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Layout definition problem

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7.1- Introduction

The search on the Web has changed in these last years; users are no more interested in obtaining a list of Web pages, but in accessing directly the Web objects (e.g. if the user wants to know the temperature in a city, he expects that the search engine directly returns it and not a list of pages containing this information). Then the search is becoming a process and queries tend to be more and more complex, so the answer has to be structured oriented and not a simple list of pages.

In order to fulfill these requirements, the search engines have to consider the concepts of domains (fields of interest such as people or city) and types (e.g. image, video). The user can ask a query (mono-domain-> it regards a single domain; ambiguous-domain-> it involves multiple domains, depending on the interpretation of the user; multi-domain-> it spans several explicated domains) and the result set is composed by items of several information types. For example the user is interested in a city and the result set includes images, news and links.

The problem of layout definition regards the visualization of the different types of result items, in the result page, in a optimal way that reflects the importance of the information and the users' needs. The result visualization is a core aspect of the search engines, because the way in which the results are showed, influences the quality of the user experience.

7.2- Analysis of the search systems' behavior

This section is about the background on the existing search engines, with the focus on the query results in terms of content (domain and type) and layout.

The goal is to understand if the search engines, including domain-specific functionalities, are able to answer mono-domain queries, ambiguous domain queries, multi-domain queries, with also attention to the organization of the results in the page.

In particular are considered the aspects of:

- “Query disambiguation”: it means understand if the search engine can recognize the different concepts possibly related to an ambiguous query.
- “Entity-type identification”: it regards the recognition of proper names by the search engine, considering also more than one concept.
- “Automatic layout”: it is about the presentation aspects of the different results.

For each one of the previous points are performed some queries, by these general-purpose search engines: Google (<http://www.google.com>), Yahoo! (<http://www.yahoo.com>), Bing (<http://www.bing.com/>) - all in the English version. The results are described according to the involved goals.

7.2.1- Query disambiguation

An ambiguous query is a question with multiple interpretations; each of them is related to a different meaning.

The goal of this step is to assess if the search engine is able to notice the ambiguity of a query, thus showing the results about the various concepts connected to the query. As we don't know for sure what the user means, it's a good choice to show a diversified result set.




It will be taken into account the first page returned by the search engines, because it is the most important page usually considered by users. If the common interpretations of the query don't appear in the first page, the following ones will be examined, to see if and where the others meanings appear.




Common interpretations are the common meanings related to an ambiguous query: e.g. by typing only “jaguar” the user is interested in the car or in the animal and not for example in a specific company, named Jaguar, returned by the search engine.




The considered queries are:

- 1- Paris Hilton vs Hilton Paris
- 2- jaguar
- 3- Washington
- 4- apple
- 5- leopard
- 6- opera
- 7- panda
- 8- mouse
- 9- nike
- 10- Senna
- 11- Rai
- 12- python
- 13- pascal

The results obtained for each search engine are described in the following table:

Query			
1	<p>The results of the query “Paris Hilton” are all about the girl. A hotel appears in the second page. For “Hilton Paris” instead are showed the results about the hotels and the girl.</p>	<p>Considering the query “Paris Hilton” the results are all about the girl. The first result about the Hilton hotels is in the third page, but rarely the user reaches that page. For the query “Hilton Paris” results are about the hotels and the girl.</p>	<p>“Paris Hilton” is recognized as the girl and all the results are about this person. A hotel appears in the second page. “Hilton Paris” results are about the Hilton hotels and the girl.</p>
2	<p>The query “jaguar” is recognized as the car and the big cat. A minor result is about the world’s fastest “supercomputer” named Jaguar.</p>	<p>The results are about both the car and the big cat. A result with less importance regards a company named Jaguar.</p>	<p>All the traditional meanings are retrieved: results are about the car and the big cat.</p>
3	<p>“Washington” is interpreted as the US capital, the state and the US president. Minor results are about the university in the Washington state, the newspaper / magazine and the sport teams.</p>	<p>“Washington” is related to the US capital and the state (with link about its university). Other results regard a sport team and newspapers. The reference to the president appears in the second page.</p>	<p>The returned results are on the state (with also an explicit link to its university) and the US capital. A result is wrong, because it is about the tourism in Western Australia. Only in the third page, the result on the president appears; it is the other traditional meaning that could be searched by the user.</p>
4	<p>The results for the query “apple” are about the company/its products. A news and an image regard the fruit. In the second page there is a link related to the fruit.</p>	<p>“apple” is recognized as the American company (with some links on its products) and as the fruit (only two links).</p>	<p>The results about the apple company (including its products and its stores), and the fruit are found.</p>

Query			
5	<p>“leopard” is interpreted as the animal and the Mac OS. A less important result is about a company with this name.</p>	<p>The results of the query “leopard” are about the animal and the Mac OS. Minor results regard a company with this name, a news in which leopard is the name of a street, a novel and a yacht.</p>	<p>Results for “leopard” regard both the animal and the Mac OS. Less important results are about a company with this name, a novel and a yacht.</p>
6	<p>The query “opera” returns references to the browser and to the art form (including links about the theatre institutions). A club with this name is retrieved.</p>	<p>“opera” is interpreted as the browser and the art form. Minor results regard institutions with this name.</p>	<p>The results of the query “opera” regard both the browser and the art form, including the theatre institutions.</p>
7	<p>The query “panda” return results about the antivirus (only two links) and the animal. There is also a reference to an association.</p>	<p>“panda” is recognized as the animal. A result is about the antivirus and one regards a food chain.</p>	<p>The result set of the query “panda” consists on references to the antivirus (only two links) and the animal. Two results are on restaurant/food chain.</p>
8	<p>The results of “mouse” are about the computer pointing device and the animal. Minor results regard institutions with this name.</p>	<p>“mouse” is interpreted as the animal and the pointing device. A minor result regards an institution with this name.</p>	<p>The query “mouse” returns results on the animal and the pointing device. A minor result regards an institution with this name.</p>
9	<p>All the results of the query “nike” are about the company that produces sportswear and sport equipment. Only in the third page there are references to the goddess of Greek mythology.</p>	<p>“nike” is interpreted as the company and a result is about the goddess of Greek mythology.</p>	<p>The results for “nike” are about the company. One is about the goddess of Greek mythology.</p>

Query			
10	<p>“Senna” is interpreted as the medical plant and as the F1 driver (Ayrton Senna). A news regards the F1 driver Bruno Senna. A result about a cosmetic company is retrieved.</p>	<p>The result set for “Senna” comprises references to the medical plant. One link is about the F1 driver (Ayrton Senna). A minor result about a cosmetic company is retrieved.</p>	<p>“Senna” is interpreted as the medical plant; one result is about the F1 driver (Ayrton Senna) and a news regards the F1 driver Bruno Senna.</p>
11	<p>“Rai” is interpreted as the Italian tv company, a share title “Reynolds American Inc”, there are some institutions and an actress with this name.</p>	<p>Results for “Rai” are about the share title and the Italian tv company, but they also regard some institutions, a form of music, a locality for resort and an actress.</p>	<p>The query “Rai” returns results about the Italian tv company, the share title, a form of music, an actress and a singer.</p>
12	<p>Results for the query “python” are about the programming language. Considering the animal there are only images/news. A minor result is about a group with similar name (Monty Python).</p>	<p>“python” is interpreted as the programming language and the animal. Other results are about a group with similar name and a company called Python.</p>	<p>“python” return results all about the programming language except for two about the animal. A sponsored result is about a fashion collection.</p>
13	<p>“pascal” is interpreted as the person (Blaise Pascal) and the programming language. There are other references about a project, a restaurant and a private web site, all named pascal.</p>	<p>The query “pascal” returns references about the person, the programming language and the measurement unit.</p>	<p>Results for “pascal” are about the programming language, the person and the measurement unit. A result is about a laser system, one regards an actress and another one is about a private web site, all named pascal.</p>

Observations:

- We can notice that there is the trend to show a varied result set, as answer of an ambiguous query. Therefore the behavior of the three analyzed search engines is similar.
- Sometimes the disambiguation is already showed in the first result page, where the user can find all the links related to the common meanings. Other times instead, it is necessary to continue the exploration in the next pages (e.g. for some search engines the information about Washington president, apple fruit, goddess Nike are in the following pages).
- For some queries the search engines show a varied result set in the first page, but references are almost all related to one meaning (the most important one, commonly searched by the user). E.g. for some search engines, the results for “python” in the first page are almost all about the programming language, or for the query “panda” are almost all about the animal.
- We found a query (“nike”) for which Google showed only one interpretation in the first page; the results in fact are all related to the company and not about the Greek goddess. The result of the last interpretation is anyway returned to the user (it means that the disambiguation is performed), but in the second page.

7.2.2- Entity-type identification




The goal of this step is to analyze if the search engines can recognize the proper nouns as concepts. The performed queries are grouped into these categories:




- city,
- actor,
- politician,
- singer,
- product,
- company,
- book,
- author

A subset of the executed queries is:

- 1- City: Rome, Boston, Moscow, London
- 2- Actor: Tom Cruise, George Clooney, Brad Pitt, Angelina Jolie
- 3- Politician: Barack Obama, Jacques Chirac, Romano Prodi, Walter Veltroni
- 4- Singer: Vasco Rossi, Gianni Morandi, Bruce Springsteen, Bryan Adams
- 5- Product: PowerShot G11, Deskjet 5500, ir1020, Ipod
- 6- Company: Nestlè, Hp, Nokia, Mattel
- 7- Book: The cloven viscount, Macbeth, The old man and the sea, The picture of Dorian Gray
- 8- Author: Italo Calvino, William Shakespeare, Dan Brown, Carlo Collodi

The results are showed in the following table:

Query			
1	The cities are recognized by Google. In fact it is showed the map and some images about the city, sometimes videos, blogs, news.	Yahoo recognizes the cities, by showing pictures, sometimes the news.	Bing is able to recognize the cities. It shows some pictures, the city map, information about the weather and the attractions in the city, sometimes news or videos.
2	Actors are correctly identified; images, videos, news, blogs, can be showed.	The search engine recognizes the actors, by returning for example photos, recently news, videos, references to related movies/tv shows/people.	Actors are recognized: the result set can include images, news, videos, blogs.

Query			
3	Politicians are recognized; Google returns the list of recently news, images, sometimes videos and references to blog posts.	Politicians are usually identified: for each of them can be showed the references to latest news, videos and photos. In few cases it is returned a flat list of links.	Politicians are identified by showing for example photos, news, videos, blogs. In a case it is returned a flat list of links, but by reading the related searches we can understand that the name is seen as a politician.
4	Singers are identified; the result set includes images, videos, news, sometimes blog posts.	Singers are recognized and the search engine returns images, videos, possible news. In one case there is a list of links, but are returned the play tracks, so the name is identified as a singer.	Singers are correctly recognized and the result set includes photos and videos, sometimes news, blogs.
5	The search engines recognizes the products; for example are showed the shopping results, videos representative of the product, pictures, news. In few cases the products are not identified, as there aren't the shop results.	Products are usually recognized. The result set includes a list of links (sometimes the reference to Amazon), but the left bar has the link "Shopping sites", meaning that Yahoo has recognized that the entity is a product. In few cases there is a flat list of links.	Products are identified by returning shop results, sometimes images, videos or news. In few cases there is a flat list of links.
6	Companies are recognized, because it is returned the official web site, sometimes news or images about the realized products.	The search engine recognizes the companies by showing the official web site and sometimes the news.	Companies are identified. It is returned the official web site and sometimes news or shopping results for the realized products.

Query	Google	YAHOO!	bing
7	Books are recognized; it is returned a list of links and sometimes images or also videos related to films inspired to the book. In the left bar there is the link "Book" meaning that Google has understood that the words are referred to a book.	Books are recognized: there are images or a list of links, but on the left bar there is the link "Shopping sites", in order to buy the book (or links to specific web sites such as Amazon, alibris, Bookrags). In a case it is recognized the film inspired to the book.	The search engine in few cases recognizes the books, by returning images. In many cases it is returned a flat list of links or there are images/videos of films inspired to the book.
8	Authors are recognized by showing photos, sometimes the videos (for example about an interview), news, the timeline related to the author, books references.	The search engine sometimes identifies the authors, by returning photos or news or videos. In many cases it returns a flat list of links.	Authors are usually recognized, as the result set includes images of the person, sometimes news, blog, videos. In few cases there is a flat list of links.

Observation:

In respect to proper nouns, all the three search engines can recognize cities, actors, singers and companies. Products are recognized except for few cases. Yahoo has some problems with the categories politician and authors, while Bing for books and authors. Google instead recognizes correctly books and authors.

7.2.2.1- Identification of more concepts

The behavior of the search engines in respect to composite queries (queries with more than one concept) is analyzed considering the combinations of:




- Cities and people (actors, politicians, singers),
- People,
- Products,
- Companies,
- Companies and products,
- Authors

The considered queries are:




- 1- Tom Cruise Rome (actor and city)
- 2- Barack Obama Boston (politician and city)
- 3- Bruce Springsteen Rome (singer and city)
- 4- Brad Pitt Angelina Jolie (actors)
- 5- Tom Cruise Brad Pitt (actors)
- 6- Barack Obama Angela Merkel (politicians)
- 7- Bruce Springsteen Britney Spears (singers)
- 8- Tom Cruise Bryan Adams (actor and singer)
- 9- ipod Pixma Ip2700 (products)
- 10- Nokia Samsung (companies)
- 11- Hp p3005x (company and product)
- 12- Oscar Wilde William Shakespeare (authors)




In order to understand if the query is recognized, the result sets of each separate concepts (e.g. the result set of the query “Tom Cruise” and that of the query “Rome”) have been compared with the one of the query involving the two concepts together (e.g. Tom Cruise Rome). Considering the differences between the result sets, it is possible to comprehend if the involved nouns are identified as concepts or not.

The results are showed in the following table:

Query			
1	Google don't recognize the query; the result set includes a flat list of links.	Yahoo shows some pictures and videos about the actor in Rome. The search engine has probably recognized the actor and has associated him with the city key word.	Bing has the same behavior of Yahoo.

Query	Google	YAHOO!	bing
2	The two concepts are not recognized; there is a key words based search.	There are some images about the politician, one of them in the Boston city. The search engine may has identified only the person and associating him with the city seen as a key word.	There is the same behavior of Yahoo.
3	The result set includes some photos and videos about the singer in Rome. The search engine has probably recognized the person, but not the city (the association with Rome is by key word).	There is the same behavior of Google.	There is the same behavior of Google.
4	The search engine shows images and videos with the two actors. We are not sure that it has recognized the two people; it could have understood only one name (Brad Pitt) and associating the other by key words. News and blog posts related to them are returned by correlation of the key word.	There is the same behavior of Google, without the blog posts.	There is the same behavior of Yahoo.
5	There are some photos and videos in which there are the two people together. The search engine may has recognized only one actor and associating the result set with the other key words.	The behavior is the same of Google and there are also some photos about one person.	There is the same behavior of Yahoo.

Query			
6	The query is not recognized: there is a flat list of links.	There are some photos with the two people together, but the search engine could have recognized only one person and associated the other by key word.	There is the same behavior of Yahoo.
7	The result set includes a flat list of links.	There are some images and a video related to a person and only one photo about the other person. There are also some videos with the two people together. The search engine may has recognized the first noun and seen the second as a key word.	There is the same behavior of Yahoo.
8	The query is not recognized; Google has searched by key words.	There are some photos of Bryan Adams, so the search engine has identified only one person.	There is the same behavior of Yahoo.
9	There is a list of links, retrieved by a key words based search.	There is a list of links, but in the left bar the is the link “Best Buy”, meaning that Yahoo has understood that there are involved some products.	There is a flat list of links, but the tab link “Shopping” indicates that Bing has recognized that there are some products.
10	There is a flat list of links.	There are some images about Nokia and Samsung mobile phones, but they are retrieved by a key words based search (the two nouns are not identified as companies).	There is the same behavior of Yahoo.
11	Only the product is recognized, by showing the shopping results.	There is a flat list of links, but in the left bar the link “Shopping” means that it is recognized the product.	The product is recognized, by showing the shopping results.

Query			
12	There is a flat list of links.	There are some images about one author (the search engine has probably recognized him).	There is the same behavior of Yahoo.

Observation:

The analyzed search engines have difficulties in identifying more than one concept (mono-domain or multi-domain).

Sometimes it is returned a flat list of links: it means that the search engine has searched by key words, returning all the references with the nouns specified in the query, but without the identification of the concepts.

Other times instead, it seems that the search engine is able to recognize one concept, by showing for example pictures for people, or shopping results for products. However the other concept involved in the query is not recognized, but it is treating as a key word. Therefore in this case the association is done by connecting the recognized concept (e.g. the actor Tom Cruise) with the remaining key word (e.g. the key word "Rome").

7.2.3- Automatic layout

The goal of this last step is to understand if, for the previous recognize concepts, there are automatic layouts, adopted by the search engines. For each concept will be considered different queries, in order to exemplify the visualization modality and to highlight the possible differences regarding the content or the structure of the result set.

7.3.1- Layout for cities

Google

1) Moscow

Links of the content types

- Everything
- Maps
- News
- Images
- Videos
- More

Other visualization modalities

- Any time
- Latest
- Past 2 days
- All results
- Wonder wheel
- Sites with images
- Page problems
- More search tools

Map and images

Links

News

Images

Links

Videos

Sponsored links

Related searches

- moscow facts
- moscow airport
- moscow pictures
- moscow files
- moscow map
- moscow street
- moscow weather
- moscow news

2) London, Washington

Everything

- Maps
- Blogs
- Images
- News
- Videos
- More

All results

- Wonder wheel
- Sites with images
- More search tools

London UK maps.google.com

Map and images

Sponsored links

Links

Blog

Images

Searches related to London

- london attractions
- london pictures
- living in london
- london facts
- london movie
- london history
- london weather
- london map

3) Boston, Lisbon, Rome, Philadelphia

The image shows a Google search for "Boston, MA". The search results are annotated with brackets on the right side, categorizing different parts of the page:

- Sponsored links:** A banner for "Boston Hotels from \$33" with a link to "130+ top Boston Hotels at low rates. Book your Hotel here & save! www.hotelreservation.com/Boston".
- Map and images:** A Google Maps snippet for "Boston, MA" with several small image thumbnails.
- Links:** A list of search results including:
 - Boston.com:** "12 Aug 2010 ... Boston.com 24-hour breaking news and sports with coverage from The Boston Globe." Links to "Sports - The Boston Globe Online - Boston.com - Red Sox - Weather".
 - Boston sights, attractions, hotels and things to do while visiting...** with a link to "www.boston.com/romb/boston/".
 - Boston - Wikipedia, the free encyclopedia:** "Boston (pronounced en-us-Boston.ogg /ˈbɒstən/ (help·info)) is the capital and largest city in Massachusetts, and is one of the oldest cities in the United ...".
 - Welcome | City of Boston:** "Official site offering administrative and visitor information. Parking Clerk - Assessing Online - Online Services".
 - Greater Boston CVB:** "Includes information for tourists, tour planners, and meeting planners. Offers information about lodging, dining, events, activities, and entertainment".
 - Official Boston Homepage:** "dbalig fast www.boston.gov/".
 - The BOSTON Homepage: In Concert:** "26 Feb 2010 ... News, lyrics, discography and email discussion list".
 - Boston University:** "An independent, co-educational, and non-sectarian institution of higher education and research located along the banks of the Charles River in Boston, ...".
 - Boston Athletic Association:** "The world's oldest annual marathon. In 2007 more than 20,000 runners completed the race. The Marathon has distinguished itself by virtue of its traditions; ...".
 - Boston Online:** "Boston for visitors and residents - Boston guides, forums and other resources".
- News:** A news snippet titled "BILL POWERS BOSTON PAST TORONTO" with a sub-headline "Bill Hall hit two homers and drove in four runs as the Boston Red Sox stormed to a 10-1 victory over the Toronto Blue Jays at Rogers Centre on Wednesday ...".
- Images:** Four small image thumbnails showing cityscapes of Boston.
- Searches related to Boston:** A list of related search terms including "boston band", "boston red sox", "boston rock group", "boston college", "boston lyrics", "boston university", "boston herald", and "boston celtics".

For the city Philadelphia in the right part of the page there are the links “Also try” (e.g. Philadelphia airport, Philadelphia eagles,...).

3.1) Madrid, Stockholm, Dublin, Hong Kong, Turin

The scheme is similar to the previous one: there are the same content types but the links are located both before and after the news.

The screenshot shows a search engine results page for "Madrid Spain". The page is annotated with brackets on the right side, grouping different content types into categories:

- Sponsored links:** Includes advertisements for "Offerte Hotel Madrid", "Hotel Madrid - 75%?", and "240 Hotels in Madrid".
- Map and images:** Points to the map of Madrid and a grid of small images showing various landmarks.
- Links:** Points to a list of search results including "Madrid - Wikipedia", "About Madrid Travel Guide, Spain", "esMADRID.com - Visit Madrid!", "Madrid travel guide featuring Madrid hotels, all Madrid ...", "Madrid travel guide - Wikitravel", and "News gaming.com -- MADRID".
- News:** Points to a news item from "The Guardian" about Jose Mourinho's return to Spain.
- Links:** Points to a second list of search results including "The Madrid Guide", "Madrid.com", "Madrid Travel Information and Travel Guide - Spain - Lonely Planet", "Madrid Spain Tourist & Hotels Guide", "MADRID by All About Spain", and "Madrid travel guide featuring Madrid Hotels, all Madrid ...".
- Images:** Points to a section titled "Images for Madrid" which displays several large images of the city.

3.1.1) Cancun

The scheme is similar to the one of Madrid: there are the same content types but links and images, in the bottom of the page, are exchanged (before images and after links).

Map and images → Links → News → Images → Links

3.1.2) Singapore

There are the same content types, but with a different order.

Map and images → Links → Images → Links → News

3.2) Oslo

The schema is like the one of Boston, without the news.

The screenshot shows a Google search for "Oslo". On the left, there is a sidebar with filters for "Everything", "Maps", "Images", "Any time", and "All results". The main search results are as follows:

- Map and images:** A map of Oslo, Norway, with a grid of small images showing various landmarks and buildings.
- Sponsored links:** Two sponsored links for hotels in Oslo, including "75 Hotels in Oslo" and "51 Hotels in Oslo, Norway".
- Links:** A list of text-based search results, including "Home - Official Travel & Visitor's Guide to Oslo, Norway", "Oslo - Wikipedia, the free encyclopedia", "Oslo City - Local Travel Information and City Guide", "Oslo The Capital of Norway", "Home - University of Oslo", "Oslo travel guide - Wikitravel", "Oslo - Norway official travel guide - visitnorway.com", "Current local time in Norway - Oslo", "Oslo Airport", and "OSLO on MySpace Music".
- Images:** A section titled "Images for Oslo" showing a row of four small images of Oslo.
- Searches related to Oslo:** A list of related search terms such as "pictures of oslo", "oslo weather", "oslo airport", "oslo university", etc.

Annotations on the right side of the screenshot include:

- A bracket labeled "Map and images" pointing to the map and image grid.
- A bracket labeled "Sponsored links" pointing to the hotel advertisements.
- A bracket labeled "Links" pointing to the list of text-based search results.
- A bracket labeled "Images" pointing to the "Images for Oslo" section.

3.2.1) Venice, Cairo

The schema is as the one of Oslo, but links are divided before and after the images.

Map and images → Links → Images → Links

4) Chicago

The screenshot shows a Google search for "Chicago, IL" on the maps.google.com interface. The results are annotated with brackets on the right side, categorizing them as follows:

- Map and images:** Points to the map and a grid of image thumbnails.
- Sponsored links:** Points to the top right section containing sponsored advertisements for hotels and travel services.
- Links:** Points to the main list of search results, including Wikipedia, the official Chicago Tourism Site, and the City of Chicago website.
- News:** Points to the "News for Chicago" section, which includes a headline about the San Francisco Giants defeating the Chicago Cubs.
- Blog:** Points to the "Blog posts about Chicago" section, featuring articles about restaurants and local events.
- Images:** Points to the "Images for Chicago" section, which displays a row of image thumbnails.

4.1) Los Angeles

The scheme is as the one of Chicago, but links are divided before and after the news. Map and images → Links → News → Links → Blog → Images

5) New York

The screenshot shows a search engine results page for "New York, NY". The page is annotated with brackets on the right side, grouping results into categories:

- Map and images:** Includes a map of New York City and several small images of city buildings.
- Sponsored links:** Includes advertisements for "Offerte Hotel a New York" and "Flights to New York".
- Links:** Includes various search results such as "New York, Wikipedia, the free encyclopedia", "The Official New York City Guide to NYC Attractions, Dining...", "New York.com", "iLOVENY | The Official New York State Tourism Site Home", "New York Magazine", "The New York Times", "WWW.NY.GOV", "The Official New York City Site", and "Times Square Cam - EarthCam".
- News:** Includes a news article titled "Isiah Thomas Withdraws From Role as Consultant with NBA's New York...".
- Videos:** Includes video thumbnails from "Times Square Cam - EarthCam".
- Images:** Includes a row of four larger images showing different views of the New York City skyline.

Searches related to New York are listed at the bottom: new.york.fish, new.york.magazines, new.york.plants, new.york.facts, new.york.times, new.york.pictures, I love new.york, new.york.state.

5.1) Tokyo

The schema is similar to the previous one, but the links are divided before and after the news.

Map and Images → Links → News → Links → Videos → Images

6) There are some cases in which the map of the city is visualized at the end of the page. This group is divided into two cases, because there are the same elements, but with different order.

6.1) Shanghai

The screenshot shows a search results page for 'Shanghai'. On the left, there are search filters: 'Everything', 'News', 'Images', 'Maps', 'More', 'Any time', 'Latest', 'Past 4 days', 'All results', 'Sites with images', and 'More search tools'. The main content area includes:

- Sponsored links:** A box for 'Shanghai' with the text 'Visiting Shanghai? Find Deals & Read Hotel Reviews! www.TripAdvisor.com.' This is grouped under 'Sponsored links'.
- Links:** A list of search results including 'Shanghai - Wikipedia, the free encyclopedia', 'China Shanghai Travel Guide', 'SHANGHAI CHINA', and 'Shanghai Foreign Affairs Office'. This is grouped under 'Links'.
- News:** A section titled 'News for Shanghai' with a snippet about 'Investors and traders in China's main financial district in...'. This is grouped under 'News'.
- Images:** A section titled 'Images for Shanghai' with a grid of six small images showing cityscapes and buildings. This is grouped under 'Images'.
- Links:** A list of search results including 'Shanghai travel guide - Wikitravel', 'Shanghai (2010)', 'Expo 2010 Shanghai China', 'WELCOME TO SHANGHAI STOCK EXCHANGE', 'Shanghai Daily | 上海日报', 'Shanghai.ed - Shanghai's home on the web', and 'Current local time in China - Shanghai'. This is grouped under 'Links'.
- Map and images:** A section titled 'Shanghai China' with a map and a grid of six images showing various landmarks. This is grouped under 'Map and images'.

6.2) Brasilia

The screenshot shows a search engine results page for 'Brasilia'. On the left, there are search filters: 'Everything', 'Images', 'News', 'Maps', 'More', 'Any time' (Latest, Past 24 hours), 'All results' (Sites with images), and 'More search tools'. The search results are as follows:

- Links:**
 - Brasilia - Wikipedia, the free encyclopedia**: [Portuguese pronunciation: [braˈzilĩjɐ]] is the capital of Brazil. The name is commonly spelled **Brasília** in English. The city and its District are ...
 - Brasilia - capital city of Brazil**: Information on **Brasilia**, with focus on the peculiarities of being the planned capital of the country; includes photos and maps.
 - Brasilia - UNESCO World Heritage Centre**: **Brasilia**, a capital created ex nihilo in the centre of the country in 1956, was a landmark in the history of town planning. Urban planner Lucio Costa and ...
- Images:**
 - Images for Brasilia - Report Images**: A row of five small images showing various views of Brasilia.
- Links:**
 - Brasilia travel guide - Wikitravel**: Open source travel guide to **Brasilia**, featuring up-to-date information on attractions, hotels, restaurants, nightlife, travel tips and more.
 - Current local time in Brasilia - Distrito Federal - Brasilia**: Find out current local time in **Brasilia** - Distrito Federal - Brazil. Get **Brasilia's** weather and area codes, time zone and DST. Explore **Brasilia's** sunrise ...
 - THE HISTORY OF BRASILIA - Index**: The history of **Brasilia** (Brazil's capital) from the first proposals to the present days.
 - Brasilia Espresso Machines, Commercial Espresso Coffee Machines...**: **Brasilia** are renowned innovators in the field of coffee making and have been manufacturing high quality precision built espresso machines in Italy for over ...
 - Embaixada dos Estados Unidos no Brasil**: **Brasilia**, July 28th 2010 - After the success of the Youth Ambassadors Program, a cultural exchange project run by the U.S. Embassy taking Brazilian public ...
 - Current time in Brasilia, Brazil - daylight savings time 2010...**: **Brasilia** current time in **Brasilia**, Brazil daylight savings time change date 2010 **Brasilia** world clock.
 - FIFA.com - Brasilia**: The construction of this ultra-modern city, situated in the centre of Brazil, began in 1956.
- News:**
 - News for Brasilia**:
 - Brazil to record UFO sightings** - 15 hours ago ... any experiences with unidentified flying objects with the Aerospace Defense Command in **Brasilia** along with any material proof by way of photos or video, ...
 - US converts Brazilian debt into environmental protection** -
 - MSN Malaysia News** - 123 related articles »
- Map and images:**
 - Brazil** maps.google.com: A map of Brazil with state abbreviations and a sidebar of image thumbnails.

At the bottom, there are 'Searches related to Brasilia': [brasilia photos](#), [map of brasilia](#), [brasilia espresso](#), [brasilia coffee machine](#), [brasilia facts](#), [brasilia population](#), [brasilia architecture](#), [brasilia hotels](#).

6.2.1) Tunis, Athens

The schema is equal to the previous one, without the news.

Links → Images → Links → Map and Images

Content types (Google city): Map, Image, Link, Sponsored link, News, Video, Blog

Yahoo

The following screenshot shows an example of how Yahoo represents the cities:

Query specifications

Image and links

Sponsored links

News

Links

Images

Links

Sponsored links

Query specifications

Other possible layout schemas are:

- Image and links → Links → Images → Sponsored links
- Image and links → Links → Images → Links → Sponsored links
- Image and links → Links → Images → Links → News → Sponsored links
- Image and links → Links → News → Links → Images
- Image and links → Links → News → Links → Images → Sponsored links
- Image and links → News → Links → Images → Sponsored links
- Sponsored links → Image and links → Links → News → Links → Images → Sponsored links
- Sponsored links → Image and links → Links → Images → Sponsored links
- Sponsored links → Image and links → Links → Images → Links → Sponsored links
- Links → Images → Links → News → Sponsored links
- Links → Images → Sponsored links
- Images → Links

In the left part of the page there are usually thumbnails and links to point of interests in the city. Sometimes there are links to specific web sites, such as “Wikipedia”, “Wikitravel”, “Yahoo! Travel”, “TimeandDate.com”, “Answers.com”, “New World Encyclopedia”, “Wiktionary”, or there are links about “Related Searches”, with names of correlated cities/states.

Content types (Yahoo city): Image, Link, Sponsored link, News

Bing

The following screenshot shows an example of how Bing represents the cities:

The screenshot displays a Bing search results page for "Moscow". Annotations on the right side categorize different parts of the page:

- Web**: Points to the search filter tabs.
- Tabs related to content types**: Points to the "Web, Maps, Weather, News, Videos, Images" tabs.
- Sponsored links**: Points to the "Hotel in Moscow" and "Moscow Hotels" results.
- Box with Image, Links, Map, Weather**: Points to the main result box for "Moscow, Russia" which includes a city image, weather forecast (75°F), and a map.
- Sponsored links**: Points to "Moscow Hotels", "Delta Air Lines", and "Moscow Apartments" results.
- News**: Points to the "News: Moscow" section with several news snippets.
- Links**: Points to a list of various links including "Moscow - Wikipedia", "Moscow - Weather from Answers.com", "Moscow | Videos, Blogs and Tweets", "Communities - Welcome to Moscow!", "A Journey to Moscow", "Moscow Map", "Map of Moscow, Russia | Moscow Map", "TYP: Moscow Maps", "Map of Moscow", "Map of Moscow and travel information about Moscow", "Moscow Russia", "Moscow - Wikipedia, the free encyclopedia", "Moscow (English pronunciation)", "Moscow - Travel Information and Travel Guide - Russia", and "Angelina Jolie wears Moscow with Russian hero spy film".
- Related searches**: Points to the "Related Searches" box at the bottom left.
- Sponsored links**: Points to the "Hotel in Moscow" result at the bottom of the page.

Other possible layout schemas are:

- Box with Image, Map, Weather, Links → Links → News
- Box with Image and info description, Map, Weather, Links → Links → Images
- Box with Image and info description, Map, Weather, Links → Links → News → Images
- Sponsored links → Box with Links, Map, Weather → Links → Images → Sponsored links

- Sponsored links → Box with Image, Links, Map, Weather → Links → Sponsored links
- Sponsored links → Box with Image, Links, Map, Weather → Links → News → Links → Sponsored links
- Sponsored links → Box with Image, Links, Map, Weather → Links → News → Images → Links → Sponsored links
- Sponsored links → Box with Image and info description, Map, Weather, Links → Links → Sponsored links
- Sponsored links → Box with Image and info description, Map, Weather, Links → Links → Videos → Images → Sponsored links
- Sponsored links → Box with Image and info description, Map, Weather, Links → Links → News → Links → Sponsored links
- Sponsored links → Box with Image and info description, Map, Weather, Links → Links → Images → Sponsored links
- Sponsored links → Box with Image and info description, Map, Links → Links → News → Sponsored links
- Sponsored links → Box with Image and info description, Links → Links → Images → Sponsored links
- Sponsored links → Box with Image, Map, Links → Links → Sponsored links
- Box with info description, Map, Weather, Links → Links → News
- Box with Image, Map, Links → Links
- Box with Image and info description, Map, Weather, Links → Links
- Links → Images

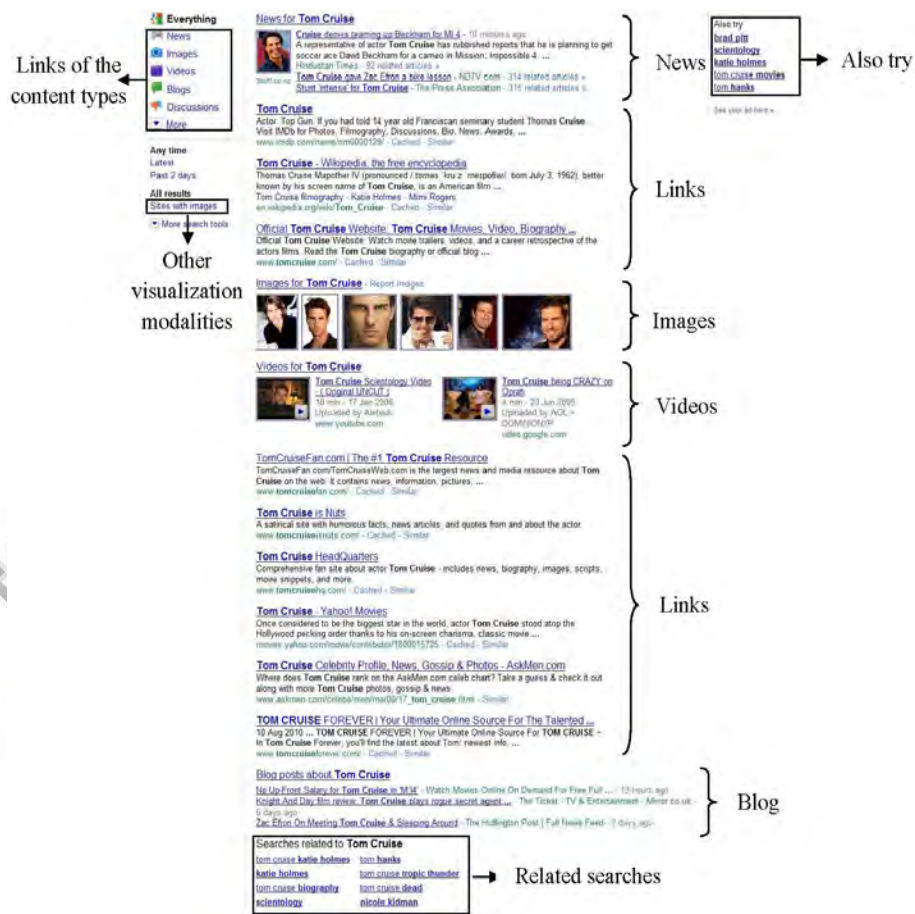
We can notice that there are many layout schemas, depending on the contents of the element “Box” (Images, Links, Images with info description, Map, Weather). If we consider the “Box” as a close component, without analyzing its content, the cases are reduced to:

- Box → Links → News
- Box → Links → Images
- Box → Links → News → Images
- Box → Links
- Sponsored links → Box → Links → Sponsored links
- Sponsored links → Box → Links → Images → Sponsored links
- Sponsored links → Box → Links → News → Sponsored links
- Sponsored links → Box → Links → News → Links → Sponsored links
- Sponsored links → Box → Links → News → Images → Links → Sponsored links
- Sponsored links → Box → Links → Videos → Images → Sponsored links
- Sponsored links → Box → News → Links → Sponsored links
- Links → Images

Content types (Bing city): Image, Link, Sponsored link, News, Video, Map, Weather

7.3.2- Layout for actors

Google



Other layout schemas:

- News → Links → Images → Links → Blog → Videos
- Images → Links → News → Links → Videos
- Images → Links → News → Videos → Links
- Images → Links → News → Videos
- Images → Links → News → Videos → Links → Blog
- Images → Links → News → Links → Blog
- Images → Links → Videos → Links
- Images → Links → Videos → Links → Blog
- Links → News → Images → Links → Blog
- Links → News → Images → Links → Videos
- Links → News → Images → Videos → Links
- Links → Images → Videos → Links
- Links → Images → Links
- Links → Images → Links → News → Videos
- Links → Videos → Images

In the left part of the pages there are the visualization modalities. Sometimes there is “Something different”, with links to the names of other actors.

Content types (Google actors): Image, Link, Sponsored link (in the right part of the page), Video, News, Blog

Yahoo

Also try: tom cruise katie holmes, tom cruise movies, more... → Query specifications

Tom Cruise - Official Site

News & Photos Videos Official Tweets

Box with News & Photos, Videos, Twitter

Tom Cruise - Wikipedia

Links

Also try: tom cruise katie holmes, tom cruise movies, more... → Query specifications

Other layout schemas:

- Box with News & Photos, Videos, Twitter → Links → Sponsored links
- Box with News & Photos, Twitter → Links
- Images → Links
- Images → Links → Sponsored links
- Links → Images → Links

The left part of the page contains thumbnails and links to concepts related to the actor. The possible cases are: “Related People”, “Related Movies”, “Related TV Shows”. Sometimes there is “Related Searches” and/or links to web sites, such as “IMDb”, “Wikipedia”, “Answers.com”, “Hollywood.com”.

Content types (Yahoo actors): News, Image, Link, Sponsored link (in the bottom/right part of the), Video, Twitter

Bing

Web

Web Images News Videos Wikipedia Blogs → Tabs related to content types

ALL RESULTS 1-19 of 56,309,000 results

RELATED SEARCHES

- Tom Cruise Katie Holmes Split
- Tom Cruise Nicole Kidman Movie
- Tom Cruise Break Up
- Tom Cruise Wedding
- Tom Cruise State
- First Wife of Tom Cruise
- Andrew Morton Tom Cruise
- List Tom Cruise Movies

Box with Images, Links

Tom CRUISE
 Official Tom Cruise Website: Tom Cruise
 Official Tom Cruise Website: Watch movie trailers, videos, and a career retrospective of the actor's film...

Links

Tom Cruise - Wikipedia, the free encyclopedia
 Early life Career Popularity Relationships and Thomas Cruise Mapother IV (pronounced /ˈtɒmz kɹuːz/; born July 3, 1952), better known by the screen name of **Tom Cruise**, is an American film actor and producer...

News

Entertainment news: Tom Cruise
 Tom Cruise has defended his daughter Suri's right to wear grown-up outfits, insisting he wants to encourage the 14-year-old's "self-expression"...

Videos

Videos of Tom Cruise

Links

Tom Cruise Movies
 Foreign fans could decide Cruise's 'M.I.4' fate - Entertainment Weekly
 LOS ANGELES -- Never in his decades of stardom has Tom Cruise been more delicately jumped to related: **Movies: Tom Cruise**...

Blogs

Blogs for Tom Cruise
 Tom Cruise's daughter Bella could trade in Xenu for Nicole. This would totally be a fascinating story, if only it were true. Of course, there could totally be something there. Let me start.
 7/23/2010 Top Celebrity Headlines
 Tom Cruise contemplates a reality show, showing promise. 7/21/2010
 Who Has the More Fab Abs - Tom Cruise or Leonardo DiCaprio? 1 day ago

Related searches

- Tom Cruise Katie Holmes Split
- Tom Cruise Wedding
- Andrew Morton Tom Cruise
- Tom Cruise Nicole Kidman Movie
- Tom Cruise State
- List Tom Cruise Movies
- Tom Cruise Break Up

Other layout schemas:

- Box with Images, Links → News → Links → Videos → Links → Blogs
- Box with Images, Links → Links → Videos → News → Links → Blogs
- Box with Images, Links → Links → Videos → News → Links
- Box with Images, Links → Links → Videos → Links → Blogs
- Box with Images, Links → Links → Videos → Links
- Box with Images, Links → Links → Videos
- Sponsored links → Box with Images, Links → News → Links → Videos → Links → Blogs → Sponsored links
- Sponsored links → Box with Images, Links → Links → Videos → News → Links → Sponsored links
- Videos → Links → Images → Links
- Images → Links

Content types (Bing actors): Image, Video, Blog, News, Link, Sponsored link (in the top/bottom/right part of the page).

7.3.3- Layout for politicians

Google

Other layout schemas:

- Links → Images → Links → News → Videos
- Links → Images → Links → News
- Links → Images → Links → Videos
- Links → Images → Links
- Links → News → Images → Links → Blog → Videos
- Links → News → Images → Links → Videos
- Links → News → Links → Videos → Images
- News → Links → Images → Links → Videos
- News → Links → Videos → Links
- Links → Blog → Videos → Images
- Links → News → Blog → Videos → Books

In the left part of the page sometimes there are the references about “Something different”. In the right part of the page for some politicians there are the links “Also try”.

Content types (Google politicians): News, Image, Video, Blog, Link, Sponsored link, Book

Yahoo

Barack Obama - Latest News

News Photos Videos Twitter

Barack Obama 'may be prepared to meet Iranian president'
Daily Telegraph - Aug 13 03:17am
Barack Obama's national security adviser, Gen James Jones, has indicated the President may be prepared to meet Mahmoud Ahmadinejad if the regime resumed. [Full story](#)

Obama signs bill to help U.S. manufacturing
CNN - 1 hour ago

Barack Obama celebrates primary victories as Tea Party splits vote
Quadrant Unlimited - 10 hours ago

Barack Obama and Bill Clinton back different Colorado candidates
Daily Telegraph - Aug 10 11:55am
[mark Barack Obama news](#)

Barack Obama and Joe Biden: Organizing for America
Official site of U.S. President Barack Obama and Vice President Joe Biden, featuring news, blogs, store, and photos.
[www.barackobama.com](#)

President Barack Obama
Official White House biography for President Barack Obama Barack H Obama is the 44th President of the United States
[www.whitehouse.gov/administration/president-obama - Cached](#)

The White House
Features statements and press releases by the President as well as documents, an index of government information, history, and tour information.
[www.whitehouse.gov - 55k](#)

Barack Obama - Wikipedia
Early life... Political... 2008... Presidency
Barack Hussein Obama II is the 44th and current President of the United States. He is the first African American to hold the office. Obama previously served as a United States Senator...
[en.wikipedia.org/wiki/Barack_Obama - 79k](#)

Barack Obama News & Videos about Barack Obama - CNN.com
Four weeks after becoming President of the United States, Barack Obama has now become a true commander-in-chief, committing himself to war.
[topica.cnn.com/topics/Barack_Obama - 130k - Cached](#)

Barack Obama News - The New York Times
News about Barack Obama. Commentary and archival information about Barack Obama from The New York Times. Barack Hussein Obama was sworn in as the 44th.
[topica.nytimes.com/topics/.../barack_obama/index.html - 91k - Cached](#)

Barack Obama on Myspace
Official Myspace page for Barack Obama. See blogs, videos, the Obama store, and more.
[www.myspace.com/barackobama - 164k - Cached](#)

YouTube - BarackObamaDotcom's Channel
Welcome to the official Organizing for America YouTube channel. Watch videos of President Obama and clips of grassroots supporters organizing around the President's ...
[www.youtube.com/user/BarackObamaDotcom - 64k - Cached](#)

Barack Obama on Twitter
Keep up with Barack Obama's news and activities by subscribing to his RSS feed on Twitter.
[twitter.com/barackobama - Cached](#)

Barack Obama | Facebook
Welcome to the official Facebook Page about Barack Obama. Join Facebook to start connecting with Barack Obama.
[www.facebook.com/barackobama - 74k - Cached](#)

Other layout schemas:

- Images → Links → News → Links
- Images → Links → News
- Images → Links
- Links → Images → Links
- Box with News, Photos, Videos, Twitter → Links → Images → Links

In the left part of the page there are links to web sites such as “Wikipedia”, “YouTube”, “BBC News”, “Time Magazine”,... and/or “Related Searches”. In some cases there are thumbnails and links about “Related People” / “Related TV Shows” / “Related Movies”. Sometimes in the top and in the bottom of the page it appears “Also try”, with links to similar contents.

Content types (Yahoo politicians): Link, News, Image, Video, Twitter

Bing

Web | **Web** | Images | News | Videos | Maps → **Tabs related to content types**

Related searches

Sponsored links

Box with Images, Links, Twitter

News

Links

Related searches

Other layout schemas:

- Box with Images, Links → Links → Videos → News → Links
- Box with Images, Links → Links → Videos → Links → News
- Box with Images, Links → Links → Videos → Links
- Box with Images, Links, Twitter → Links → News → Links → Blogs
- Box with Images, Description → News → Links → Videos
- Images → Links
- Links → Images
- Videos → Links → News → Images → Links
- News → Videos → Links → Images → Links
- Links → Videos → Images
- Links → Videos → Links → Images

Content types (Bing politicians): Image, Video, News, Blog, Link, Sponsored link, Twitter

7.3.4- Layout for singers

Google

Links of the content types

Other visualization modalities

Links

News

Images

Videos

Links

Blog

Related searches

Other layout schemas:

- Links → News → Images → Videos → Links
- Links → Images → Links → News → Blog → Videos
- Links → News → Links → Blog → Videos → Images
- Images → Links → News → Videos → Links → Blog
- News → Links → Images → Videos → Links
- News → Links → Images → Videos → Links → Twitter (updating content)
- News → Links → Videos → Links → Blog → Images
- Links → Images → Videos → Links

In the left part of the page in a case there are the links “Something different”. In the right part of the page sometimes there are the links “Also try”.

Content types (Google singers): Image, Video, News, Blog, Link, Sponsored link (in the right part of the page), Twitter

The screenshot shows a Yahoo search results page for 'Bruce Springsteen'. On the right side, there are five vertical brackets with labels pointing to specific sections of the page:

- Box with Videos, Links**: Points to the top result box which includes a video thumbnail and several links.
- Links**: Points to a list of search results, including the official website and MySpace profile.
- News**: Points to a section of search results containing news articles.
- Links**: Points to a section of search results containing various website links.
- Images**: Points to the bottom section of search results which displays a row of image thumbnails.

Other layout schemas:

- Box with Videos, Links → Links → Images → Links
- Box with Videos, Links → Links → Images → Sponsored links
- Box with Videos, Links → Links → Images → Links → News → Sponsored links
- Box with Videos, Links → Links → Images → Links → Sponsored links
- Box with Videos, Links → News → Links → Images → Links → Twitter
- Box with Videos, Links → Links
- Box with Images, Links → Links
- Box with Images, Links → Links → Images → Links
- Images → Links → News

The left bar contains thumbnails and links to concepts related to the singer. The possible cases are: “Related People”, “Related Movies”, “Related TV Shows”. Sometimes there is only “Related Searches” and/or links to web sites such as “Wikipedia”, “You Tube”, “MTV”, “Yahoo! Music”. It was found a case with the query specifications “Also try” on the top of the page.

Content types (Yahoo singers): Image, News, Video, Link, Sponsored link (in the bottom/right part of the page), Twitter

Bing

The image shows a Bing search results page for 'Bruce Springsteen'. The search bar at the top contains the text 'Bruce Springsteen'. Below the search bar, there are tabs for 'Web', 'Images', 'News', 'Videos', 'Wikipedia', and 'Blog'. The main search results are organized into several sections, each with a bracketed label on the right side:

- Sponsored links:** A box at the top right contains a sponsored link for 'Buy on Music at Amazon' with a 'See your message here' button.
- Box with Images, Links:** A box on the left side contains a list of related searches: 'Bruce Springsteen Concert Dates', 'Bruce Springsteen Video Clips', 'Bruce Springsteen Music Videos', 'Bruce Springsteen Plink Cadillac', 'Bruce Springsteen and Julianne Phillips', 'Jessica Springsteen', 'Patti Scialfa', and 'Lyrics to Bruce Springsteen'.
- News:** A section containing an 'Entertainment news' article about Bruce Springsteen's performance at the Edge of Town.
- Links:** A section containing several links, including 'Bruce Springsteen News', 'Bruce Springsteen - Wikipedia', 'Backstreets.com', and 'Bruce Springsteen Biography from Answers.com'.
- Videos:** A section containing a 'Videos of Bruce Springsteen' section with several video thumbnails.
- Links:** A section containing several links related to Bruce Springsteen concert tickets, including 'Bruce Springsteen Tickets', 'Bruce Springsteen Concert Tickets at StubHub', and 'Bruce Springsteen Tickets - Cheap Bruce Springsteen Concert Tickets At Outlets'.
- Blogs:** A section containing a blog post titled 'Blogs for Bruce Springsteen'.
- Related searches:** A box at the bottom left contains a list of related searches: 'Bruce Springsteen Concert', 'Bruce Springsteen Plink Cadillac', 'Patti Scialfa', 'Bruce Springsteen Video', 'Bruce Springsteen and Julianne Phillips', 'Lyrics to Bruce Springsteen', 'Bruce Springsteen Music', and 'Videos'.

At the top right, there is a label 'Tabs related to content types' pointing to the search tabs. At the bottom right, there is a label 'Related searches' pointing to the bottom search box.

Other layout schemas:

- Box with Images, Links → News → Links → Videos → Links
- Box with Images, Links, Twitter → News → Links → Blogs
- Box with Images, Links, Twitter → Links → Videos → News → Links → Blogs
- Box with Images, Links → Links → Videos → Links → News → Blogs
- Box with Images, Links, Twitter → News → Links → Videos → Links → Blogs
- Box with Images, Links, Twitter → News → Links → Videos → Links
- Box with Images, Links → Links → Videos → News → Links → Blogs
- Sponsored links → Box with Images, Links → Links → Videos → News → Links → Blogs → Sponsored links
- Box with Images, Links → Links → Videos → Links
- Links → Images → Links
- Links → Videos → Links → Images

- Links → Videos → Links → Images → Links
- Videos → Links
- Videos → Links → Images
- Videos → Links → Images → Links → News

Content types (Bing singers): Image, Link, Sponsored link (in the top/bottom/right part of the page), News, Video, Blog, Twitter

7.3.5- Layout for companies

Google

The image shows a Google search results page for 'Nokia'. On the left, there are three vertical boxes with arrows pointing to specific parts of the search interface: 'Links of the content types' points to the 'Everything' filter menu; 'Other visualization modalities' points to the 'All results' and 'Sites with images' options; 'Other brands' points to the 'Something different' filter menu. On the right, there are three vertical brackets with labels: 'Sponsored links' points to the top sponsored result; 'Links' points to the main list of search results; 'News' points to the 'News for nokia' section; 'Images (of company's products)' points to the 'Images for nokia' section. At the bottom, an arrow labeled 'Related searches' points to the 'Searches related to nokia' box.

Other layout schemas:

- Links (the first one to the official site)
- Links (the first one to the official sites) → News
- Sponsored links → Links (the first one to the official sites) → News
- Sponsored links → Links (the first one to the official sites) → News → Links
- Links (the first one to the official sites) → News → Links
- Links (the first two to the official sites) → News → Shopping results (of company's products)
- Links (official web site) → Shopping results → Links

Content types (Google companies): Link, Sponsored link, News, Image, Shop

Yahoo

The image shows a screenshot of a Yahoo search results page for the query 'Nokia'. The search bar at the top contains the text 'Also try: nokia phones, nokia n95, nokia n70, nokia themes, more' and is labeled 'Query specifications'. Below the search bar, the main search results are displayed, including a sponsored link for 'Nokia - Nokia on the Web (NYSE: NOK)' and several organic links such as 'Nokia - Wikipedia, the free encyclopedia', 'Nokia USA - world leader in cell phone industry', and 'Nokia Europe - Find mobile phones - Touch screen, Slide, Twist'. A box on the left side of the page highlights the 'Related Searches' section, which includes 'sony ericsson', 'samsung', 'motorola', 'sony ericsson cell', and 'blackberry', with an arrow pointing to the text 'Other brands'. A bracket on the right side of the page groups the search results under the label 'Links'. At the bottom of the page, the search bar is repeated with the same text 'Also try: nokia phones, nokia n95, nokia n70, nokia themes, more' and is also labeled 'Query specifications'.

Other layout schemas:

- Links (the first one/two to the official site) → Sponsored Links
- Links (the first one to the official site) → News → Links
- Sponsored links → Links (the first one to the official site) → Sponsored links
- Links (the first one to the official site) → Images → Links
- Links (the first one to the official site) → News

In the left part sometimes there is the link “Shopping Sites” for the company’s products.

Content types (Yahoo companies): Link, Sponsored link (in the right/top/bottom part of the page), News, Image

Bing

Web Finance Wikipedia News Images Shopping → Tabs related to content types

Related searches: Nokia N95, Nokia E71, Nokia N73, Nokia N76, Nokia 6000, Nokia 6200, Nokia 6300, Nokia Mobile

Sponsored links: Nokia Mobile Phones, Nokia N73, Nokia 6500

Box with Links: Nokia - Nokia on the Web

Links: Nokia - Wikipedia, Nokia USA, Nokia Europe, Nokia Finland

News: Nokia (NOK) is facing stiff competition from local players in the Indian mobile phone market...

Images: Various Nokia mobile phones

Shop: Cell phones, Accessories, Similar brands

Related searches: Nokia N95, Nokia N96, Nokia 6330, Nokia E71, Nokia 6500, Nokia Mobile, Nokia N73, Nokia 6200

Sponsored links: Nokia - Nokia on the Web

Other layout schemas:

- Sponsored links → Links (also to the official web site) → News → Sponsored links
- Sponsored links → Box with links (official web site) → Links → Shop → Sponsored links
- Sponsored links → Box with links (official web site) → Links → Shop → Links → News → Sponsored links
- Sponsored links → Box with links (official web site) → Links → News → Links → Sponsored links
- Sponsored links → Box with links (official web site) → Links → News → Links → Shop (for the company's products) → Sponsored links
- Sponsored links → Box with links (official web site) → Links → News → Shop (for the company's products) → Sponsored links
- Sponsored links → Box with links (official web site) → Links → Twitter → Links →

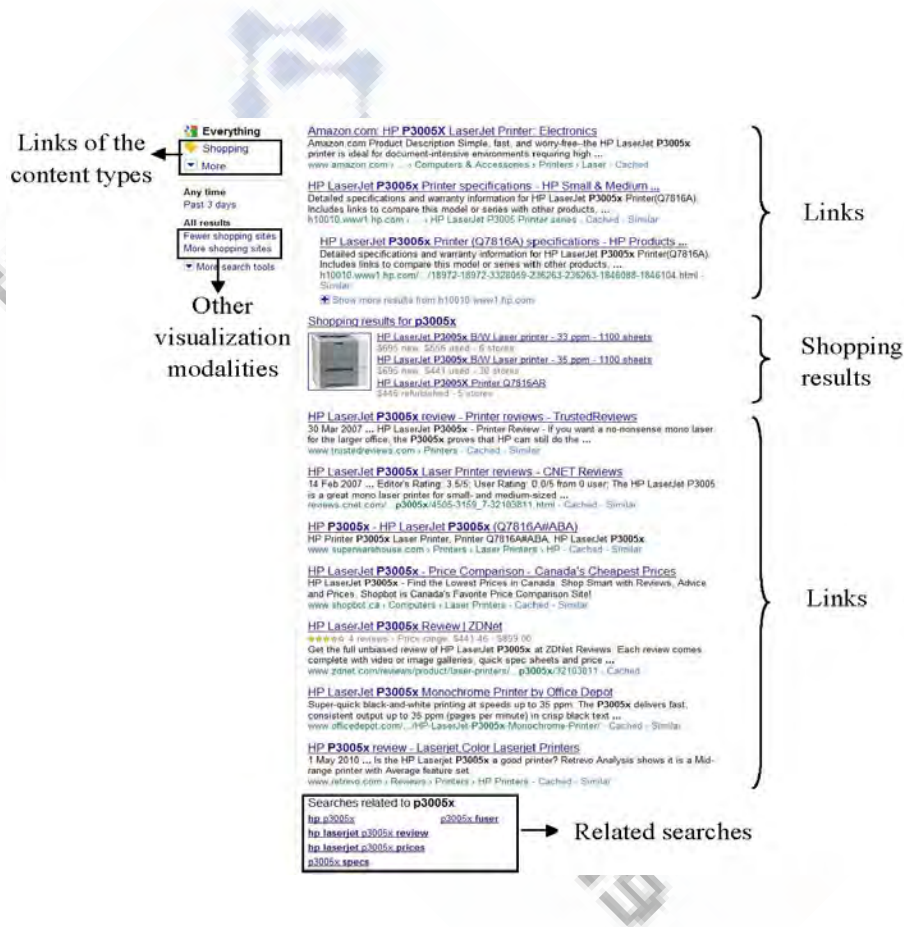
Images → Links → News → Shop → Sponsored links

- Box with links (official web site) → Links → Shop (for the company's products) → Links
- Box with links (official web site) → Links → News → Links → Shop
- Links (the first to the official web site) → News → Videos → Links → Shop
- Links (the first one to the official web site)
- Links (the first to the official web site) → Shop

Content types (Bing companies): Link, Sponsored link, News, Image, Shop

7.3.6- Layout for products

Google



Other layout schemas:

- Links
- Shopping results → Links
- Shopping results → Links → Videos → Links → News
- Links → Shopping results → Links → Images
- Links → Shopping results → Links → Videos
- Links → Shopping results → Videos → Links
- Links → Videos
- Links → Videos → Links
- Links → Blogs → Videos
- Links → News → Video → Links
- Links → News → Links → Images

- Links → Shopping results → Images → Links → Videos
- Links → Shopping results → News → Links
- Images → Links → Shopping results → Links → Videos
- Links → Twitter results (updating) → Shopping results → Links

In the left bar it is visualized the link “Shopping”, in order to buy the product. Sometimes there are the links “Something different”.

Content types (Google products): Link, Sponsored link (in the right part of the page), Shop, Video, Image, Twitter

Yahoo

The screenshot shows a Yahoo search results page for the query "hp laserjet p3005x". At the top, there is a search bar with the query and a "Query specifications" label. Below the search bar, there are several search results. On the left side, there is a vertical navigation bar with a "Shopping Sites" section highlighted. The search results include links to Amazon.com, CNET Reviews, Office Depot, and various manuals and reviews. Annotations with arrows point to "Query specifications" at the top and bottom of the results, and "Links" in the middle of the results list.

Other layout schemas:

- Links → Sponsored links
- Sponsored links → Links
- Links → News → Links → Sponsored links

In the left part of the page there are links to Shopping sites or to specific web sites such as “Amazon”, “Engadget”, “Office Depot”, “CNET Reviews”, “ShopWiki”. In few cases it appears “Related Searches” with links to similar products.

Content types (Yahoo products): Link, Sponsored link (in the right/top/bottom part of the page).

Bing

Web **Shopping** → Tabs related to content types

ALL RESULTS: 1,110 of 51,500 results

Sponsored links

- P3005X - Cheap Prices
- P3005X at Amazon

Links

- Amazon.com: HP P3005X LaserJet Printer: Electronics
- HP LaserJet P3005x Printer specifications - HP Small & Medium Business
- HP LaserJet P3005x Laser Printer reviews - CNET Reviews

Shop

- Shop for p3005x
- HP LaserJet P3005X from \$699.00
- LaserJet P3005X \$695.00
- LaserJet P3005X \$869.00
- LaserJet P3005X \$868.00

Links

- HP LaserJet P3005x Monochrome Printer by Office Depot
- HP P3005x Manuals, Support and Troubleshooting - LaserJet Color
- HP P3005x - HP LaserJet P3005x (Q7816A#ABA)
- hp laserjet p3005x Free Printer Driver Download & Find Driver Software
- HP LaserJet P3005x review - Printer reviews - TrustedReviews
- Buy HP LaserJet P3005x RAM Upgrades from PC Memory Store
- HP LaserJet P3005X Toner Cartridges

Other layout schemas:

- Links
- Shop → Links
- Sponsored links → Shop → Links → Sponsored links
- Sponsored links → Links → Shop → Sponsored links
- Sponsored links → Links → Shop → Links → Sponsored links
- Sponsored links → Links → News → Links → Shop → Links → Videos → Sponsored links
- Sponsored links → Shop → Links → Images → Sponsored links
- News → Videos → Links → Shop → Links

In the left/bottom part of the page sometimes there are the links about the “Related Searches”. Also in the case where it is returned the list of links there is the tab “Shopping”, on the top of the page.

Content types (Bing products): Link, Sponsored link, Shop, News, Video

7.3.7- Layout for books

Google

Links of the content types

Links

Shopping results

Links

Related searches

Other layout schemas:

- Links
 - Links → Videos → Links → Images
 - Links → Videos → Books → Links → Images
 - Links → Videos → Images
 - Links → Images → Books → Links → Videos
 - Links → Images → Videos → Books → Links → Timeline (with references to the specified key words)
 - Links → Images → Videos → Links → Timeline
 - Links → Books → Timeline
 - Links → Timeline → Images
- (Videos regard the films inspired to the book. Some images are about the film while others are about the book coverage).

In the left part of the page there is always the link “Books” and sometimes the links Something different. In the right side, sometimes there is “Also try”.

Content types (Google books): Link, Sponsored link (in the right part of the page), Shop, Video, Image, Book, Timeline

Yahoo

The image shows a screenshot of a Yahoo search results page for the query "The cloven viscount". The search bar at the top contains the text "Also try: the cloven viscount summary, more..." with an arrow pointing to the label "Query specifications". Below the search bar, the page is divided into several sections:

- Shopping sites:** A vertical sidebar on the left lists "Shopping Sites" with a downward arrow pointing to a section of results.
- Search results:** The main area displays a list of search results, each with a title and a brief description. The results include:
 - The Cloven Viscount - Wikipedia, the free encyclopedia:** A link to the Wikipedia page for the novel.
 - Amazon.com: The Cloven Viscount Books:** A link to Amazon's product page for the book.
 - The Cloven Viscount - eNotes.com Reference:** A link to an eNotes reference page.
 - The Reading Life: "The Cloven Viscount" by Italo Calvino:** A link to a blog post.
 - The Nonexistent Knight and the Cloven Viscount by Italo Calvino:** A link to a page listing related books.
 - Westminster Wisdom: The Cloven Viscount:** A link to a blog post.
 - Amazon.ca: Cloven Viscount, The Italo Calvino Books:** A link to Amazon Canada's product page.
 - johnsu01: The Nonexistent Knight and the Cloven Viscount:** A link to a journal entry.
 - The Nonexistent Knight and The Cloven Viscount: Current ...:** A link to a page with current information.
 - The Nonexistent Knight & the Cloven Viscount | Overstock.com:** A link to Overstock.com's product page.
- Annotations:** A large bracket on the right side of the page groups the search results under the label "Links".

Other layout schemas:

- Links → Images → Sponsored links
- Links → Sponsored links
- Images → Links → Sponsored links
- Images → Links

In the left part of the page there is the link Shopping sites, in order to buy the book, or links to other web sites such as “Amazon”, “Wikipedia”, “BookRags”, “SparkNotes”. Sometimes there is “Related Searches” or “Related People”.

Content types (Yahoo books): Link, Sponsored link (in the right/bottom part of the page), Image

Bing

Web | **Web** Videos Wikipedia Images → **Tabs related to content types**

RELATED SEARCHES
 Summary Old Man Sea
 Symbols Old Man Sea
 Themes Old Man Sea
 Quiz Old Man Sea
 Old Man Sea Movie
 Old Man Sea Criticism
 Symbolism in the Old Man and the Sea
 The Old Man and the Sea Outline

ALL RESULTS

The Old Man and the Sea - Wikipedia, the free encyclopedia
 Plot summary Background and Symbolism of character
The Old Man and the Sea is a story by Ernest Hemingway, written in Cuba in 1951 and published in 1952. It was the last major work of fiction to be produced by Hemingway and published on Wikipedia.org/wiki/The_Old_Man_and_the_Sea. *Cached page*

SparkNotes: The Old Man and the Sea
 From a general summary to chapter summaries to explanations of famous quotes, the SparkNotes **The Old Man and the Sea Study Guide** has everything you need to ace quizzes, tests, and [www.sparknotes.com/theoldman](#). *Cached page*

The Old Man and the Sea (1999 film) - Wikipedia, the free encyclopedia
 Plot summary Background and Symbolism of character
The Old Man and the Sea is a 1999 part-on-glass-animated short film directed by Aleksandr Petrov, based on the novel of the same name by Ernest Hemingway. The film won many awards. *en.wikipedia.org/wiki/The_Old_Man_and_the_Sea_(1999_film)*. *Cached page*

Videos of The old man and the sea

The Old Man and the Sea Part 14
 YouTube 9:27

Stand Up, Anton Kader - Roman
 Comedy Central
 YouTube 3:39

The Old Man and the Sea Part 13
 YouTube 3:39

Dirty old men in search of Jack
 LA Observer 2:36

The Old Man and the Sea (1958)
 User rating 8.9/10. Adventure-Drama. 88 min.
 An old Cuban fisherman's dry spell is broken when he hooks a gigantic fish that drags him out to sea. Based on Ernest Hemingway's story. [www.imdb.com/title/tt0052921](#). *Cached page*

Amazon.com: The Old Man and The Sea (9780684801223), Ernest Hemingway...
 User rating 4.6/5. 757 reviews.
 Here, for a change, is a fish tale that actually does honor to the author. In fact **The Old Man and the Sea** renewed Ernest Hemingway's career, which was foundering under the [www.amazon.com/Old-Man-Sea-Ernest-Hemingway/dp/9780684801223](#). *Cached page*

The Old Man and the Sea Summary and Lesson Plan Summary | BookRags.com
 The Old Man and the Sea summary with 914 pages of lesson plans, quotes, chapter summaries, analysis, encyclopedia entries, essays, research information, and more. [www.bookrags.com/The_Old_Man_and_the_Sea](#). *Cached page*

The Old Man and the Sea Study Guide and Homework Help - CliffNotes
 Get free homework help on Ernest Hemingway's **The Old Man and the Sea**, book summary, chapter summary and analysis, quotes, essays, and character analysis -- courtesy of CliffNotes. [www.cliffsnotes.com/study-guides/The-Old-Man-and-the-Sea-48102-Man](#). *Cached page*

The Old Man and the Sea Information from Answers.com
 The Old Man and the Sea, one of Ernest Hemingway's most famous works, was published on this date in 1952. Critics praised the novella, which was Hemingway's last major work. [www.answers.com/topic/the-old-man-and-the-sea](#). *Cached page*

Amazon.com: The Old Man and the Sea: Spencer Tracy, Felipe Pazos
 User rating 4.3/5. 37 reviews.
 Actors: Spencer Tracy, Felipe Pazos, Harry Belafonte, Don Diamond, Don Blackman Directors: Fred Zinnemann, Henry King, John Sturges Writers: Ernest Hemingway, Peter [www.amazon.com/Old-Man-Sea-Spencer-Tracy/dp/B0003HVF0D](#). *Cached page*

SCORE: The Old Man and the Sea - Teacher Guide
 Copyright© 1997 - San Diego County Office of Education Teacher CyberGuide
[http://www.sdcsoe.k12.ca.us/courses/oldman/oldmaneng.html](#) CyberGuide by Barbara Garrison
[www.k12.ca.us/courses/oldman/oldmaneng.html](#). *Cached page*

Learn more about The Old Man and the Sea
 The Old Man and the Sea is a novella by Ernest Hemingway (July 21, 1899 – July 2, 1961), written in Cuba in 1951 and published in 1952. It was the last major work of fiction to be produced by Hemingway and published in his lifetime. One of [www.k12.ca.us/courses/oldman/oldmaneng.html](#). *Cached page*

Images of The old man and the sea

Related Searches
 Summary Old Man Sea
 Symbols Old Man Sea
 Themes Old Man Sea
 Quiz Old Man Sea
 Old Man Sea Movie
 Old Man Sea Criticism
 Symbolism in the Old Man and the Sea
 The Old Man and the Sea Outline
 Lesson Plans Old Man Sea

Sponsored links
The Old Man And The Sea
 Buy books at Amazon.com and save. Qualified orders over \$25 ship free. [Amazon.com/Book](#)
 See your message here.

Links

Videos

Links

Images

Related searches

Other layout schemas:

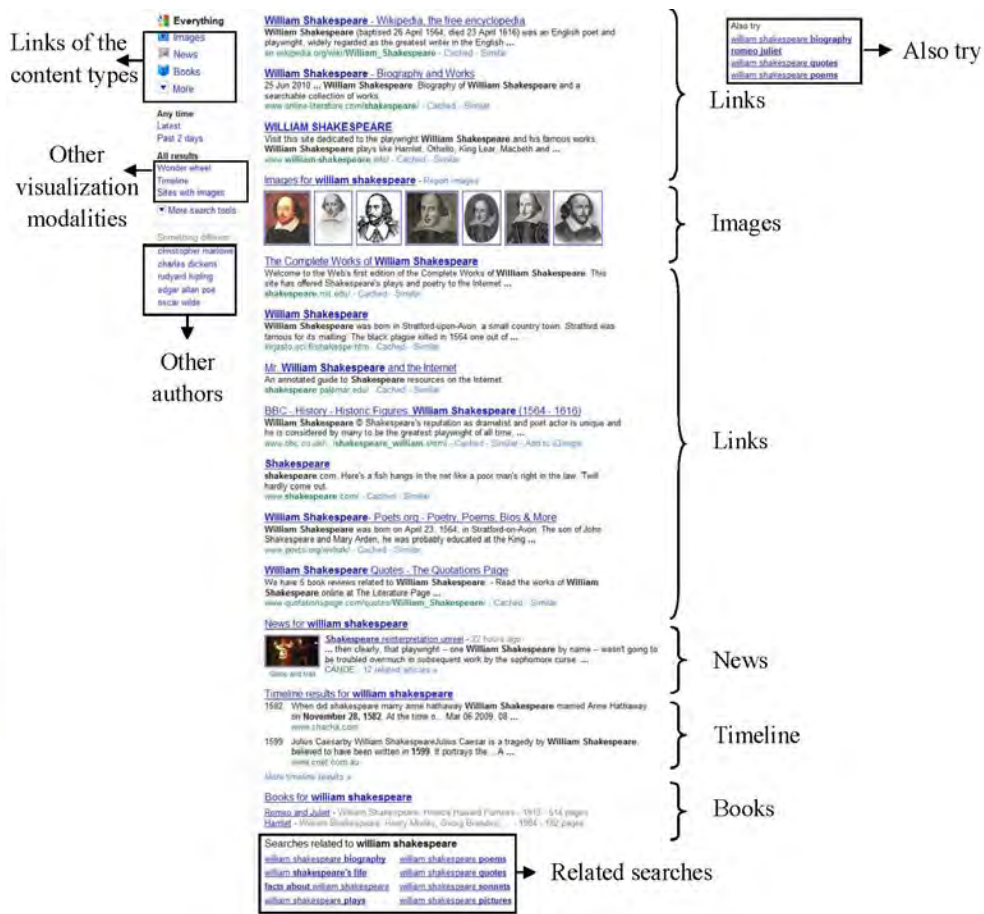
- Links → Images
- Links → Videos → Images
- Links → News → Videos → Links → Images

(Videos regard the films inspired to the book. Some images are about the film while others are about the book coverage).

Content types (Bing books): Link, Sponsored link, Image, Video, News

7.3.8- Layout for authors

Google



Other layout schemas:

- Links → Videos → Images
- Links → Videos → Books → Images
- Links → Timeline → Books → Images
- Links → Images
- Links → News → Images
- Links → Timeline → Images
- Links → Images → Links → Video
- Links → Images → Links → Timeline
- Links → Images → Links → Timeline → Books
- Links → Images → Links → News → Timeline

Content types (Google authors): Link, Sponsored link (in the right side), Image, News, Timeline, Book, Video

Yahoo

The image shows a screenshot of a Yahoo search results page for the query "William Shakespeare". The search bar at the top contains the text "Also try: william shakespeare biography, more..." with an arrow pointing to the text "Query specifications". Below the search bar, the page displays "36,700,000 results for William Shakespeare". On the left side, there is a vertical sidebar with "Related TV Shows" including "Romeo and Juliet", "Hamlet", "Macbeth", "A Midsummer Night's Dream", "Othello", "The Tempest", "Twelfth Night", "King of Hearts", "King Lear", and "The Taming of the Shrew". The main content area shows "Image Results" with three small portraits of Shakespeare and a link to "More william shakespeare images". Below this, there are several search results categorized as "Links". These include: "William Shakespeare - Wikipedia, the free encyclopedia" (with a brief bio and a link to the Wikipedia page), "William Shakespeare - Biography and Works" (with a link to an online literature site), "The Complete Works of William Shakespeare" (with a link to a website offering plays and poetry), "Briton jailed over stolen Shakespeare text - Yahoo! News" (with a link to a news article), "William Shakespeare - Biography from Answers.com" (with a link to an Answers.com page), "William Shakespeare | Ask.com Encyclopedia" (with a link to an Ask.com page), "William Shakespeare - Poets.org - Poetry, Poems, Bios & More" (with a link to a poets.org page), "William Shakespeare (American football) - Wikipedia, the free encyclopedia" (with a link to a Wikipedia page about a football player), "WILLIAM SHAKESPEARE" (with a link to a dedicated website), and "David William, Former Stratford Artistic Director, Dies at 84" (with a link to a news article). Brackets on the right side of the page group the image results under "Images" and the text-based search results under "Links". At the bottom of the page, there is another search bar with the same text "Also try: william shakespeare biography, more..." and an arrow pointing to "Query specifications".

Other layout schemas:

- Links → Images
- Links → Images → Sponsored links
- Links → Images → Links
- Box with News & Photos, Videos, Twitter → Links

The left bar contains thumbnails and links to concepts related to the author. The possible cases are: “Related TV Shows”, “Related Searches”. Sometimes there are links to web sites such as “Wikipedia”, “Answers.com”.

Content types (Yahoo authors): Link, Sponsored link (in the bottom/right part of the page), Image, News, Video, Twitter

Bing

Other layout schemas:

- Box with Image, Description → Links → Videos
- Box with Images, Links → Links → Videos → News → Links
- Box with Images, Description → Links → Videos → Links
- Box with Images, Links → Links
- Box with Images, Description → Links
- Box with Links → Links → News → Links → Blog
- Links → Images
- Images → Links

Content types (Bing authors): Link, Sponsored link (in the right side), Image, News, Video, Blog

7.3- Model of the Search Process

The search process of a search engine which integrates domain specific results, is composed by several phases:

- 1- Query submission: the user submits the query, by specifying some key words.
- 2- Query computation: the search engine computes the query and in particular it identifies the involved domain(s), each of them is associated to sub-search engines, that are invoked in order to retrieve the corresponding results. Each sub-search engine returns results of a specific type (e.g. image, link, video).
- 3- Result visualization: a subset of the retrieved results is showed to the user.

A scenario which exemplifies this process is about a user that is interested in finding information about “Moscow”. The search engine identifies the domain “City” and invokes the related sub-engines. Each of them returns a specific result type: for example the sub-engine x retrieves images about the city, the sub-engine y is dedicated to links and the sub-engine z is focused on videos. Finally the user interface shows a subset of the results, like the one of the following picture. There are items of different types: the map of the city, some links, images, news and videos. How these items are positioned in the page is an aspect of the layout.

The screenshot shows a search engine results page for the query "Moscow". On the left, there is a sidebar with filters for "Everything", "Maps", "Images", "Videos", and "More". The main content area displays several search results, each with a domain and a result type. On the right, a vertical list of labels identifies these categories: "Domain: City Result type: Map", "Domain: City Result type: Link", "Domain: City Result type: News", "Domain: City Result type: Image", "Domain: City Result type: Link", and "Domain: City Result type: Video".

Search Result	Domain	Result Type
Moscow Russian Federation	City	Map
Moscow - Wikipedia, the free encyclopedia	City	Link
A Journey to Moscow - Travel guide to Moscow hotels, restaurants, and entertainment centers	City	Link
Moscow Travel Information and Travel Guide - Russia - Lonely Planet	City	Link
Towers for Moscow	City	News
Images for Moscow	City	Image
The Moscow Times Russia's only daily English language newspaper	City	Link
Moscow travel guide - Wikitravel	City	Link
Moscow	City	Link
Communities - Welcome to Moscow!	City	Link
Current local time in Moscow - Moscow	City	Link
Videos for Moscow	City	Video

In case of ambiguous queries, the search engine tries to recognize the domains related to the different interpretations and shows the results about more than one domain. Explicit multi-domain queries are correctly managed by SeCo which integrates results coming from the involved domains and shows them to the user. It is involved a process of combination (based on structured information and joins operations), and there are specific search services which retrieve the domain specific information.