 2", "Verb: 8", "Adv: 1", "oun: 1:". Below these, the words "My car", "eats", "gas", "when", "I", "step", "on the gas", and "." are listed in boxes. Below "gas", there is a yellow box with the text: "gasolene, gasoline, petrol, gas" and "(54%) a volatile flammable mixture of hydrocarbons (hexane and heptane and octane etc.) derived from petroleum; used mainly as a fuel in internal-combustion engines". A blue box labeled "Disambiguation" has an arrow pointing to this box.

Below "on the gas", there is a yellow box with the text: "gun, accelerator pedal, gas pedal, throttle, accelerator, gas" and "(60%) a pedal that controls the throttle valve; 'he stepped on the gas'". A blue box labeled "Disambiguation" has an arrow pointing to this box.

On the right side, there are two panels. The top panel, labeled "Categories", shows a list of categories: "motor vehicle 28.5% (3)" and "chemistry 0.9% (1)". The bottom panel, labeled "Logic (semantic triples)", shows a tree structure of semantic triples: "eat" with "SBJ: 'My car'" and "OBJ: 'gas'", and "step" with "SBJ: 'I'". A blue box labeled "Logic (semantic triples)" has an arrow pointing to the "OBJ: 'gas'" triple.

The status bar at the bottom left shows "Ready".

# Technology Stack & Precision



# Technology - Semantic Network

The screenshot shows the COGITO Studio - Sensigrafo interface. The search term is 'oil'. The results are organized into three columns with counts: 5, 12, and 5. The first column lists general categories like hydrocarbon, organic compound, organic substance, and substance, matter, cat. sostanze. The second column lists specific types of oil like oil, oil color, and oil paint. The third column lists specific products like motor oil, multigrade oil, hydraulic oil, black oil, and lube oil. Each entry includes a percentage of related terms and a brief description.

**COGITO® Semantic Network:**

- 350,000 words
- 2.8m relationships

# Semantic Development Environment

The screenshot displays the COGITO Studio - Discover - main.efe interface. The main window shows the following code in the editor:

```
3 TEMPLATE (TEST)
4 {
5     @PERSON,
6     @DATE,
7     @BRAND
8 }
9
10 SCOPE SENTENCE IN SECTION (BODY)
11 {
12     IDENTIFY (TEST)
13     {
14         @PERSON [TYPE (NPH)]
15     }
```

The Output window shows the message: "E" language rules correctly compiled. Document analysis.

The Extraction window shows the following table:

| Record / Fields | Value      | Text | Concep... | Ancest... | Position | Sentence |
|-----------------|------------|------|-----------|-----------|----------|----------|
| TEST            |            |      |           |           |          |          |
| └ PERSON        | Mary Smith |      |           |           |          |          |


The Rules window shows the following table:

| Rule                        | Hit / Blocks                |
|-----------------------------|-----------------------------|
| There are no items to show. | There are no items to show. |

The bottom status bar shows: BODY Line: 25, Col: 2 CAP NUM SCRL



**DISTILLING KEY  
INFORMATION**

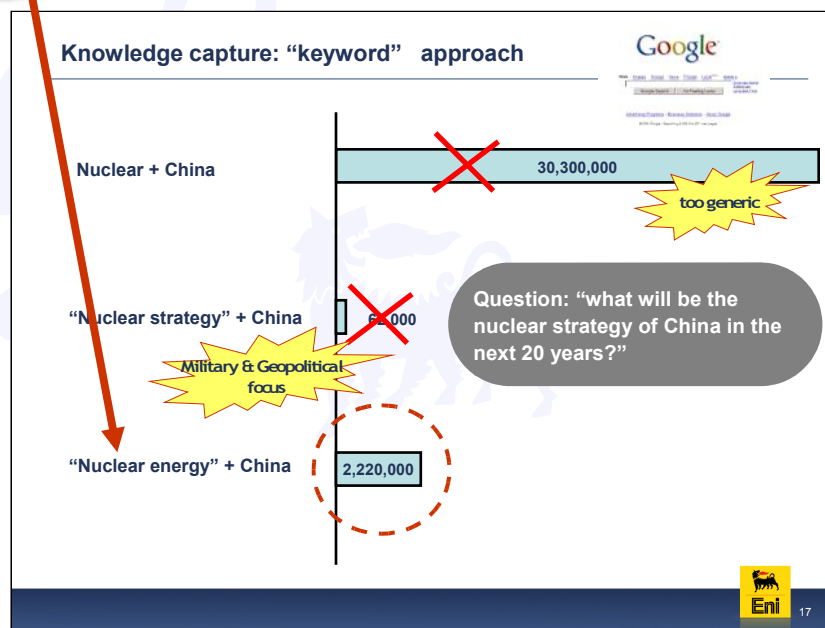
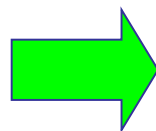


**PROCESSING  
AND TRACKING  
KNOWLEDGE**



Question: “What will be the nuclear strategy of China in the next 20 years?”

We will semantically explore this “corpus” of 2,220,000 documents





Elements

Headword Concepts Tools

| Keyword        | Freq.        | Headword      | Freq. | Concept  | Freq. |
|----------------|--------------|---------------|-------|--|-------|
| energy         | 32612        | china         | 2737  | be - Verb. Have the quality of being; ; (be)                               | 2729  |
| <b>nuclear</b> | <b>32579</b> | have          | 1772  | China, People's Republic of China, Communist China, mainland C...          | 2568  |
| china          | 31590        | technology    | 1502  | make up, constitute, comprise, be, represent - Verb. To make ...           | 1359  |
| power          | 15253        | energy        | 1499  | United States of America, United States, America - Pr.N. Federa...         | 1190  |
| have           | 12879        | nuclear       | 1237  | not - Adv. Adv. Negative adverb used to form structures...                 | 1117  |
| development    | 12819        | development   | 1023  | process, system, methodology, proceeding, way, procedure, m...             | 1109  |
| new            | 11028        | use           | 1003  | American - Adj. Adj. Relating to the United States, its peop...            | 1106  |
| technology     | 10658        | u.s.          | 9910  | program, plan - Noun. A method of doing something; a series.....           | 1031  |
| u.s.           | 10567        | new           | 9895  | nuclear, atomic - Adj. Adj. Using atomic energy (nuclear, atomi...         | 1011  |
| chinese        | 9749         | country       | 9627  | this - Adj. Adj. Used to refer to the present event,....                   | 8518  |
| states         | 9617         | chinese       | 9171  | demand, involve, want, require, ask, need, necessitate, call for ...       | 7983  |
| international  | 8314         | plan          | 7338  | technology - Noun. The theoretical elaboration and application ...         | 7663  |
| fuel           | 8010         | can           | 6912  | land, country, State, state, nation - Noun. The territory occupi...        | 7478  |
| countries      | 7454         | say           | 6841  | government State, regime state authorities - Noun A noun                   | 7427  |
| united         | 7382         | system        |       | ology  | 7303  |
| plan           | 7057         | year          |       | Belong   | 7123  |
| world          | 6980         | program       |       | Of c   | 7089  |
|                | 6974         | united states |       | . The c  | 6579  |
|                | 6973         | power         |       | he cap   | 6302  |
|                | 6963         | fuel          |       | alongin  | 5898  |
|                | 6702         | fuel          |       | an, tak  | 5770  |
|                | 6561         | government    |       | th - No  | 5765  |
|                | 6557         | world         |       | vdj. At  | 5666  |
|                | 6412         | develop       |       | dv. In   | 5351  |
|                | 6402         | make          |       | to empl,   | 5328  |
|                | 6395         | oil           | 5436  | also, as well - Adv. Adv. In addition; as well (also, as well)             | 5300  |
|                | 6001         | international | 5412  | chain reactor, atomic pile, nuclear pile, reactor, nuclear reactor ...     | 5209  |
|                | 5941         | emission      | 5358  | development, passage, evolution, growth - Noun. A process in ...           | 5189  |
|                | 5930         | support       | 5290  | strategy, scheme - Noun. A carefully devised plan of action to.....        | 4944  |
|                | 5880         | project       | 5277  | area, geographical area, region, Area, country, geographic lands...        | 4709  |
|                | 5785         | nuclear power | 5213  | house, business firm, company, enterprise, firm, establishment, ...        | 4675  |
|                | 5668         | strategic     | 5188  | oil, fossil oil, petroleum, coal oil, rock oil - Noun. Crude oil that o... | 4560  |
|                | 5646         | provide       | 5164  | ply, supply, furnish, provide, cater - Verb. To give, sell, or make ...    | 4558  |
|                | 5583         | policy        | 5102  | further, encourage, advance, promote, boost - Verb. To promo...            | 4473  |
|                | 5519         | strategy      | 4944  | new - Adj. Adj. Not of long duration; having just come....                 | 4349  |
|                | 5439         | cooperation   | 4812  | objective, end, purpose, target, object, aim - Noun. The goal in...        | 4315  |
|                | 5222         | issue         | 4703  | say - Verb. To convey information or express feelings in...                | 4310  |
|                | 5082         | reactor       | 4676  | other, extra, additional - Adj. Adj. Further or added (other, ext....      | 4307  |
|                | 4964         | need          | 4615  | task, project, undertaking, labor - Noun. A particular piece of w...       | 4305  |
|                | 4948         | one           | 4525  | development - Noun. Act of improving by expanding or enlargin...           | 4169  |
|                | 4928         | state         | 4491  | energy, vigour, vigorousness, vigor - Noun. Liveliness or forceful...      | 4035  |
|                | 4859         | military      | 4448  | India, Republic of India, Bharat - Pr.N. A republic in S Asia; 2nd ...     | 3967  |
|                | 4726         | increase      | 4419  | all - Adj. Adj. Quantifier; used with either mass or co...                 | 3884  |
|                | 4684         | reduce        | 4378  | amelorate, better, improve upon, amend, improve, meliorate - ...           | 3880  |
|                | 4516         | india         | 4363  | emission, discharge - Noun. A substance that is emitted or relea...        | 3870  |
|                | 4488         | research      | 4346  | state, commonwealth, State, body politic, nation, country, land...         | 3739  |

keyword: nuclear  
frequency: 32,579



# Semantic area of "nuclear"

concept: "nuclear energy"  
frequency: 3,332

concept: "nuclear power"  
frequency: 3,384

| Concept  | Freq. |
|--|-------|
| nuclear - Adj. Relating to, using, or producing nuclea...          | 1439  |
| nuclear - Adj. Constituting or like a nucleus (nuclear...          | 236   |
| nuclear - Adj. Relating to, involving, or contained in...          | 303   |
| nuclear arsenal - Noun. A large number of nuclear weapons. ...     | 197   |
| nuclear attack - Noun. Military attack using nuclear weapons. ...  | 112   |
| nuclear chemistry - Noun. The branch of chemistry in which ...     | 2     |
| nuclear disarmament - Noun. The reduction or elimination of ...    | 88    |
| nuclear energy - Noun. The energy released by a nuclear rea...     | 3332  |
| nuclear engineering - noun. The branch of engineering conc...      | 88    |
| nuclear explosion, atomic explosion - Noun. The explosion of...    | 37    |
| nuclear fuel - Noun. A substance such as an isotope of...          | 1141  |
| nuclear fusion reaction, fusion, nuclear fusion - Noun. A nucl...  | 93    |
| nuclear industry - Noun. Industry that produces nuclear ener...    | 433   |
| nuclear medicine - Noun. The branch of medicine in which ra...     | 13    |
| nuclear model - Noun. Imported from ##Zanichelli## (nucl...        | 5     |
| nuclear physicist - Noun. A physicist who specializes in nuclea... | 3     |
| nuclear physics - Noun. The branch of physics that studies t...    | 28    |
| nuclear plant - Noun. Atomic energy plant (nuclear plant).         | 354   |
| nuclear power - Noun. Nation which can use nuclear weapo...        | 3384  |
| nuclear power station, nuclear power plant - Noun. A power...      | 990   |
| nuclear radiation - Noun. Imported from ##Zanichelli## (nu...      | 3     |
| nuclear reaction - Noun. A process that alters the energy or...    | 10    |
| Nuclear Regulatory Commission - Pr.N. A United States gover...     | 160   |
| nuclear reprocessing plant - Noun. A place where a facility in ... | 5     |
| nuclear sector - Noun. The sector that is concerned with th...     | 31    |
| nuclear site - Noun. Nuclear site (nuclear site)                   | 41    |
| nuclear submarine - Noun. A submarine in which a nuclear re...     | 91    |
| nuclear submarine - Noun. A submarine that carries nuclear ...     | 149   |
| nuclear test - Noun. Test realized by means of atomic bombs...     | 142   |
| nuclear threshold - Noun. The point in a war being fought.....     | 1     |
| nuclear waste, radwaste, radioactive waste - Noun. Liquid, s...    | 646   |
| nuclear weapon - Noun. A weapon whose explosive power ...          | 2796  |
| nuclear winter - noun. A period that scientists believe wou...     | 6     |
| nuclear, atomic - Adj. Using atomic energy (nuclear, at...         | 10119 |
| nuclear-free - Adj. Not having or allowing nuclear weap...         | 7     |
| nuclear-free zone - Noun. An area, usually within a country, ...   | 8     |
| nuclear-powered - Adj. Powered by nuclear power (nucl...           | 53    |
| nuclearization - Noun. The equipping of something or someo...      | 4     |
| nucleate, nucleated - Adj. Having a nucleus (nucleate, ...         | 1     |
| nucleation - Noun. The forming of a nucleus (nucleation)           | 2     |
| nuclei, core group, core, nucleus - Noun. A small group of in...   | 64    |
| nuclein - Noun. Any of the substances present in the... (nuc...    | 2     |
| nucleon - Noun. A constituent of an atomic nucleus (nucleon)       | 1     |
| nucleon number, mass number - Noun. The sum of the num...          | 1     |
| nucleonics - Noun. The study of the behavior and character...      | 13    |
| nudge - Verb. To push or poke somebody gently, usually ...         | 1     |

**WARNING !!**

- nuclear weapon frequency: 2.796
- nuclear arsenal frequency: 197
- nuclear attack frequency: 112
- nuclear medicine frequency: 13







**China**

| People                                 | Freq. | Organization  | Freq. | Place                    | Freq. |
|--|-------|---|-------|--------------------------|-------|
| bush                                   | 2319  | department of energy                                  | 1676  | china                    | 26161 |
| february                               | 1049  | international atomic energy agency                    | 1400  | united states of america | 10351 |
| john mccain                            | 750   | united nations  | 929   | india                    | 5051  |
| hu jintao                              | 468   | u.n. security council                                 | 530   | iran                     | 4485  |
| barack obama                           | 423   | member state  | 512   | russia                   | 4099  |
| robert g. china                        | 408   | environmental protection agency                       | 487   | japan                    | 3685  |
| will china                             | 386   | defense   | 470   | beijing                  | 3262  |
| wen jiabao                             | 334   | organization for economic cooperation and development | 433   | asia                     | 2869  |
| usaid administrator                    | 306   | vol.  | 379   | europaean union          | 2238  |
| system china                           | 231   | state department                                      | 376   | taiwan                   | 2024  |
| zoelick details discussions with china | 227   | national education association                        | 364   | korea                    | 1999  |
| versione                               | 224   | intergovernmental panel on climate change             | 342   | america                  | 1694  |
| army king china                        | 205   | ...   | 336   | pakistan                 | 1521  |
| washington                             | 195   | ...   | 322   | africa                   | 1310  |
| nicolas sarkozy                        | 191   | ...   | 305   | iraq                     | 1054  |
| georgia & it                           | 189   | ...   | 300   | france                   | 1049  |
| condoleezza rice                       | 189   | ...   | 297   | europa                   | 919   |
| gnep percentage                        | 189   | ...   | 293   | ...                      | 810   |
| manmohan singh                         | 189   | ...   | 264   | ...                      | ...   |
| jiang zemin                            | 189   | ...   | 249   | ...                      | ...   |
| iaea safeguards agreement              | 189   | ...   | 247   | ...                      | ...   |
| costind national directors             | 189   | ...   | 240   | ...                      | ...   |
| nea secretariat                        | 189   | ...   | 223   | ...                      | ...   |
| donald h. rumsfeld                     | 189   | ...   | 206   | ...                      | ...   |
| beijing                                | 189   | world bank  | 203   | soviet union             | 620   |
| vladimir putin                         | 189   | china national nuclear corporation                    | 201   | indonesia                | 617   |
| gordon brown                           | 189   | china national petroleum corporation                  | 195   | united kingdom           | 608   |
| duke energy                            | 189   | congress  | 193   | usa                      | 570   |
| u.s. government printing office        | 189   | eia   | 192   | germany                  | 559   |
| confidence language                    | 189   | climate change science program                        | 185   | saudi arabia             | 546   |
| t'ang china                            | 189   | reform commission                                     | 179   | arabia                   | 545   |
| mukhtar dzhakishev                     | 189   | african country                                       | 177   | moscow                   | 540   |
| zhu chenghu                            | 189   | state council   | 177   | israel                   | 472   |
| dalai lama                             | 189   | international energy ag...                            | 173   | vietnam                  | 465   |
| mox fuels workshop proceedings         | 189   | nuclear regulatory commission                         | 171   | uk                       | 430   |
| cui tiankai                            | 189   | snptc. & crnc   | 171   | afghanistan              | 399   |
| american iraq                          | 189   | asian country   | 154   | teheran                  | 395   |
| michael pillsbury                      | 189   | world nuclear association                             | 154   | pacific                  | 360   |
| qinshan candu                          | 189   | associated press                                      | 147   | philippines              | 347   |
| elizabeth c. economy                   | 189   | shanghai cooperation organization                     | 147   | guangdong                | 335   |
| machi suo                              | 189   | united states agency for international development    | 147   | brazil                   | 319   |
| mark fitzpatrick                       | 189   | central intelligence agency                           | 142   | london                   | 316   |
| peter mattis china                     | 189   | white house   | 140   | shanghai                 | 311   |
| lu huagang                             | 189   | atomic energy commission                              | 139   | italy                    | 288   |
| mohamed elbaradei                      | 189   | united states department of agriculture               | 138   | egypt                    | 279   |





# How many times, in the same sentence with

| People                               | Freq. | Organization                                   | Freq. | Place                    | Freq. |
|--------------------------------------|-------|--|-------|--------------------------|-------|
| bush                                 | 63    | department of energy                           | 136   | china                    | 985   |
| february                             | 39    | international atomic energy agency             | 110   | united states of america | 383   |
| john mcc                             | 25    | organization for economic cooperation and d... | 83    | india                    | 345   |
| manm                                 | 23    | member state                                   | 48    | japan                    | 259   |
| barac                                | 21    | approach most generation iv                    | 35    | iran                     | 174   |
| hu j                                 | 19    | isoe programme                                 | 33    | ruussia                  | 158   |
| jacq                                 | 18    | u.n. security council                          | 25    | france                   | 134   |
| gnep                                 | 17    | nuclear regulatory commission                  | 24    | korea                    | 92    |
| nicolas                              | 17    | nuclear corporation                            | 21    | asia                     | 77    |
| wen j                                | 12    | nuclear institute's                            | 21    | pakistan                 | 76    |
| neal secretariat                     | 11    |  | 21    | europaean union          | 68    |
| dennis spurgeon                      | 10    |  | 19    | beijing                  | 63    |
| machi suo                            | 10    | oil canada                                     | 19    |                          |       |
| mubarak                              | 10    |  | 18    |                          |       |
| asiah                                | 9     |  | 16    |                          |       |
| george perkov                        | 9     |  | 15    |                          |       |
| patrik moore                         | 9     | community                                      | 15    |                          |       |
| qinshan candu                        | 9     | national education association                 | 15    | usa                      | 44    |
| brajesh mishra                       | 8     | snptc.â cnc                                    | 15    | italy                    | 41    |
| cheri yunshu                         | 8     | china guangdong nuclear power group            | 14    | uk                       | 38    |
| energy laboratory in                 | 8     | global nuclear energy partnership              | 14    | bangladesh               | 37    |
| mohamed elbaradei                    | 8     | gnep   | 14    | united kingdom           | 33    |
| sergey kiriyenko                     | 8     | united nations                                 | 14    | germany                  | 31    |
| vajpayee                             | 8     | areva  | 13    | vietnam                  | 31    |
| condoleezza rice                     | 7     | eia  | 13    | australia                | 30    |
| confidence language                  | 7     | general electric                               | 13    | mwe enhanced candu       | 28    |
| gnep program manager lisowski savage | 7     | state council                                  | 13    | america                  | 27    |
| john chipman                         | 7     | world nuclear association                      | 13    | mideast                  | 27    |
| zhang guobao                         | 7     | council of economic advisors                   | 12    | tokyo                    | 26    |
| angela merkel                        | 6     | greenpeace                                     | 12    | united arab emirates     | 26    |
| anne lauvergeon                      | 6     | atomic energy commission                       | 11    | chernobyl                | 25    |
| hen thode                            | 6     | gulf cooperation council                       | 11    | africa                   | 24    |

nuclear power

nuclear energy

China

place: China  
frequency: 985





# How many times, in the same sentence with

The screenshot shows a software interface with a word frequency list on the left and a search result for 'strategy' on the right. A red box highlights the search result, and a yellow box contains the text 'concept: strategy occurrences: 33'. A diagram with four circles ('nuclear power', 'China', 'nuclear energy', 'strategy') is overlaid on the left side of the screenshot, with red arrows pointing from the top text to the circles and black lines connecting the circles.

| Keyword       | Freq. | Headword       | Freq. |
|---------------|-------|----------------|-------|
| nuclear       | 1268  | china          | 972   |
| china         | 1032  | nuclear power  | 663   |
| power         | 799   | nuclear energy | 341   |
| energy        | 635   | development    | 220   |
| developm      | 272   | technology     | 166   |
| technol       | 129   | nuclear        | 153   |
| plants        | 126   | energy         | 143   |
| capacit       | 120   | capacit        | 125   |
| coopera       | 108   | plants         | 120   |
| agreement     | 88    |                | 107   |
| construction  | 72    |                | 106   |
| international | 72    |                | 104   |
| peaceful      | 71    |                | 95    |
| countries     | 70    |                | 95    |
| new           | 67    |                | 83    |
| percent       | 66    |                | 77    |
| use           | 66    |                | 73    |
| 2020          | 65    |                | 72    |
| industry      | 65    | peaceful       | 71    |
| india         | 61    | make           | 67    |
| plan          | 61    | 2020           | 65    |
| signed        | 59    | new            | 64    |
| two           | 56    | sign           | 64    |
| one           | 53    |                | 61    |
| country       |       |                | 58    |
| national      |       |                | 56    |
| have          |       |                | 55    |
| most          |       |                | 52    |
| plans         |       |                | 51    |
| research      |       |                | 50    |
| world         |       |                | 49    |
| pakistan      | 50    |                | 48    |

Search results for 'strategy':

| Concept  | Freq. |
|--|-------|
| strategy, scheme - Noun. A carefully devised pla...        | 33    |
| strength, forte, specialty - Noun. An asset of sp...       | 6     |
| strength, potency, effectiveness - Noun. Capacit...        | 2     |
| strengthen - Verb. Increase in strength or force...        | 3     |
| strengthen, fortify - Verb. To make something ...          | 12    |
| strengthen, fortify - Verb. To strengthen or rein...       | 5     |
| strike - Verb. To enter someone's mind or occu...          | 1     |
| strongly, strong - Adv. A great strength or in ...         | 2     |
| structure - Noun. The composition of k...                  | 5     |
| student, pupil, educated person - Noun. A learner who i... | 4     |
| study, report - Noun. A document descri...                 | 8     |
| study, work - Noun. Application of the mind to learnin...  | 4     |
| subject, matter, topic, issue - Noun. Some situat...       | 8     |

Diagram labels:

- nuclear power
- China
- nuclear energy
- strategy

Search result summary:

concept: strategy  
occurrences: 33





Foud 33 sentences in 25 documents

Adobe Reader - [China.pdf]

## Nuclear power strategy in China

- Electricity consumption is growing fast
- Environment protection is serious
- Nuclear power is safe, economical and clean
- China government has made an active strategy for nuclear power development to meet the situation
  - During 2006-2020,
    - China will construct 30 new NPPs,
    - power 40,000MWe,
    - percentage 4%,
    - capacity of fuel cycle facilities will also be expanded.

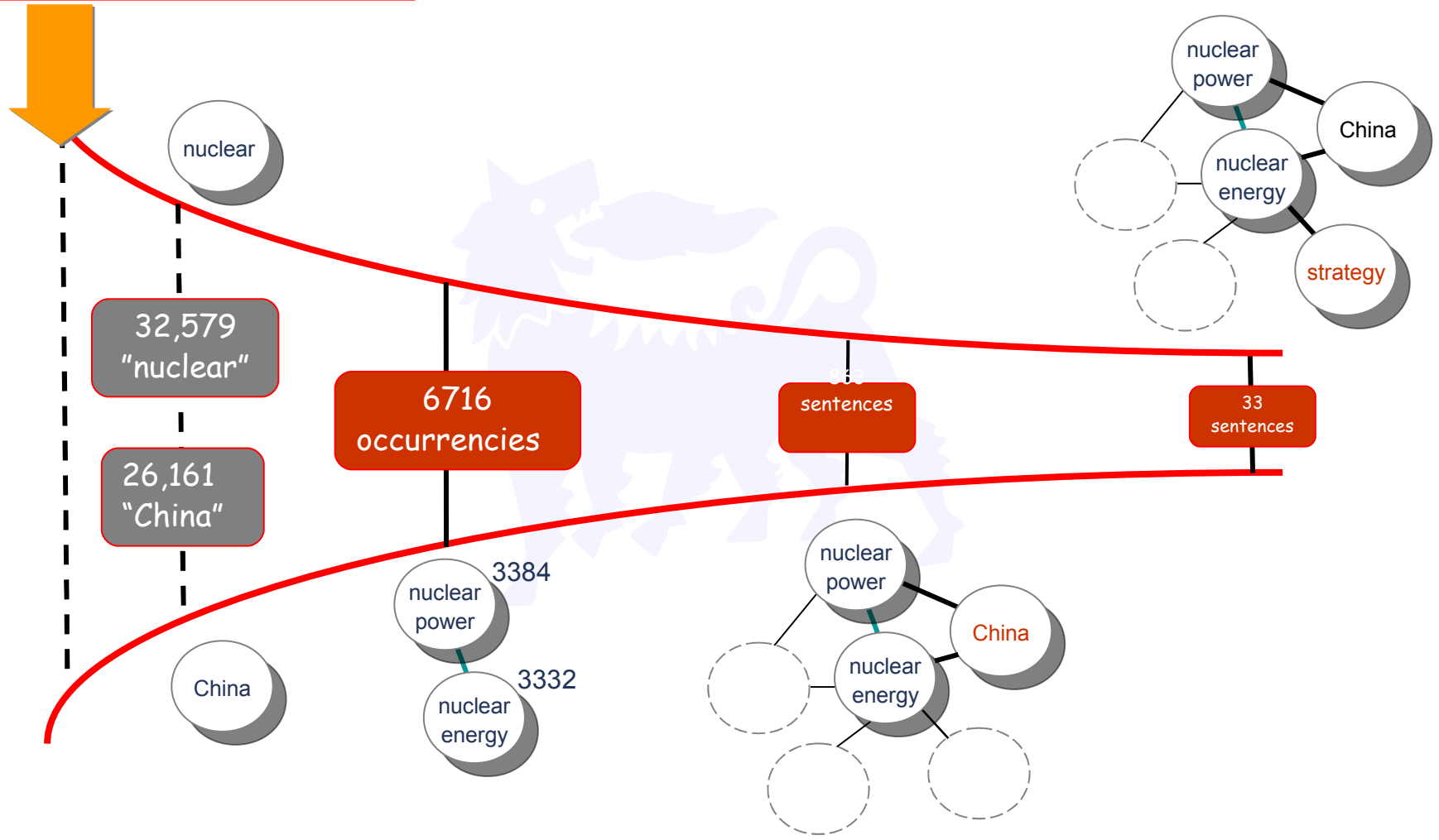
2007-10-29 IAEA TM on Establishment of IDN Vienna 2

Taskbar: Start, Posta in..., Microsoft..., COGITO..., CINA, China.pdf, 10.10, 10.00



# The virtuous funnel: from collection to connection

"nuclear energy" + China  
Corpus of 2,220,000 documents



# Serendipity, maybe



The screenshot shows the 'Elements' application window with a list of keywords and their frequencies. A network diagram on the left illustrates relationships between terms like 'nuclear power', 'nuclear energy', and 'tar sand oil sand'. A red box highlights the 'tar sand, oil sand' entry in the list, with a yellow callout box stating 'unexpected concept: tar sand occurrences: 66'.

| Keyword       | Freq. | Headword               | Freq. | Concept  | Fr...     |
|---------------|-------|------------------------|-------|--|-----------|
| energy        | 3261  | china                  | 2737  | protocol - Noun. The detailed plan of a scientific ...     | 66        |
| nuclear       | 3257  | have                   | 1772  | rich - Adj. Possessing material wealth; (rich)             | 66        |
| china         | 3159  | technology             | 1502  | rot, rotting, decaying, putrefaction, decompositi...       | 66        |
| power         | 1525  | energy                 | 1499  | Royal College of Art - Pr.N. The Royal College of ...      | 66        |
| have          | 1287  | nuclear                | 1237  | show, evince - Verb. To show a feeling or a quali...       | 66        |
| development   | 1281  | development            | 1023  | South Korean - Adj. Adj. Of or relating to or cha...       | 66        |
| new           | 1102  | use                    | 1093  | surface, Earth's surface, earth's surface - Noun. ...      | 66        |
| technology    | 1065  | u.s.                   | 989   | surging, rising - Adj. Adj. Increasing in amount o...      | 66        |
| u.s.          | 1056  | new                    | 9895  | <b>tar sand, oil sand - Noun. Sandstone bearing hig...</b> | <b>66</b> |
| chinese       | 9749  | country                | 9627  | unable, not able - A Lacking necessary p...                | 66        |
| states        | 8617  | chinese                | 9171  | added value, value Noun. The amount b...                   | 65        |
| international | 8314  | plan                   | 7338  | adverse, harmful, un untowardly, inauspi...                | 65        |
| fuel          | 8010  | can                    | 6912  | base of operations, Noun. Installation fro...              | 65        |
| countries     | 741   | black lead, graphite   | 6841  | black lead, graphite Noun. blacklead - Noun...             | 65        |
| united        | 714   | Bushire, Bushehr       | 6635  | Bushire, Bushehr - Noun. port in SW Iran, o...             | 65        |
| plan          | 6963  | combustion, burning    | 6461  | combustion, burning Noun. The act of burning ...           | 65        |
| world         | 6702  | commissioned, licensed | 6260  | commissioned, licensed                                     | 65        |
| research      | 6561  | two                    | 5568  | drawing, draught, draft - Noun. The act of movi...         | 65        |
| oil           | 6557  | fuel                   | 5550  | ecological environment - Noun. A kind of environ...        | 65        |
| strategic     | 6412  | government             | 5488  | editor - Noun. A person responsible for the edito...       | 65        |
| can           | 6402  | world                  | 5436  | fail, break down, go, conk out, give out, give wa...       | 65        |
| emissions     | 6395  | develop                | 5412  | flexile, flexible - Adj. Adj. Able to flex; able to b...   | 65        |
| security      | 6001  | make                   | 5358  | flow - Noun. Any uninterrupted stream or discha...         | 65        |
| economic      | 5941  | oil                    | 5290  | flue gas - Noun. The smoke in the uptake of a.....         | 65        |
| national      | 5930  | international          | 5277  | geothermal energy - Noun. Heat energy from gr...           | 65        |
| technologies  | 5880  | emission               | 5213  | haplessly, unluckily, unhappily, infelicitously, unfort... | 65        |
| gas           | 5785  | support                |       |  |           |
| climate       |       | project                |       |  |           |
| use           |       | nuclear power          |       |  |           |
| two           |       |                        |       |  |           |
| government    |       |                        |       |  |           |

**unexpected concept: tar sand  
occurrences: 66**





location: Canada, Alberta  
occurrences: 41

| People          | Freq. | Organization                      | Freq. | Place     | Freq. |
|-----------------|-------|-----------------------------------|-------|-----------|-------|
| alberta premier | 5     | sinopet                           | 9     | canada    | 31    |
| wen jiabao      | 3     | china national offshore oil corp. | 6     | alberta   | 10    |
| stephen harper  | 2     | aecl                              | 3     | china     | 10    |
| gary lunn       | 1     | joint working group               | 3     | africa    | 1     |
| system china    | 1     | meg energy corp.                  | 3     | calgary   | 1     |
|                 |       | energy alberta corp.              | 2     | cuba      | 1     |
|                 |       | canada-china joint working group  | 1     | iran      | 1     |
|                 |       | natural resources canada          | 1     | panama    | 1     |
|                 |       | ndrc                              | 1     | sudan     | 1     |
|                 |       | synenco energy                    | 1     | venezuela | 1     |

**Conceptual Diagram:**

```
graph TD; NP((nuclear power)) --- NE((nuclear energy)); TS((tar sand oil sand)) --- NE; A((Alberta)) --- NE; C((Canada)) --- NE; NE --- Empty(( ));
```





Found 34 sentences in 14 documents

Found 34 sentences in 14 documents

http://www.uofaweb.ualberta.ca/chinainstitute//pdfs/FUELINGTHEDRAGON.pdf

Adobe Reader - [Use China nuclear power for canada oil sands.pdf]

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Create PDF a partire da tutte le applicazioni MS Office

AUA - Newsletter 1/07

Pagina 9 di 12

announced C\$ 230 million (US\$ 200 million) investment over four years for researching clean energy technologies including next-generation nuclear power. It also flagged the possibility of using nuclear power for extracting oil from Alberta's oil sands, reducing the substantial demand for natural gas and cutting CO2 emissions from this. *Globe & Mail 18/1/07, CBC18/1/07.*

## AUSTRALIA

### Australian parliamentary report published

After 20 months work the House of Representatives Standing Committee on Industry & Resources has published a 732-page report *Australia's Uranium: Greenhouse Friendly Fuel for an Energy Hungry World*. Its Chairman said that the Committee had "reached a unanimous and bipartisan position on the need to remove all impediments to the further development of Australia's uranium resources. All members are agreed that present restrictions on uranium exploration and mining are illogical, inconsistent and anti-competitive". "Australia is uniquely placed to make a significant contribution to emissions reductions though increased production and supply of uranium." He said that "Australia should throw the world a climate lifeline through the expanded production and export of this greenhouse-friendly fuel" since renewables and energy efficiency "alone have no prospect whatsoever of meeting rapidly-growing demands for energy and abating greenhouse gas emissions to the degree required."

In respect to uranium exports to developing countries such as China: "As a matter of energy justice, Australia should not deny countries who wish to use nuclear power in a responsible manner the benefits from doing so." Parliament has now approved the bilateral treaty with China.

9 di 12

start

Posta in arrivo - Micro...

Microsoft PowerPoint ...

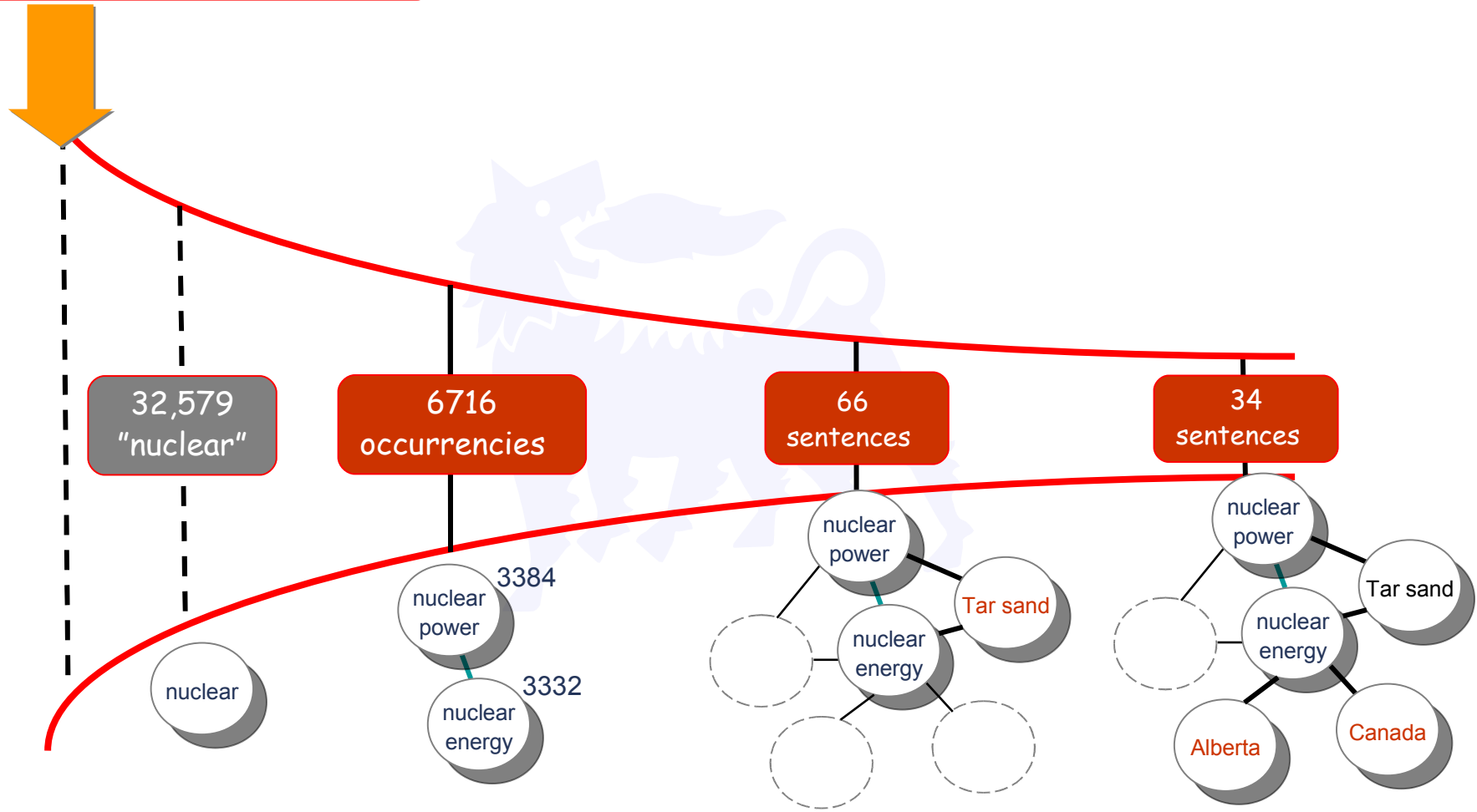
COGITO@ Intelligenc...

11.09



# The knowledge funnel

"nuclear energy" + China  
Corpus of 2,220,000 documents



# 3-Step Walk With Semantic Search

Oil as keyword = 399 results

The screenshot displays a search engine interface with the following elements:

- Browser:** COGITO® Focus
- Search Manager:** Search Manager
- Search Input:** A search box containing the keyword "oil" with a dropdown menu showing "oil".
- Results:** A section titled "Results [399 items]" with a "Multi sentence" and "Preview" dropdown menu.
- Search Results:** A list of search results, including:
  - UPDATE 2-Snam Q3 net profit up confirms c.html [1 kB]**  
Recession fears have halved the price of **oil** since its peak of \$147 per barrel in July and sparked concerns that energy companies would have to scale back their investments, hammering shares across the sector.  
**DOMAINS:** accounting - commerce - company - computer science - economics - finance
  - Oil below \$64 as US stock market pares gains.html [1 kB]**  
**Oil** had drawn support from evidence OPEC would act upon last week's decision to cut output as the United Arab Emirates state oil company reduced volumes to term customers. [...] European equities rose early on Tuesday, helped by a late surge in Asia and a jump in shares of heavyweight **oil** group BP after its third-quarter earnings beat forecasts.
- Navigation:** A footer bar showing "Page 1 of 40", "Show 10 items", and "Results 1 - 10 of 399".

# 3-Step Walk With Semantic Search

Oil as concept = 279 results

The screenshot displays a web browser window with a search engine interface. The search bar contains the word "oil". Below the search bar, a dropdown menu shows "oil" with a downward arrow. The main content area is divided into two panes. The left pane, titled "Results [279 items]", shows a list of search results. The first result is from "Holly Energy P" and the second is from "Diary - Hong K". The right pane, titled "Search item types", lists several definitions for "oil":

- K** oil
- L** oil
- S** Noun. A liquid fat obtained from plant seeds,... (oil)
- S** Noun. Crude oil that occurs naturally in sedimentary... (coal oil, fossil oil, rock oil, oil, petroleum)
- S** Noun. Petroleum derivative: any of various liquids extracted... (mineral oil, oil)
- S** Noun. An industry that produces and delivers oil... (oil industry, oil business, oil firm, refining industry, ...)

The browser's taskbar at the bottom shows the "COGITO® Focus" application and the "Search Ma..." application. The bottom right corner of the browser window displays "Results 1 - 10 of 279".

# 3-Step Walk With Semantic Search

Oil as a semantic concept = 322 results

The screenshot displays a web browser window with a search interface. The search bar contains the word "oil" and a dropdown menu is open showing "oil" with a downward arrow. Below the search bar, the results are displayed under the heading "Results [322 items]". The first result is titled "Holly Energy Partners LP Reports Third Quarter Results.html [1 kB]". The text of this result includes: "If these shippers do not meet their minimum commitments, we ... Texas, provides petroleum product and crude oil transportation, tankage and terminal services to the petroleum industry, including Holly Corporation subsidiaries. [...] The Partnership owns and operates petroleum product and crude gathering pipelines, tankage and terminals in Texas, New Mexico, Arizona, Washington, Idaho, Oklahoma and Utah." Below the text, a red banner lists domains: "DOMAINS: commerce - company - economics - industry - oil - petrochemistry". The second result is titled "Diary - Hong Kong - to November 4.html [1 kB]" and includes the text: "- # China Petroleum & Chemical Corporation Q3 results." At the bottom of the search results area, it shows "Page 1 of 33" and "Show 10 items". The bottom of the browser window shows the "COGITO® Focus" logo and a "Search Ma..." button.

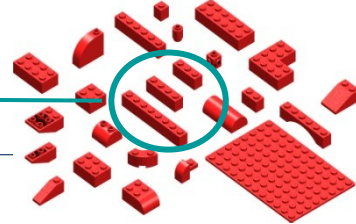
# 3-Step Walk With Semantic Search

Oil as a semantic concept & objects = 38 results

The screenshot shows a web browser window with a search engine interface. The search bar contains the text "oil China". Below the search bar, there are filters for "oil" and "China". The search results are displayed in a list format. The first result is "Diary - Hong Kong - to November 4.html [1 kB]" with a sub-heading "# China Southern Airline Co Ltd Q3 results." and a snippet "[...] - # China Petroleum & Chemical Corporation Q3 results." Below this result, there is a red banner with the text "DOMAINS: commerce - company - finance - history". The second result is "WRAPUP 1-PetroChina Sinopec turn in mixed Q3 ou" with a snippet "Now, with crude prices more than halving to \$65 and after Beijing raised gasoline and diesel prices by 18 percent in June, analysts are upbeat on the outlook for the two oil majors as they enjoy one of the highest refining margins in the world." and another snippet "[...] High international crude prices, which hit a record \$147 a barrel in July, squeezed state-owned PetroChina and rival Sinopec as they are obliged to supply the world's No. 2 oil consumer with". A "Place" popup window is open over the search results, displaying a list of locations: "China", "Hong Kong", "Mainland", and "Republic of China". The interface includes a search bar, filters, search results, and a "Place" popup window.

CAPTURING WEAK  
SIGNALS &  
UNDERSTANDING  
TECHNOLOGY  
EVOLUTION

A useful linguistic structure



## Playing with a very popular “trio”

**S**ubject

**A**ction

**O**bject



# SAO structure identification can boost technical problem solving

S

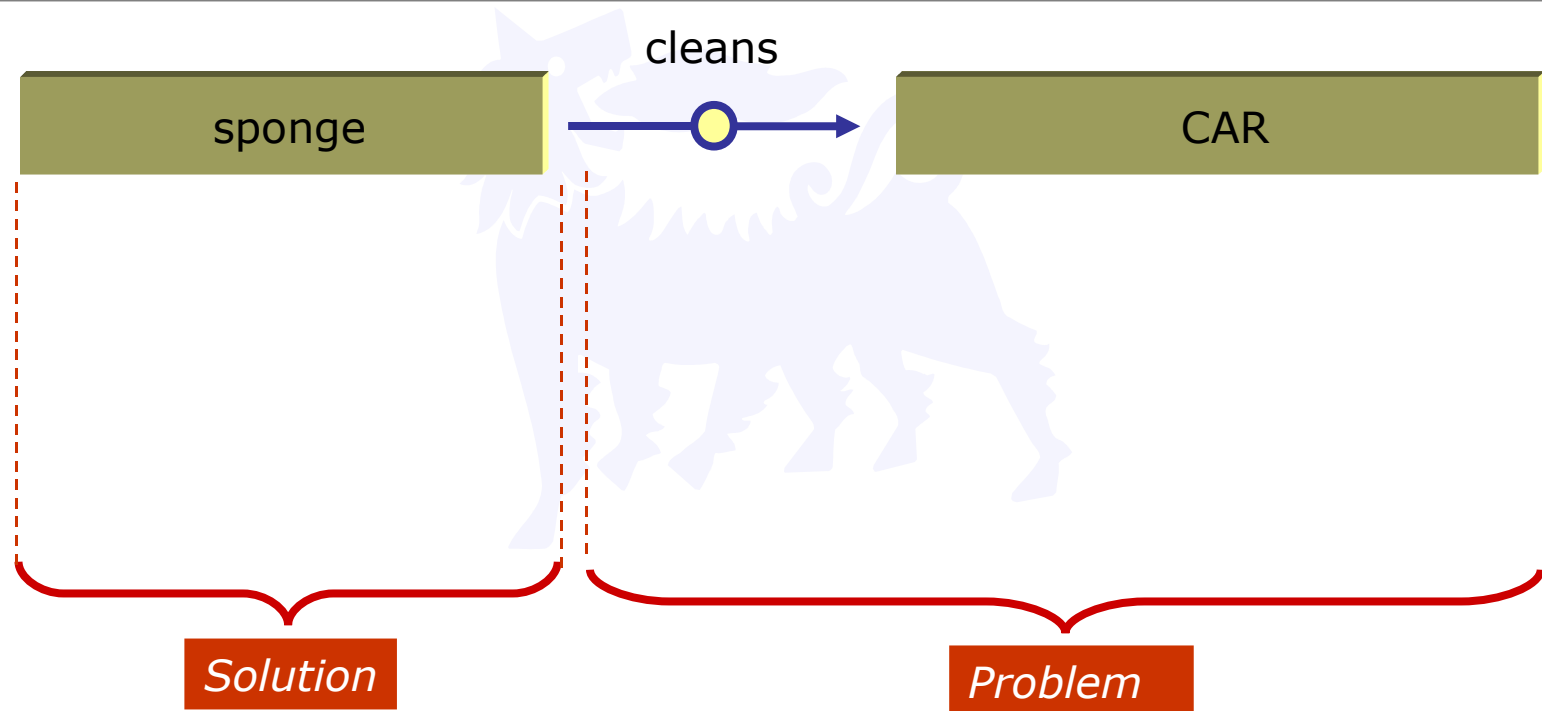
A

O

subject

action

object





# SAO structure identification can boost technical problem solving

S

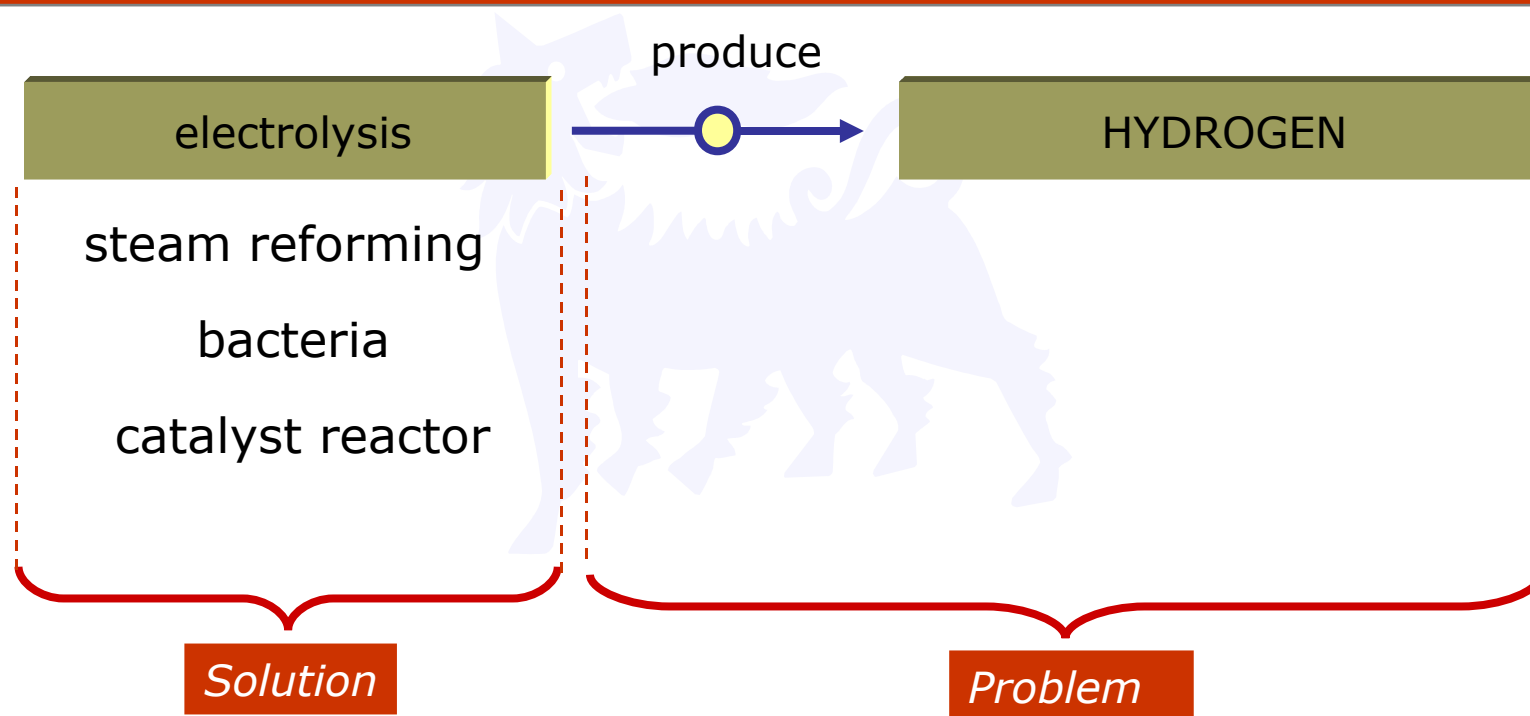
A

O

subject

action

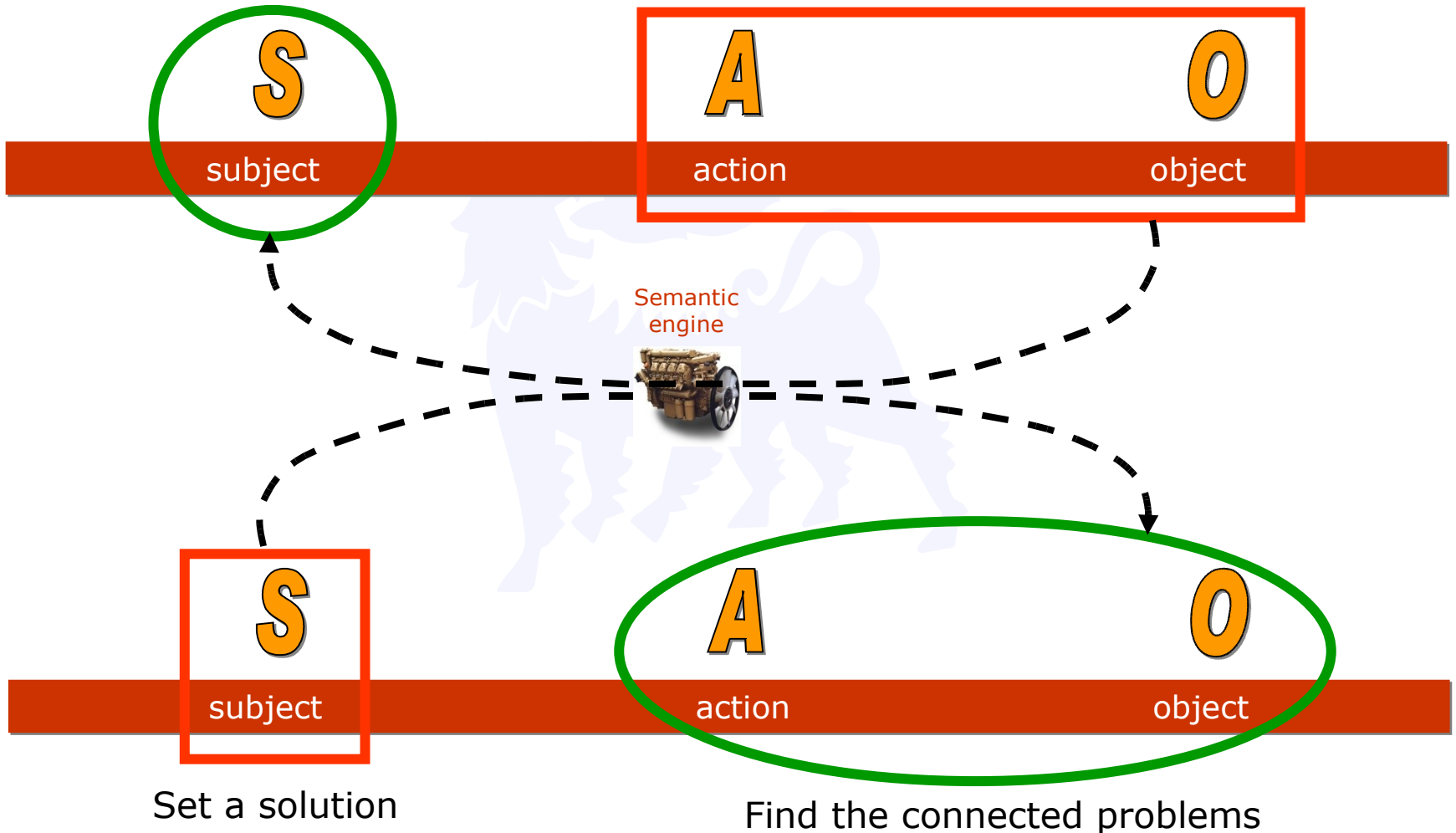
object



# Extracting knowledge through semantic queries on SAO's

Find all the solutions

Set a problem



Set a solution

Find the connected problems

# Capturing weak signals of “breakthrough”

S

A

O

subject

action

object

increase pressure

enhance

OIL RECOVERY

Inject gas

Inject polymers

Inject criogenic liquids

Ultrasonic stimulation

Magnetic stimulation

*Problem*



Radical Innovation  
Disruptive Technology  
Breakthrough

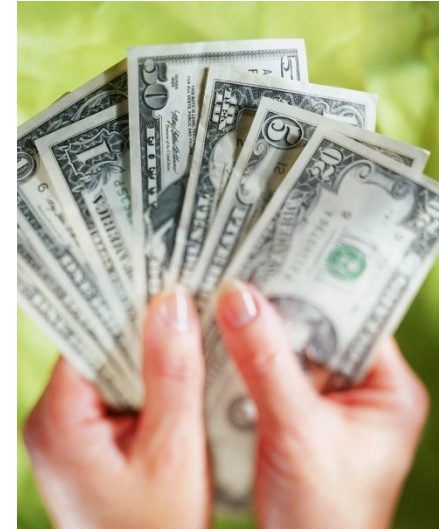
*Solution*

# Conclusions

---



# *avoid high cost*



- of wasting effort on poor content
  - ✓ early selection of high quality information without “reading” text
- of not finding information
  - ✓ management of unstructured information
- of unnecessary re-creation of content
  - ✓ because you can “know what you know”



Thank you