The informatization of Chinese building industry:
current state of the art and challeges

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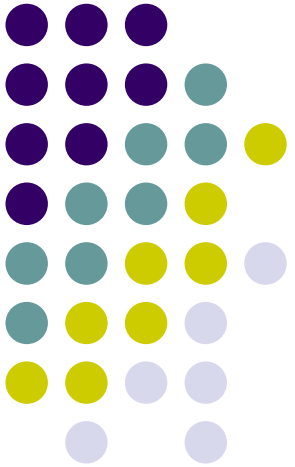
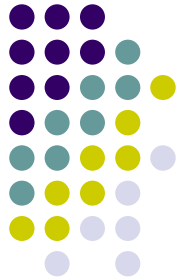


Agenda

1. Background
2. Purpose
3. Methodology
4. Statistical result
5. Current state of the art
6. Challenges

1. Background



- 1999

  “Outline on computer application and informatization for engineering design sector 2000-2005”
- 2001

  “Fundamental points on informatization of construction field”
- 2003

  “Outline on informatization of building industry 2003-2008”

- Major components are design firms and construction firms
- Informatization of the firms has not gone well
- What is the current state of the art? What are the challenges?

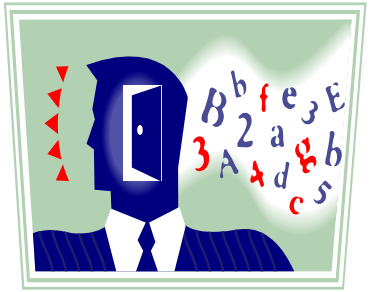
Design and construction firms

Software vendors

Research institutes

- In order to answer the questions

  The key is to grasp the current state of the art
- How?



By exprience

Generality?

By qestionnaire

Accuracy?

By field investigation

Systematicness?

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1. Background
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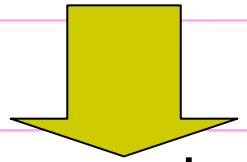
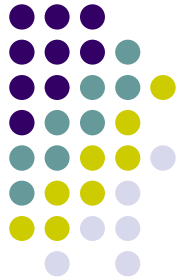
2. Purpose

to grasp
the current state of the art of the informatization of design firms and construction firms
generally and systematically



to point out
the challenges that the design firms, construction firms, the relevant software vendors and the relevant research institutes have to face



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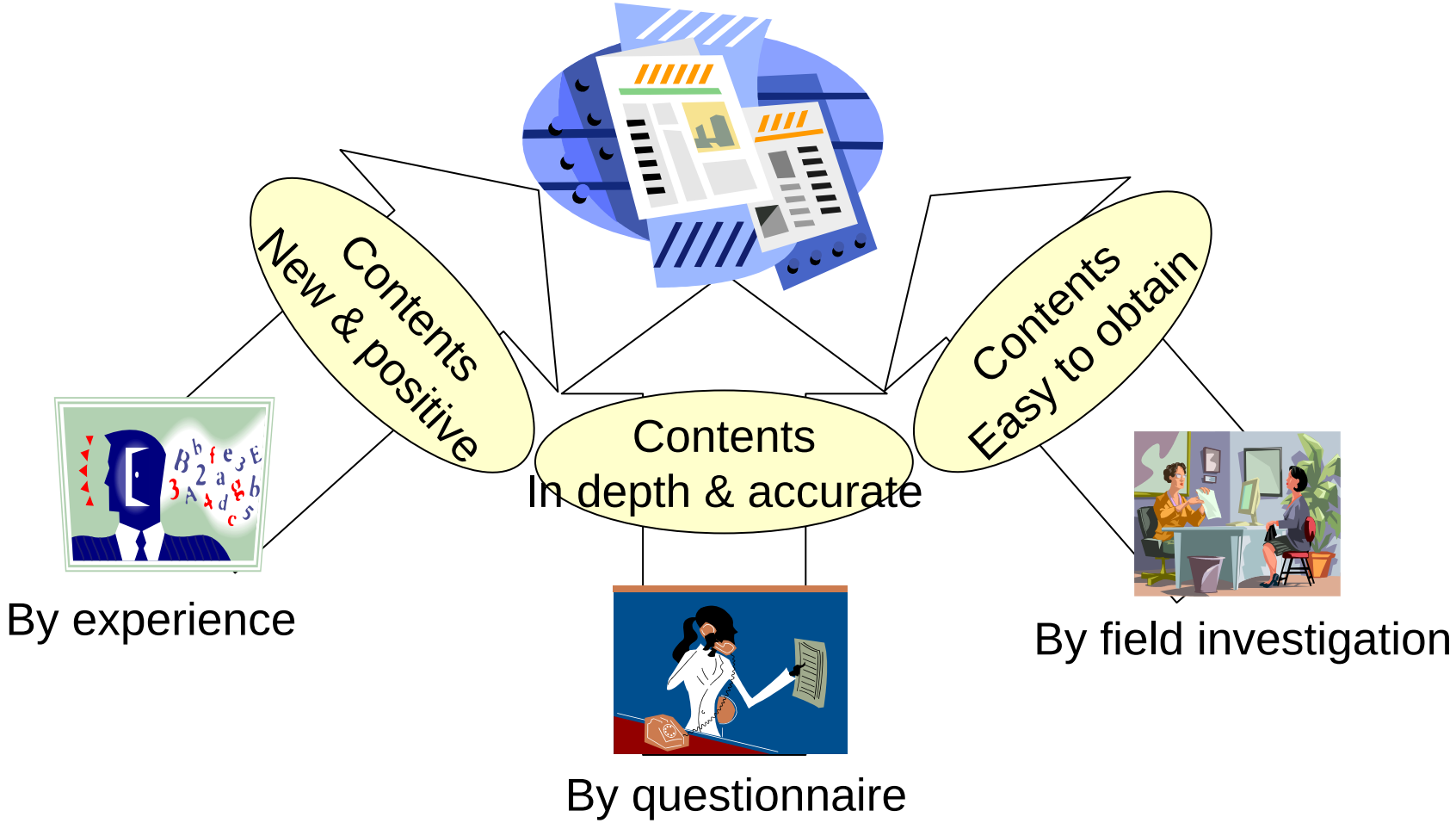
3. Methodology

- To analyze the relevant published papers



Scope of published papers

- Full text DB of CN journal papers
  Since 1994, 8200 Journals
- Full text DB of CN excl. MD theses
  Since 1999, 350 thousand theses
- Full text DB of CN excl. PhD theses
  Since 1999, 60 thousand theses
- Full text DB of CN conf. proc.
  Since 1999, > 300 soci

- Period：1997-2007
- Keywords：Informatization m design institutes, design, h
  project；CAD, aided m building, structure；Informatizatio
  Construction firms, construction project, engineering projects

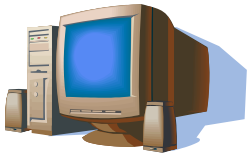
Design firms

Constr. firms

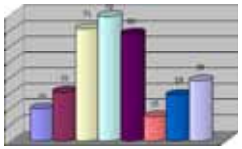
370+459

How the papers were analyzed

Each paper is roughly read to determine its category and to record its attributes, including category, source, published year etc.



The attributes of the papers are analyzed according to the subject for analysis to obtain the distribution of the papers with year.



The graph presentation of the result from the analysis is obtained and the meaning is explained.

Categories of papers

- Argumentum papers

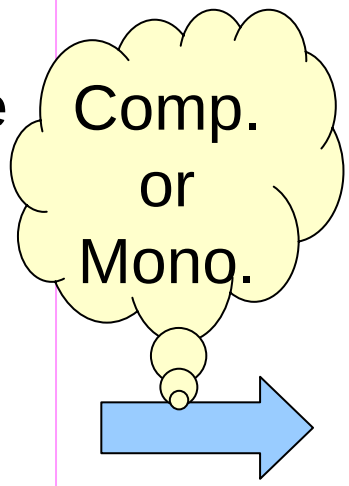
  Explain and justify some ideas

- Research papers

  Present the result of a research

- Application papers

  Present the application case of a certain technology of information system



- Comp. Argum
- Mono. Argum.
- Comp. Research
- Mono. Research
- Comp. Applic.
- Mono. Applic.

Journals published the analyzed papers concerning design firms

- Total number：175
- Major journals: 13, 90 papers (32 percent of the total)

- 中国勘察设计 （33）
- 工程设计CAD与智能建筑 （19）
- 建筑设计管理（9）
- 建筑科学（7）
- 工程建设与设计（6）
- 中国计算机用户（6）

- 计算机辅助设计与图形学学报（6）
- 科技情报开发与经济（5）
- 安徽建筑（4）
- 福建建筑（4）
- 建设科技（4）
- 石材（4）
- 西南交通大学学报（4）

Design firms

Distribution with year

Journal¥Year	97	98	99	00	01	02	03	04	05	06	07	Total
中国勘察设计	**0**	**0**	**0**	**0**	**0**	**2**	**4**	**5**	**13**	**4**	**0**	**28**
工程设计CAD与智能建筑	**0**	**2**	**3**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**11**
建筑设计管理	0	0	1	5	1	0	0	0	1	1	0	9
建筑科学	1	3	2	0	0	0	1	0	0	0	0	7
工程建设与设计	0	0	0	0	1	0	0	1	1	3	0	6
中国计算机用户	0	0	3	3	0	0	0	0	0	0	0	6
计算机辅助设计与图形学学报	0	1	2	0	1	0	1	0	1	0	0	6
科技情报开发与经济	0	0	1	1	2	0	0	1	0	0	0	5
安徽建筑	0	0	1	2	0	0	0	0	0	1	0	4
福建建筑	0	0	1	1	1	0	0	0	0	1	0	4
建设科技	0	0	0	0	0	0	0	0	4	0	0	4
石材	0	1	0	1	0	0	2	0	0	0	0	4
西南交通大学学报	0	0	4	0	0	0	0	0	0	0	0	4
Total	**1**	**7**	**18**	**15**	**8**	**4**	**8**	**7**	**20**	**10**	**0**	**98**

Design Firms

By paper category

Journal¥Paper category	Comp. Argum.	Mono. Argum.	Comp. Application	Mono. Application	Comp. Research	Mono. Research	Total
中国勘察设计	**9**	**9**	**8**	**1**	**1**	**0**	**28**
工程设计CAD与智能建筑	**3**	**2**	**0**	**0**	**1**	**5**	**11**
建筑设计管理	6	0	1	2	0	0	9
建筑科学	0	4	0	0	0	3	7
工程建设与设计	1	2	1	0	0	2	6
中国计算机用户	0	0	6	0	0	0	6
计算机辅助设计与图形学学报	0	3	0	0	0	3	6
科技情报开发与经济	2	3	0	0	0	0	5
安徽建筑	1	3	0	0	0	0	4
福建建筑	2	2	0	0	0	0	4
建设科技	0	0	1	1	0	2	4
石材	0	2	0	0	0	2	4
西南交通大学学报	0	4	0	0	0	0	4
Total	**24**	**34**	**17**	**4**	**2**	**17**	**98**

Journals published the analyzed papers concerning construction firms

- Total number: 241
- Major journals: 12, 148 papers (33 percent of the total)

- 施工企业管理（33）
- 建筑（19）
- 施工技术（18）
- 建筑经济（15）
- 山西建筑（13）
- 建筑管理现代化（11）

- 科技情报开发与经济（7）
- 中国建设信息（7）
- 基建优化（6）
- 技术经济（6）
- 建设科技（6）
- 建筑技术开发（6）

Construction firms

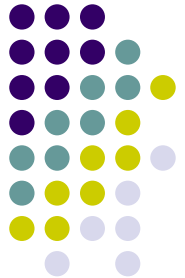
Distribution with year

Journal¥Year	97	98	99	00	01	02	03	04	05	06	07	Total
施工企业管理	**0**	**0**	**2**	**0**	**2**	**6**	**2**	**6**	**6**	**9**	**0**	**33**
建筑	0	0	0	1	2	2	9	5	0	0	0	19
施工技术	**0**	**0**	**1**	**1**	**4**	**3**	**1**	**0**	**8**	**0**	**0**	**18**
建筑经济	0	0	0	0	0	1	2	7	2	3	0	15
山西建筑	0	0	0	1	0	2	4	3	2	1	0	13
建筑管理现代化	0	0	0	2	1	1	0	2	3	2	0	11
科技情报开发与经济	0	0	0	0	1	0	0	1	5	0	0	7
中国建设信息	0	0	0	0	0	1	2	0	2	2	0	7
基建优化	0	0	0	0	0	1	1	1	3	0	0	6
技术经济	0	0	0	0	2	0	1	2	1	0	0	6
建设科技	0	0	0	0	0	1	0	2	2	1	0	6
建筑技术开发	0	0	0	0	2	0	1	3	0	0	0	6
Total	**0**	**0**	**3**	**5**	**14**	**18**	**23**	**32**	**34**	**18**	**0**	**147**

Construction firms

By paper category

Journal¥Paper Category	Comp. Argum.	Mono. Argum.	Comp. Application	Mono. Application	Comp. Research	Mono. Research	Total
施工企业管理	26	0	1	6	0	0	33
建筑	10	1	2	4	2	0	19
施工技术	9	0	0	7	0	2	18
建筑经济	10	1	0	1	1	2	15
山西建筑	12	0	1	0	0	0	13
建筑管理现代化	4	5	0	0	0	2	11
科技情报开发与经济	3	2	1	1	0	0	7
中国建设信息	4	2	0	1	0	0	7
基建优化	4	2	0	0	0	0	6
技术经济	6	0	0	0	0	0	6
建设科技	3	0	0	3	0	0	6
建筑技术开发	3	2	0	0	1	0	6
Total	94	15	5	23	4	6	147



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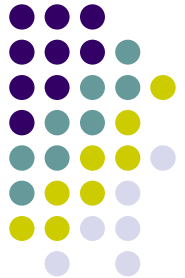
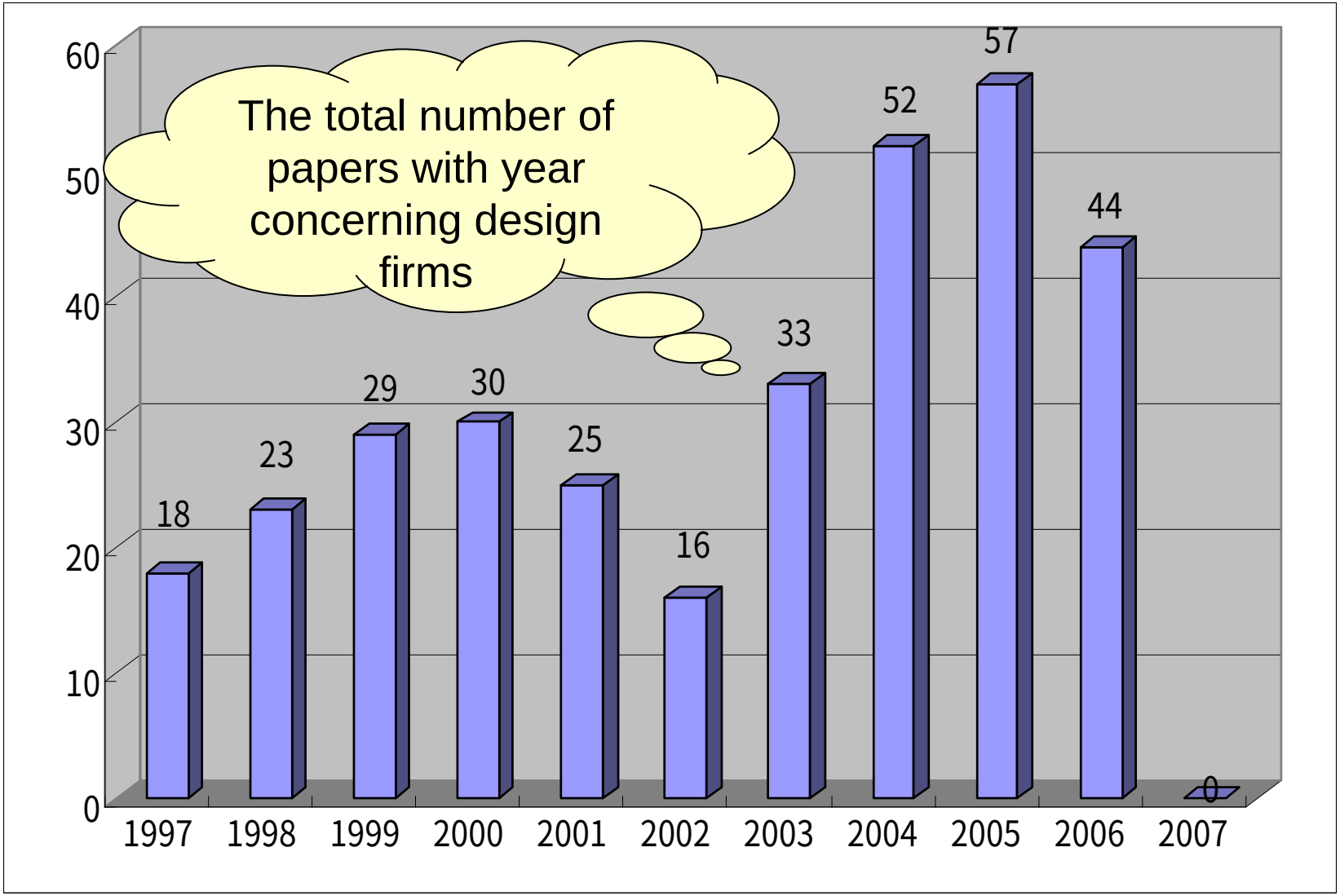
4. Statistical result



We distinguish between design firms and construction firms

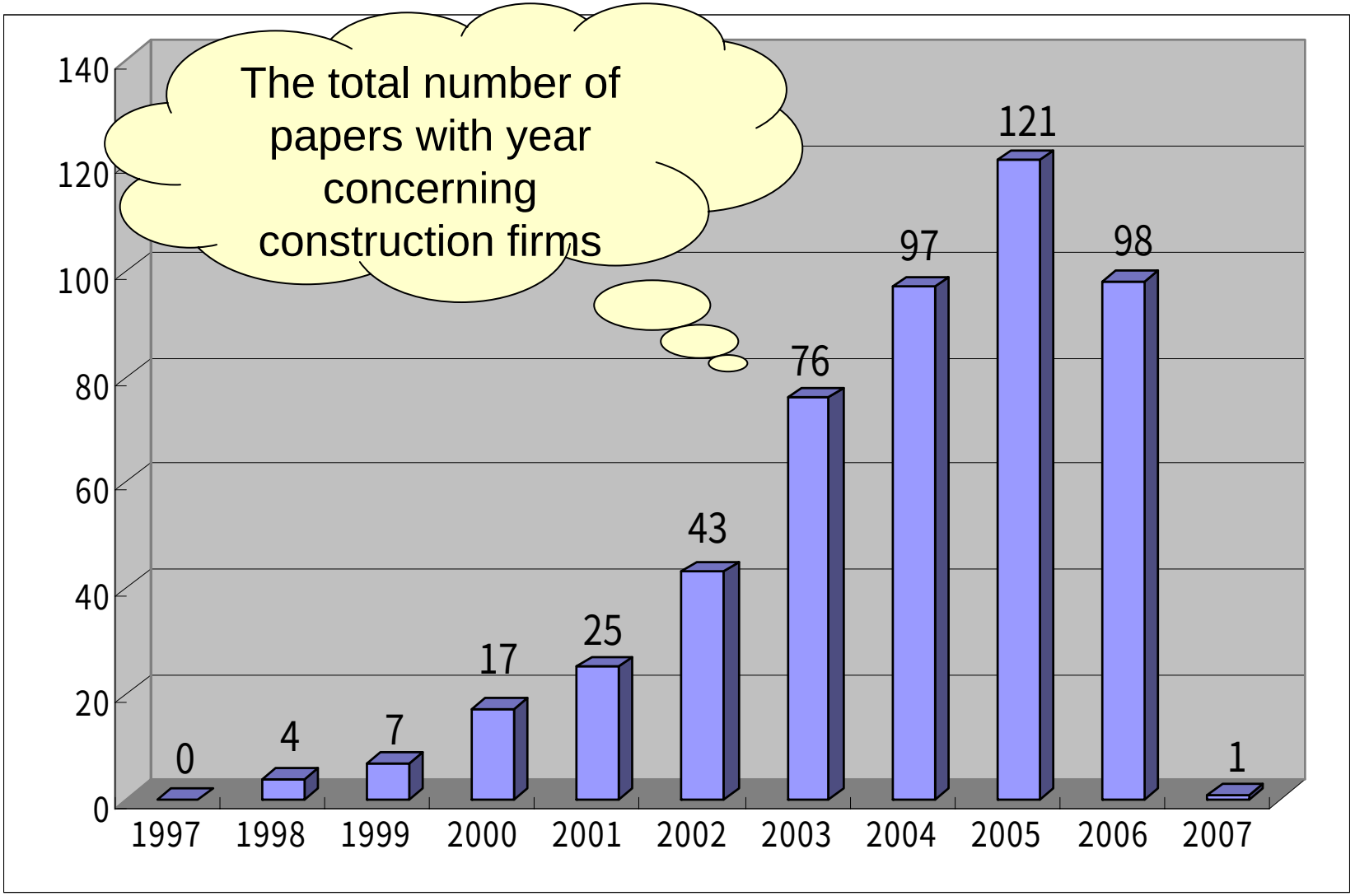
Sujects for analysis

1) The total number of papers with year
2) The number of each category of papers with year
3) The proportions of each category of papers with year
4) The number of each type of information systems involved in the application papers with year
5) Major characteristics of the firms that are involved



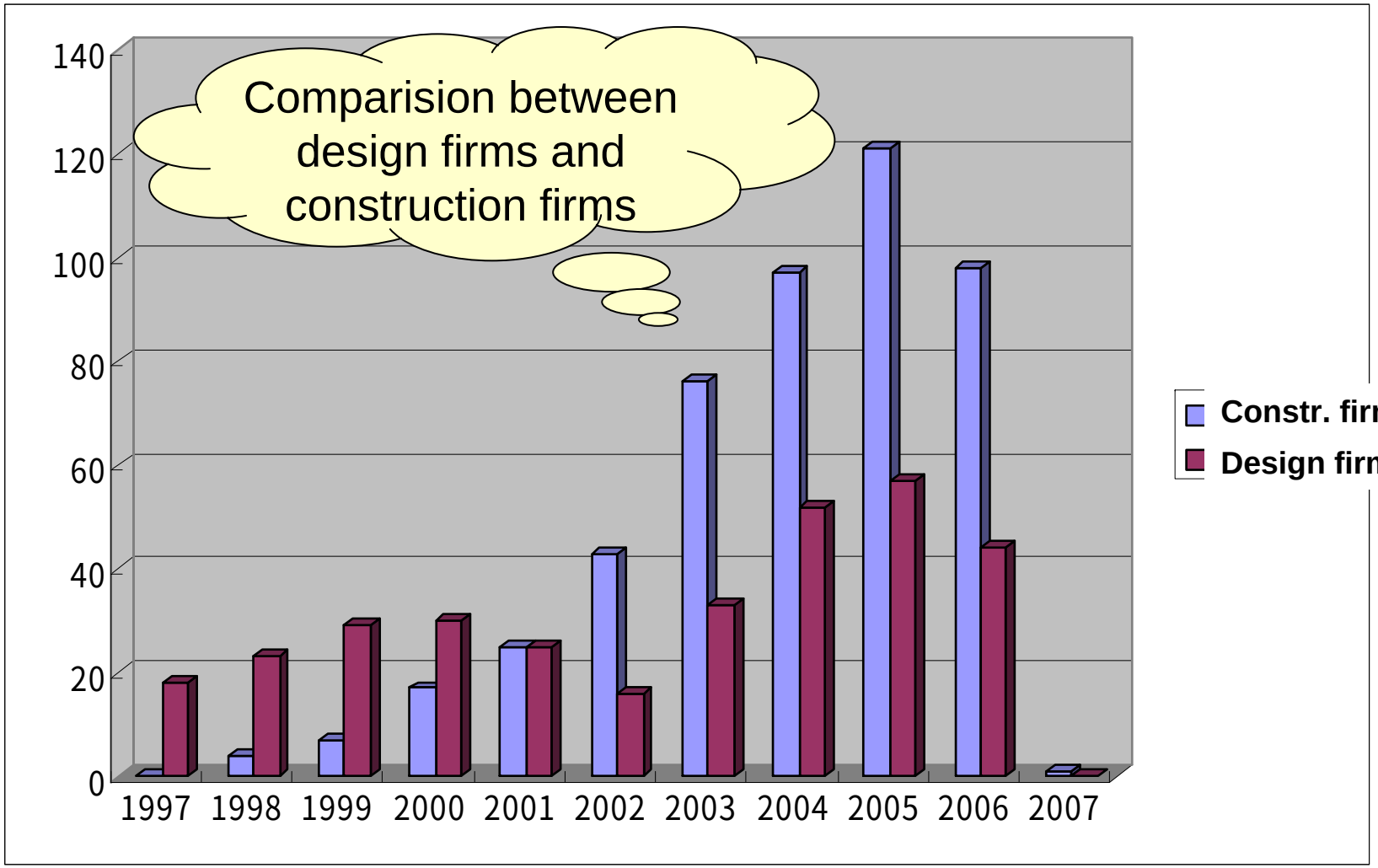
Trend: 00 peak: 30 papers

05 peak: 57 papers

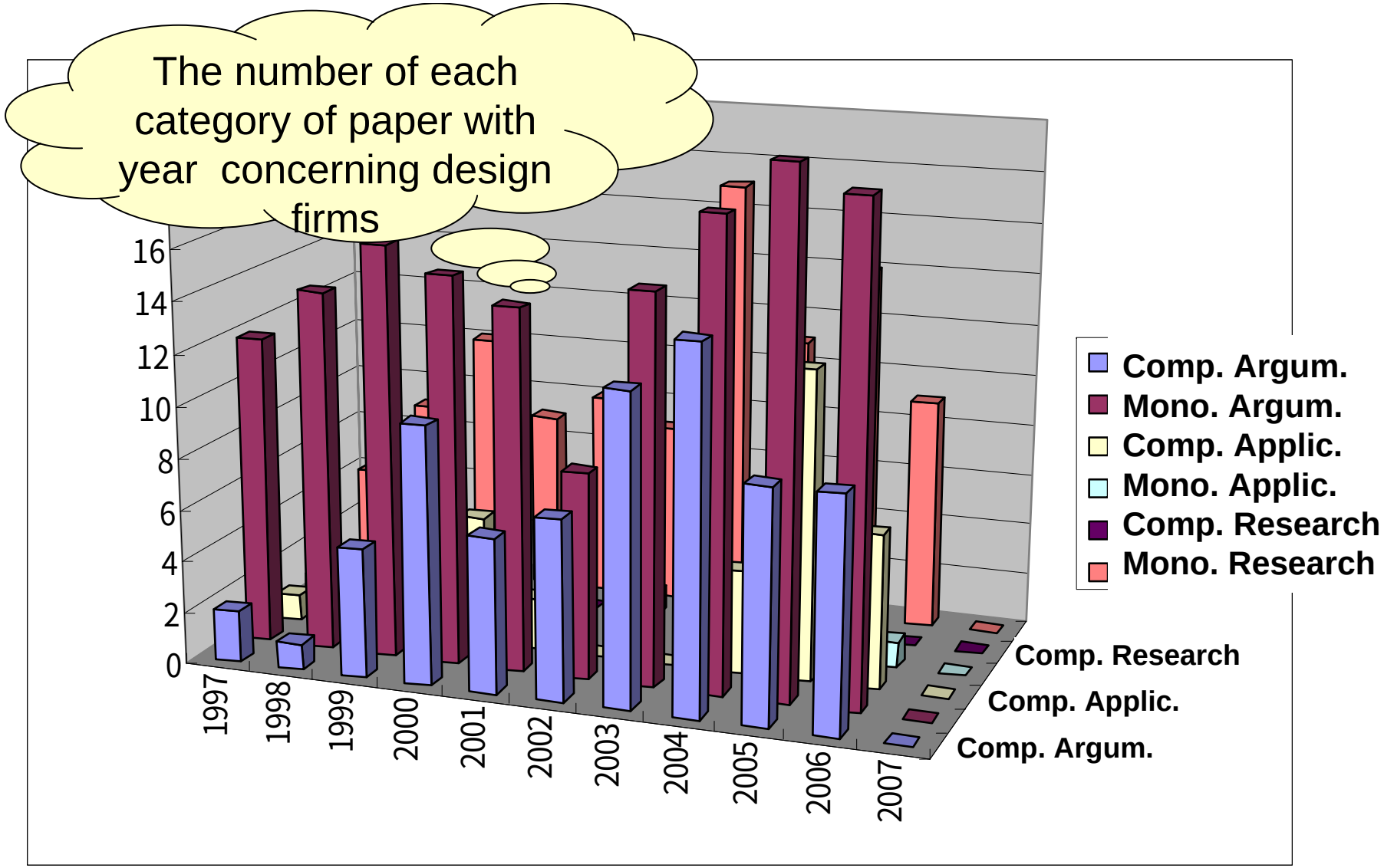


Trend：Rapid increase

05 peak: 121 papers

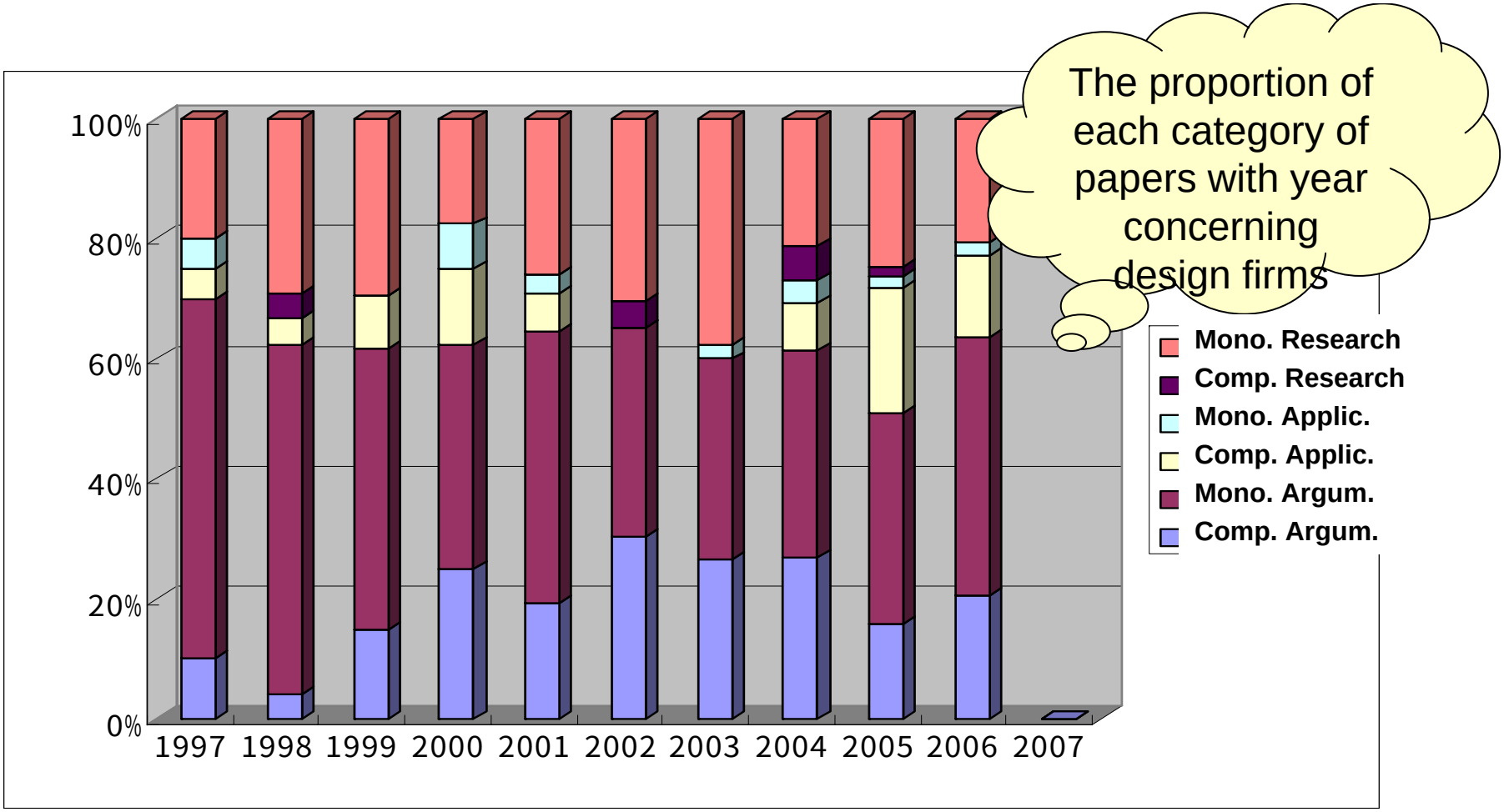


Comparison：Increase is more rapid for construction firms



Trend: Mono. Argum. > Mono. Research > Comp. Argum. > …

151 papers 95 papers 75 papers



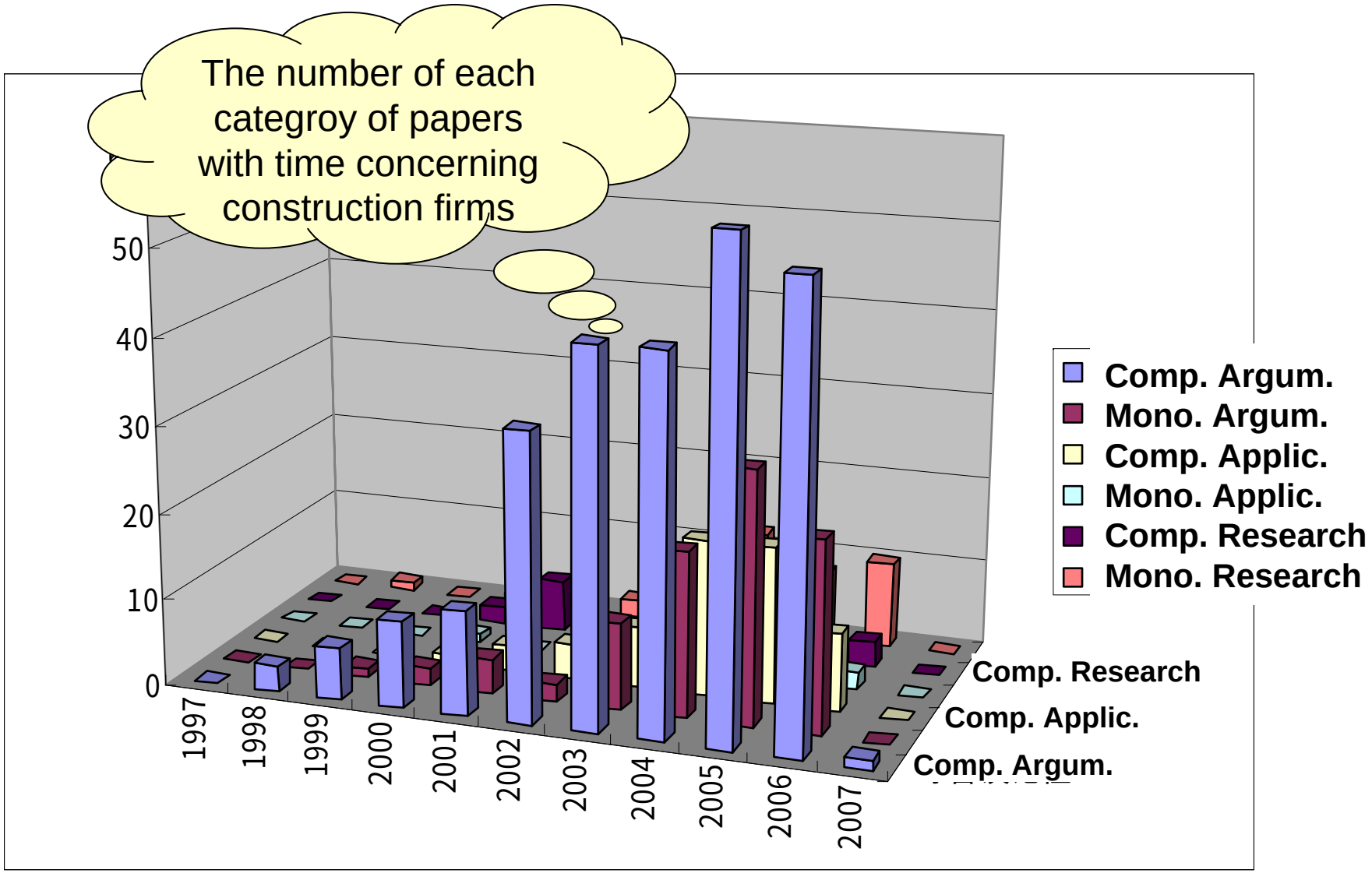
Trend: Mono. Argum. averagely 40 percent each year

Mono. Research averagely 30 percent each year

Comp. Research 1.6 percent in total, i.e. 6 papers

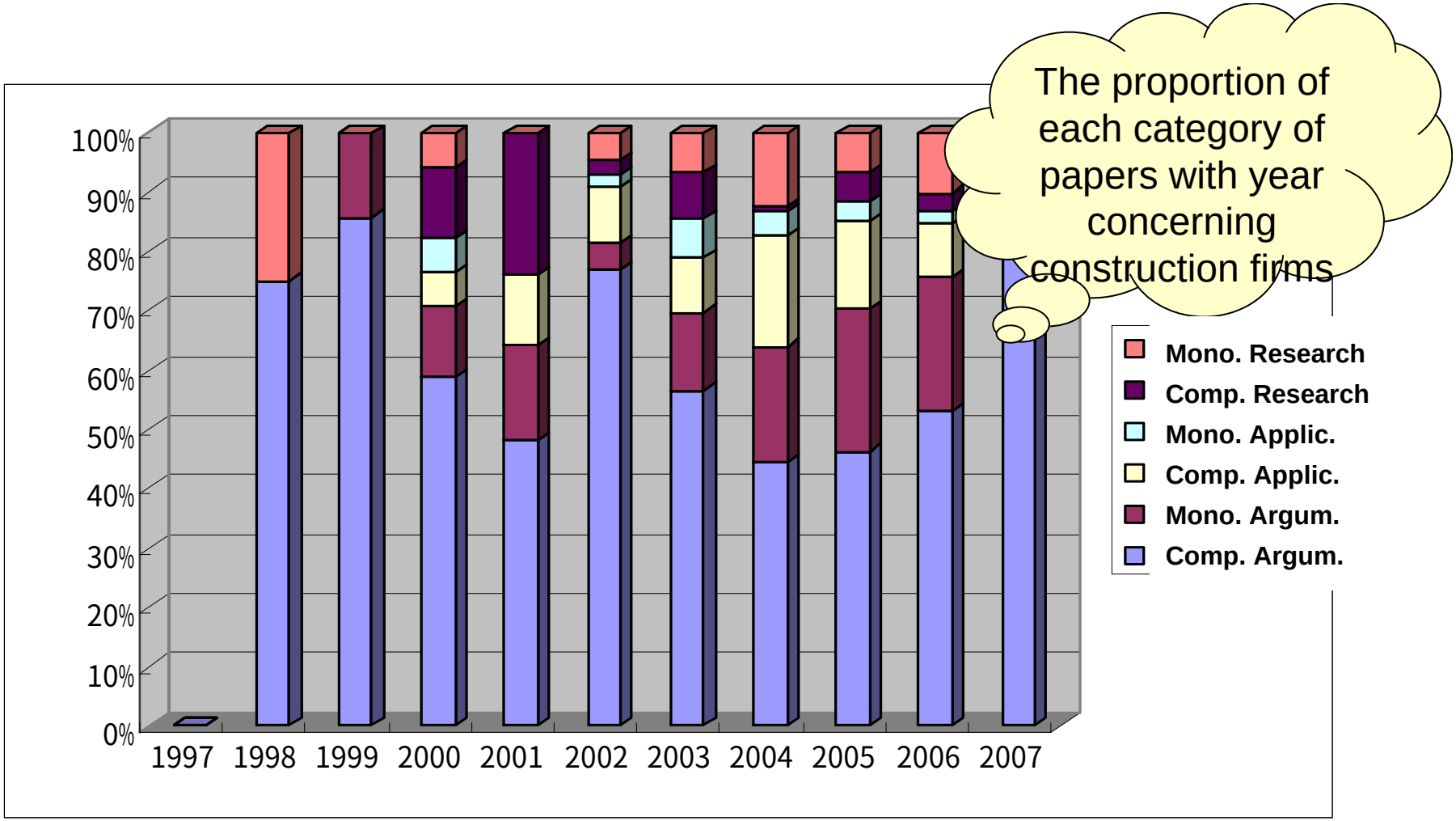
Ratio of Mono. Argum. to Comp. Argum. 2 to 1, total 226 papers

Ratio of Comp. Applic. to Mono. Applic. 3 to 1, total 44 papers



Trend: Comp. Argum. > Mono. Argum. > Comp. Applic. > …

259 papers 89 papers 60 papers



Trend: Comp. Argum. more than 50 percent averagely each year

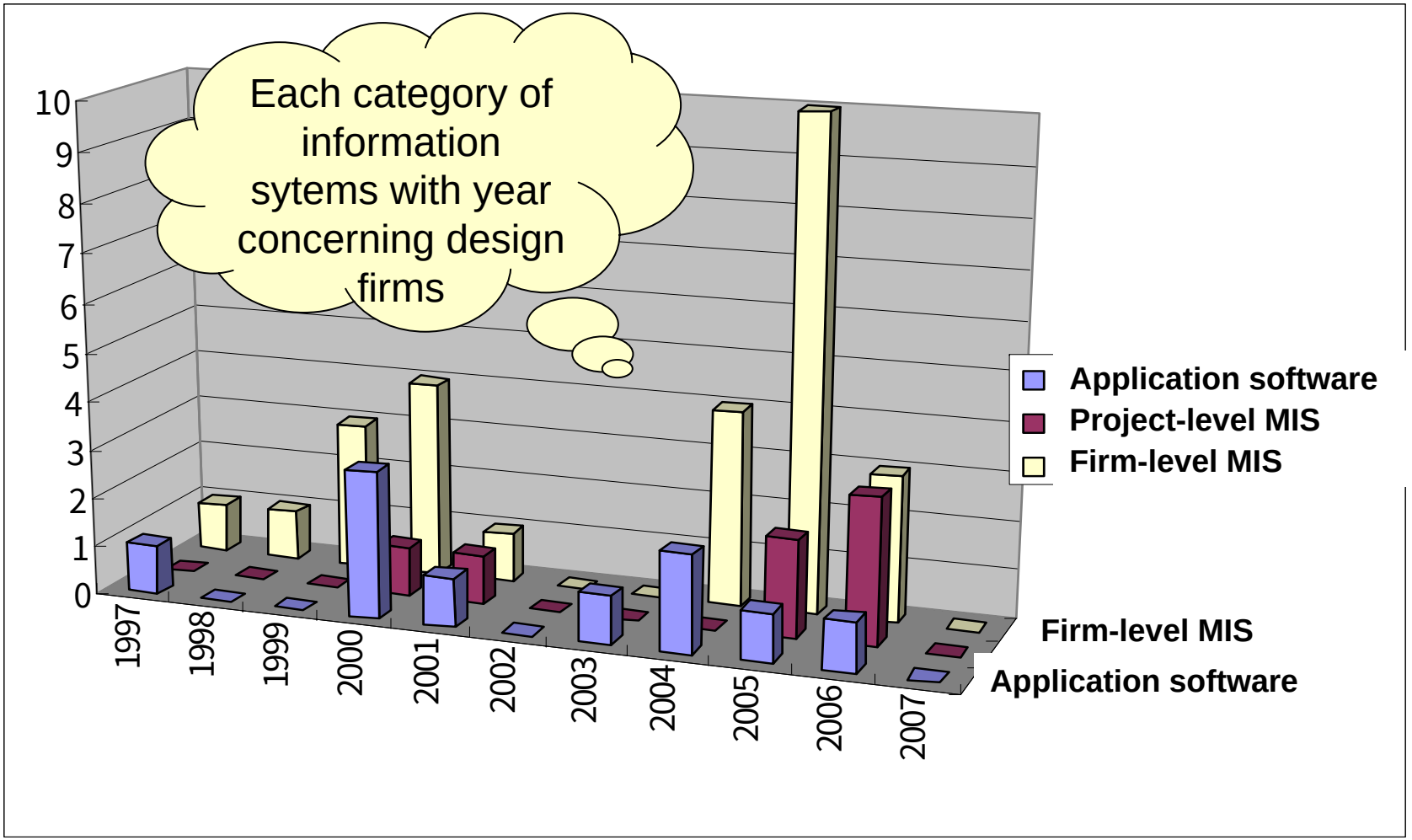
Ratio of Comp. Argum. to Mono. Argum. 3 to 1, total 348 papers

Ratio of Comp. Applic. to Mono. Applic. 4.5 to 1, total 77 papers

Research papers accounting for less than 20 percent each year

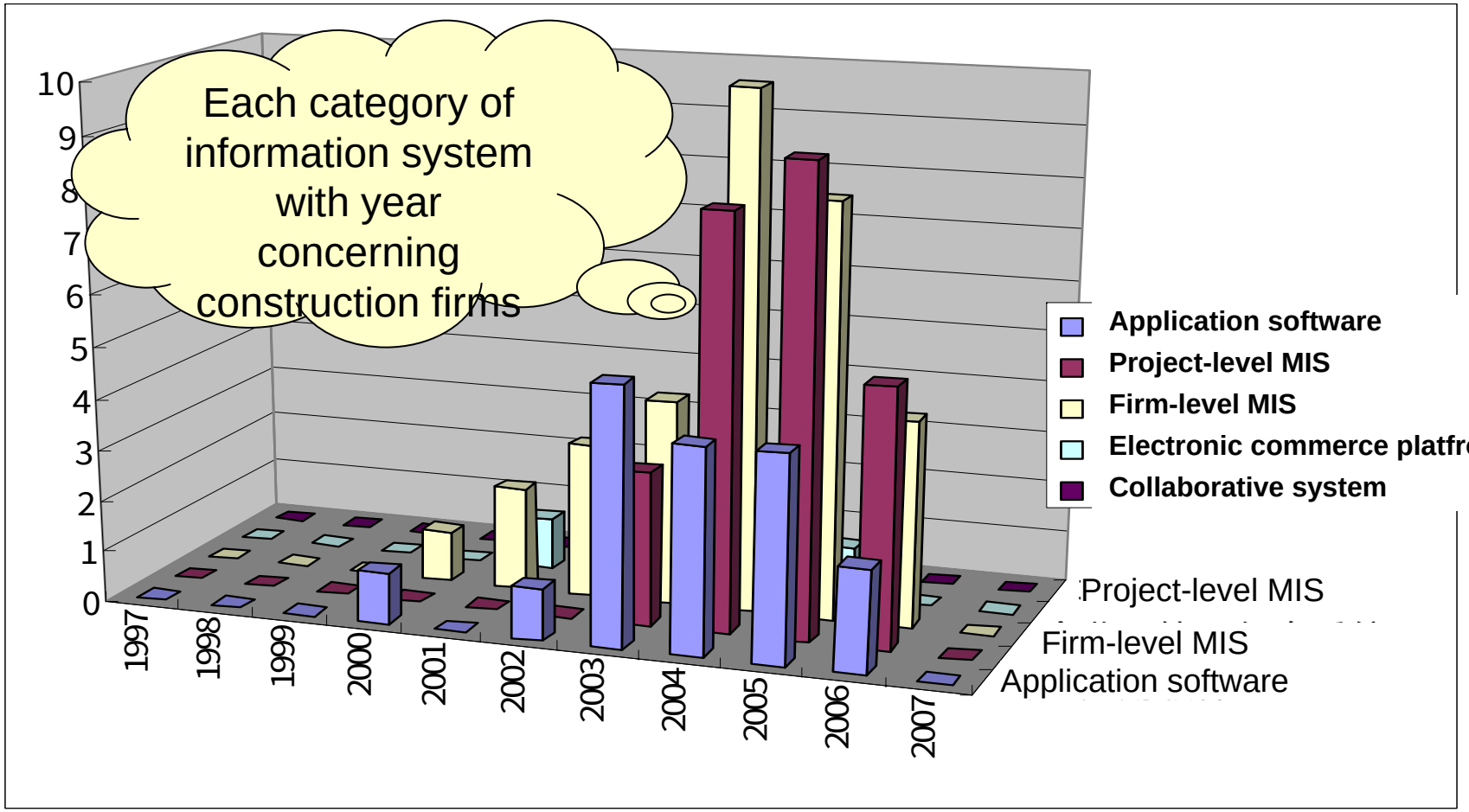
Comparison between design firms and construction firms according to paper category

- Design firms
  - Mono. Argum., Mono. Research, Comp. Argum.
  - Pay more attention to application software than to informatization of firms
- Construction firms
  - Comp. Argum., Mono. Argum., Comp. Applic.
  - Pay more attention to informatization of firms



Trend: Firm-level MIS > Application software > Project-level MIS

27 papers 10 papers 7 papers



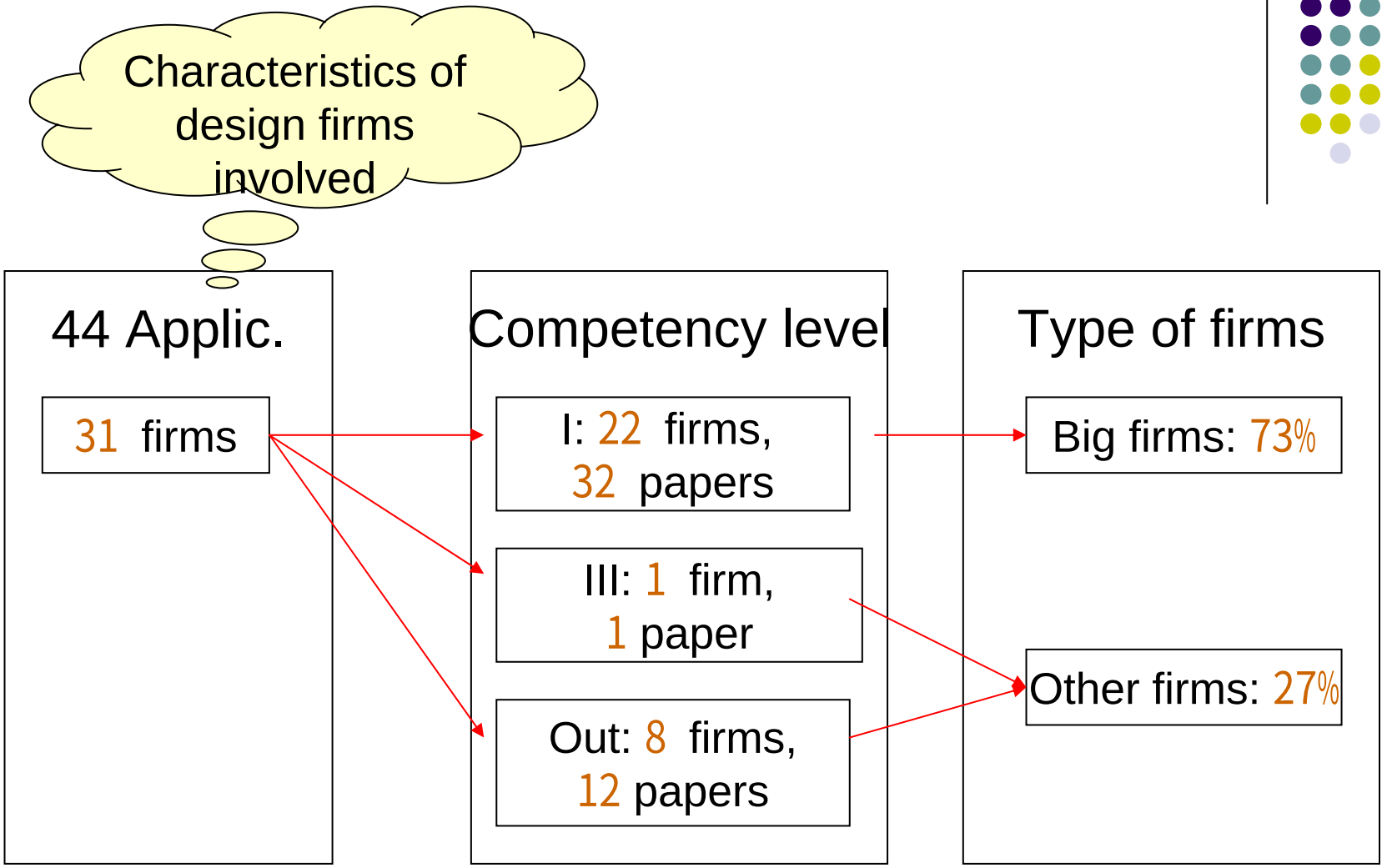
Trend: Firm-level MIS > Project-level MIS > Application software

31 papers 25 papers 17 papers

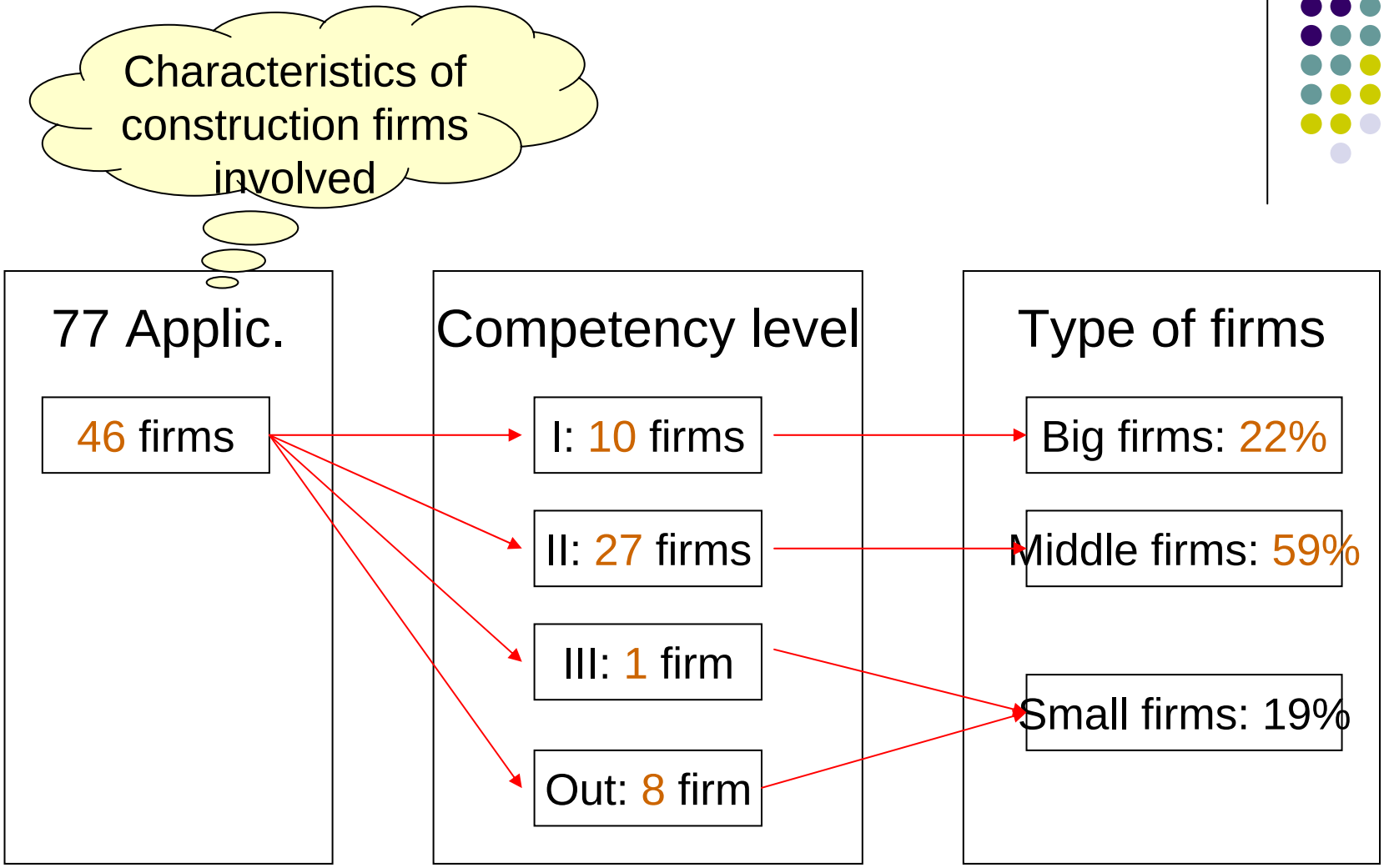
2 papers about EC, 1 paper about collaborative system

Comparison between design firms and construction firms according to information system

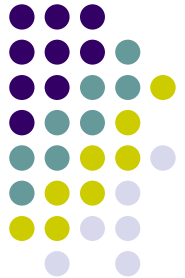
- Design firms
  - Application software, project-level MIS, firm-level MIS
  - Firm-level MIS takes the majority
- Construction firms
  - Application software, project-level MIS, firm-level MIS, electronic commerce platforms and collaborative systems
  - The firm-level MIS and the project-level MIS together take the majority



Trend: Big design firms: 72 percent, although accounting for 17.7 percent of the total design firms



Trend: Big or middle construction firms: 81 percent, although accounting for 4 percent in the total construction firms



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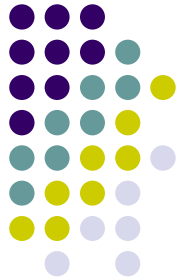
4. Current state of the art



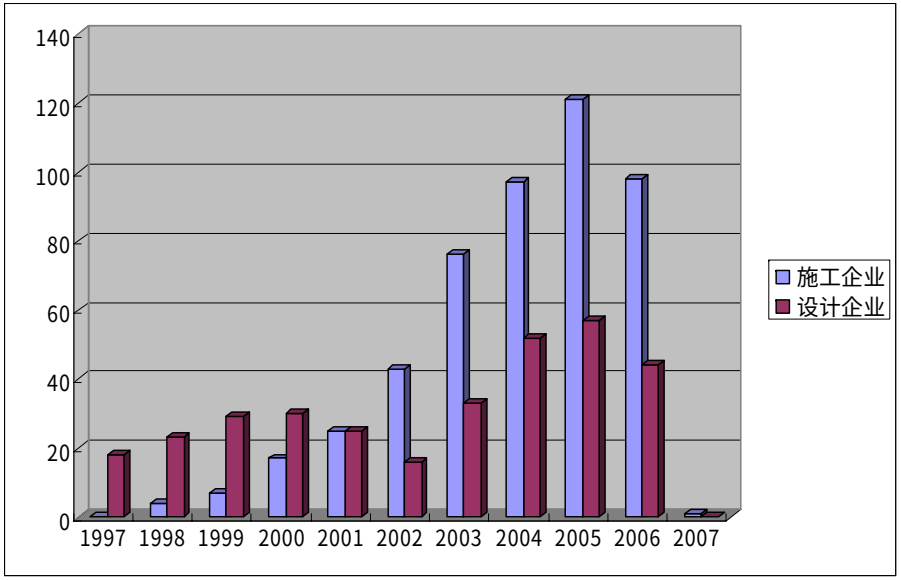
Major aspects

1) Trend of informatization development
2) Depth of knowledge about informatization
3) Extent of practice about informatization
4) Type of firms implementing informatization
5) Weakness in the implementation of informatization

Trend of Informatization

The informatization of building industry has progressed, where the construction firms have progressed more remarkably than design firms in the past ten years.

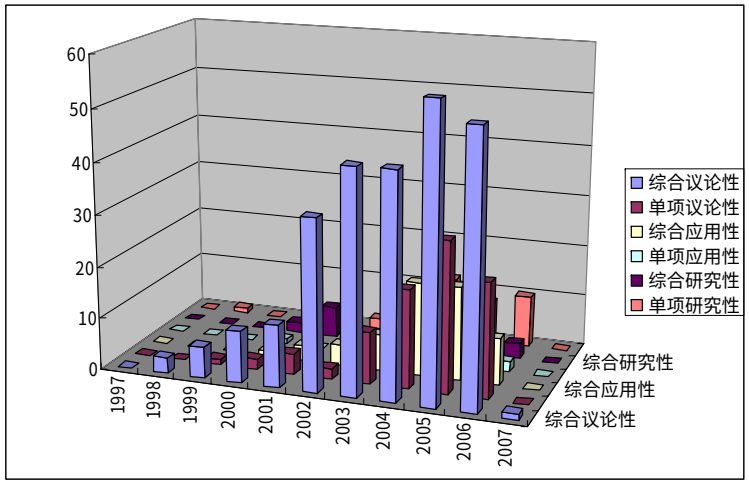
1999-2000 design firms abandon drawing plates

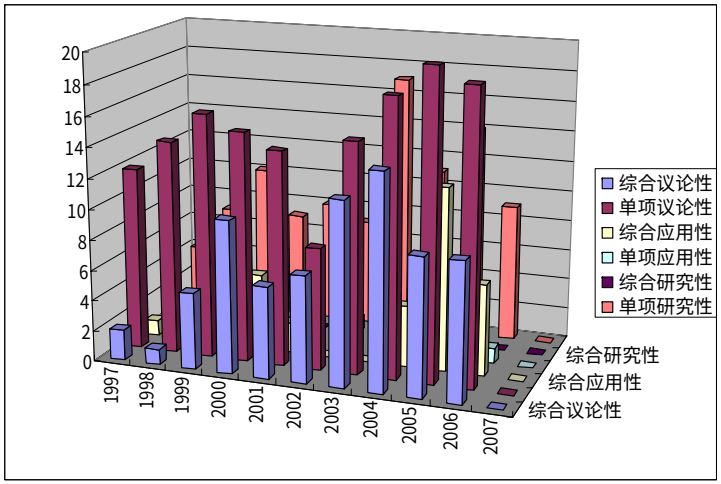


2002 A project on informatization started under tenth five-year plan

Depth of Knowledge

A lot of knowledge about the informatization has been accumulated successfully and the knowledge has been deepened.



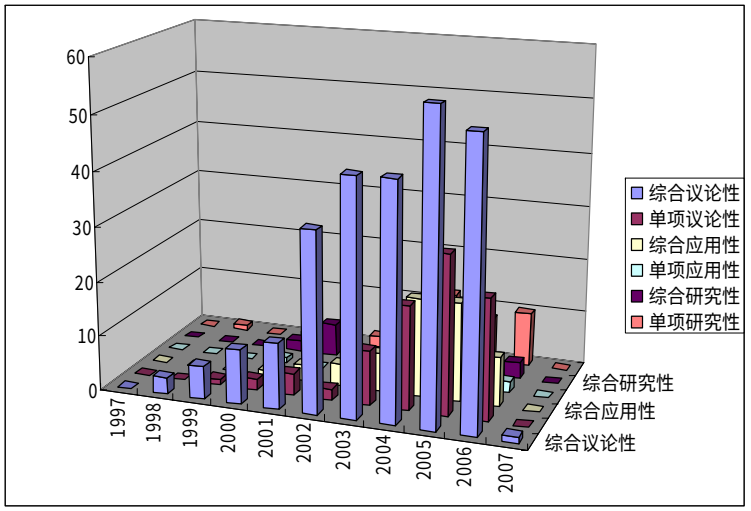


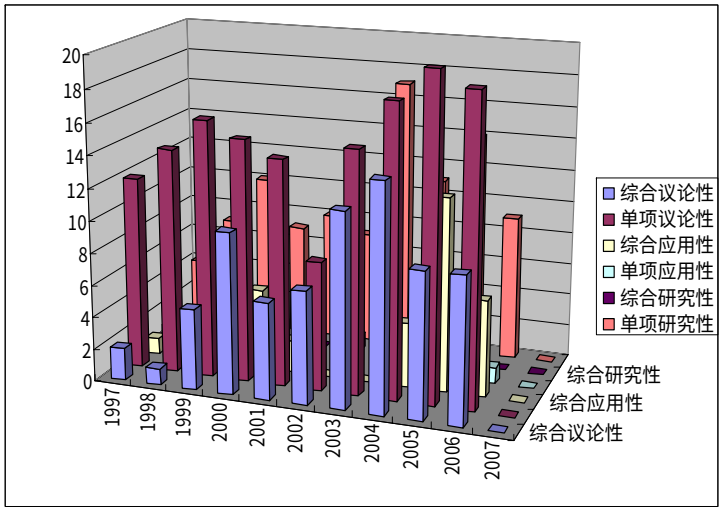
Trend: many argumentum papers

226 papers concerning design firms, 348 construction firms

Extent of Practice

Many practices about informatization have been carried out successfully and both comprehensive practices and monomial practices are included.





Trend: Many application papers

44 papers concerning both design firms and 77 papers concerning construction firms

Type of Firms

The informatization of small firms need to be promoted especially, although some big and middle scaled firms have implemented informatization successfully.

Trend: Big and middle scaled firms account for the majority

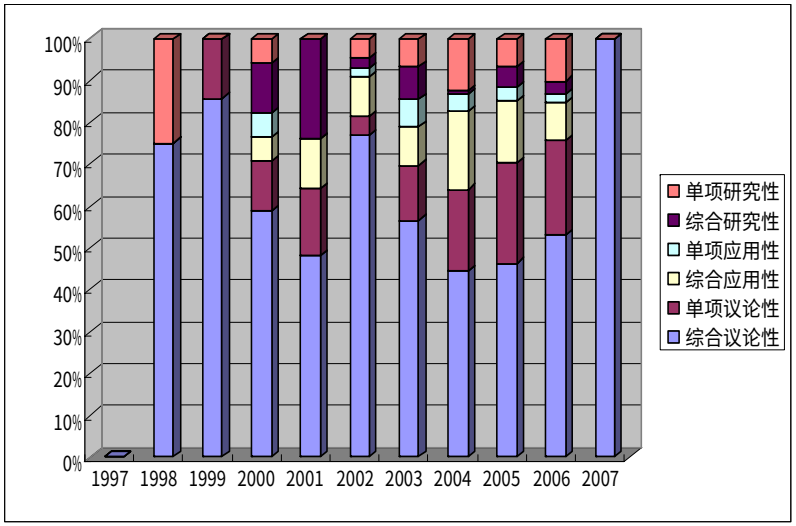
Big design firms 73 percent

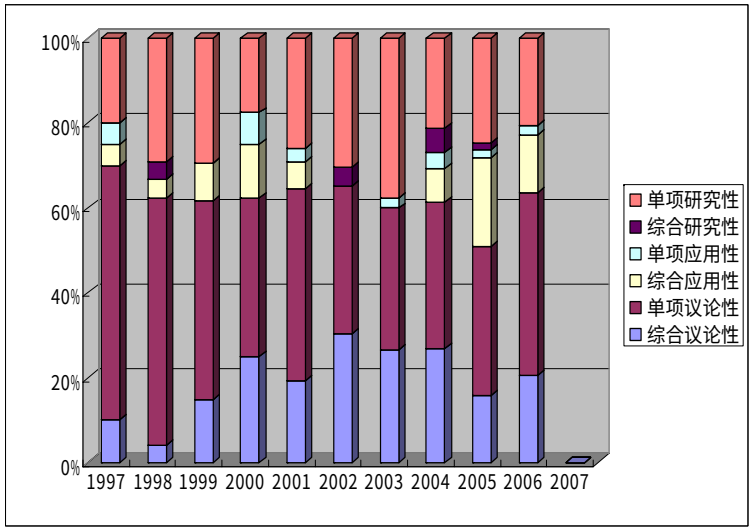
Big and middle scaled construction firms 81 percent

Although they account for only 4 percent and 17 percent in the total design firms and construction firms

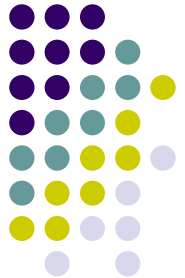
Weakness

The research on the informatization is relatively weak in the past ten years.





Trend: The proportion of research papers averagely in a year
have not exceeded 5 percent concerning design firms;
have not exceeded 20 percent concerning construction firms



Agenda

1. Background
2. Purpose
3. Methodology
4. Statistical result
5. Current states of the arts
6. Challenges

6. Challenges

Challenge 1

Next peak of informatization of design firms and construction firms will come soon.

Design firms and construction firms

should be aware that informatization is inevitable and thus should be prepared for it.

Software vendors

Research institutes

should be prepared for it in technology by developing more effective products.

Challenge 2

The chance for implementing informatization for design firms and construction firms is good now

Design firms and construction firms

Should be active to catch up the chance.

Software vendors

should develop their market aggressively.

Research institutes

should deepen their research to satisfy the new requirements.

Challenge 3

Small firms will have a good chance to be developed.

Small design firms and construction firms

should be aware that it is inevitable to implement informatization to raise the competitiveness.

Software vendors

Research institutes

should develope dedicated technology for the small design firms and construction firms.

12th International Conferences on Computing in Civil and Building Engineering & 2008 International Conference on Information Technology in Construction

October 15-17, 2008
Beijing, China
Beijing Friendship Hotel

Organizer

Abstract due **Aug. 31, 2007**
Full paper due **Mar. 31, 2008**

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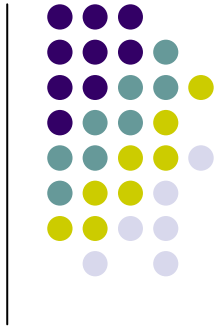

Thank you very much
for your attention