# Panel: Future Directions of Database Research—
# The VLDB Broadening Strategy, Part 2

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## 1. Broadening the Database Field

### 1.1 The Challenge

Over its 40-year history, database research has made major contributions to developing core database management systems technology, which now lies at the heart of every conventional application. Whereas the database field should contribute to the full scope of data management—its applicability, its challenges, and its future directions—this has not happened. The database field now faces two challenges. First, fundamental data management assumptions do not apply to the data requirements of the next generation of applications. Long-standing data application challenges, such as semantic interoperability, inhibit data-centric solutions, thus leading to solutions in other domains. New computing environments, such as the WWW, require a rethinking of core database technology in all areas, e.g., architecture and query/search techniques. Second, new application domains typically do not appeal to the database field to address new data management problems. Over the past decade, other new or established areas have addressed data-intensive problems (e.g., the role of data in the Web, e-commerce, digital libraries, and knowledge management/discovery). As the Internet, gizmos, e-applications, ubiquitous computing, and other trends revolutionize computing (which is accompanied by an explosive growth of data and transaction volumes), database technology is relegated to its conventional forms. The database field is being narrowed to core database technologies used by conventional applications.

As we embrace the largest revolution in computing history, the database community should face the full scope of data management challenges in the next generation of computing, that is, all forms of data in all applications. Data, which is one of the three pillars of computing, is critical to current and future computing. Data volumes and database transactions are growing to astronomical levels. Yet data and its management are not first-class citizens with process/logic, communications, or presentation. New areas with critical data components do not turn to the database community for ideas, advice, or technology. In turn, the database community does not adequately reach out to these new domains. The database community has much more to offer the current and next generation of computing than is currently offered or requested. This must change. The database community must broaden its scope to all aspects of data in all contexts and to take its proper role in developing the next generation of computing.

### 1.2 A Role for VLDB

In addition to presenting database research results and current industry challenges, database conferences provide an opportunity to push the boundaries of database research to meet new requirements. Invited talks, panels, and industrial sessions are intended to introduce new challenges, directions, and ideas to the VLDB community. On average, 90% of papers in past VLDB conferences dealt with core database technology, including many high-quality "delta" papers. This remarkable strength contributed to the worldwide $10 billion (US) annual DBMS market. However, there is much more to the world of data than core technology. The VLDB Endowment has attempted to expand the scope of VLDB conferences beyond core database technology, by introducing paper categories and a Broadening Strategy.

In 1996, the VLDB Endowment added the Experience/Application submission category to the conventional Research category. In 1998, the Vision category was added. These categories, defined in [Bro00-1], were introduced to encourage the submission

of such papers, with the promise that these papers would be recognized as different from Research papers and be evaluated accordingly. To date, categories have been only modestly successful. Research papers dominate (i.e., between 86% and 98% of accepted papers). Vision and Experience/Application papers are increasing, but much too slowly. In 1996 and 2000, the acceptance rates for Experience/Application papers far exceeded those for Research papers. The submission and acceptance rate for Vision papers is unacceptably low. Since categories have not had the desired effect, the Broadening Strategy was introduced for VLDB2000.

## 1.3 The Broadening Strategy

The strategy attempted to encourage Broadening by soliciting papers that were (1) on a broader range of topics than those considered by previous database conferences; (2) on riskier and more novel challenges, as opposed to incremental improvements on existing results; (3) from a broader range of contributors (e.g., from across the spectrum of developing and deploying database technology and from those outside the field who pose new requirements and challenges); and (4) in novel formats such as reports on case studies, systems development and testing, and product evaluations relative to new application requirements.

A VLDB submission was considered to contribute to broadening the database field if it addressed issues beyond conventional database topics and technology. It must contribute to expanding database technology or methods beyond conventional databases and applications to the full scope of data management—its applicability, its challenges, and its future directions. The program committee evaluated Broadening on a three-point scale.

- **Strong**: Papers that produce new, substantial results related to issues that clearly contribute to Broadening data management beyond core topics (e.g., address new, advanced application challenges or Broadening issues such as the impacts of data management on new applications or business processes, or vice versa).

- **Modest**: Papers that explicitly address and contribute to a Broadening topic or issue or apply exciting or new solutions to a topic or issue that is beyond core data management.

- **Little or none**: Applies to most VLDB papers in the past, which have generally dealt with core data management technologies or topics. Papers may mention or reference applications requirements or contexts or Broadening issues but not contribute to the Broadening objectives, as defined for VLDB2000.

The Broadening Strategy objectives were that (1) 30% of VLDB2000 papers, 50% of keynotes and demos, and 67% of panels and industrial sessions contribute to Broadening; (2) the quality of those contributions be comparable to the standards set by previous VLDBs; and (3) the database community (e.g., VLDB attendees and subsequent readers) be encouraged to expand the scope of the work to include all relevant aspects of data. The objective of increasing the accepted Broadening papers from between 2% and 19% to 30% was not dramatic. The strategy was defined to the community in calls for papers, in announcements in *DBWorld,* and in a document [Bro00-1] that defined the Broadening Strategy, its objectives, and its implementation, including examples of Broadening contributions in past VLDBs (1996–1999). A VLDB first was to publish the paper review form and the instructions to reviewers.

The strategy was initially resisted by those who, although they agreed with the objectives, felt that they did not understand Broadening or its implementation. Quality was a typical concern. Research methodologies for conventional database topics are well established. This leads to high-quality standards for papers on those topics. Research methods and standards for Broadening papers, those that go beyond conventional topics, are much less settled. This leads to novelty and innovation and to risk due to a lack of adequate quality measures. The VLDB Endowment unanimously accepted this risk in order to broaden the database field, at least in VLDB conferences. However, program committees tend to be very conservative (see the Appendix). In the past, papers submitted on advanced topics were rejected because they did not match the quality established by papers on core database technology. To ensure the acceptance of contributions that contribute to Broadening and to maintain the quality of core papers, quotas were established. At least as many core papers were to be accepted as in the past, while at least 20 Broadening papers were to be accepted. This required adding a fourth parallel session to the conference.

## 1.4  Broadening Strategy Results

An informal evaluation of contributions in recent VLDB conferences (see the Appendix) indicated that prior to VLDB2000, few research papers contributed to Broadening, (i.e., from 2% in 1998 to 19% in 1997). Other sessions contributed more (i.e., from a range of 25%–83% in 1995 to a range of 35%–100% in 1998). After Broadening was defined, encouraged, and incorporated into the VLDB2000 submission and review processes [Bro00-1], the program committees evaluated 78% of submitted papers and 89% of the accepted papers as contributing to Broadening. All other sessions increased the Broadening range to 56%–100%. The acceptance rate for Broadening papers (17.3%) was more

than double that for non-Broadening papers (7.7%). The quality of these papers was on par with or exceeded that of core papers. In fact, the papers with the highest overall scores also had the highest Broadening scores. Moreover, there was no shortage of Broadening papers to fill the broadening quota—something that was initially a concern. Indeed, the Broadening quotas were exceeded in part by strong core papers that included Broadening content.

### 1.5 Future Directions

Two Broadening Strategy objectives were achieved, while the third is an ongoing challenge. It was a very successful step. The ultimate success of the Broadening Strategy will be when the scope of the database field is broadened to encompass all data-related topics in all relevant contexts and when database work is expressed with adequate context—applications, technical, business, policy, political, etc. This will take time. Success will require that all participants—contributors, program committee members, and chairs—share a common understanding of Broadening and its objectives. Contributors must plan, execute, and report their work to fit categories and to contribute to Broadening. Reviewers and program committee chairs must understand and apply the appropriate criteria consistently in evaluating papers and be willing to accept innovations related to the strategies over research papers on core technology. This was not the case for VLDB2000 and is not yet the case in the database field.

What can the database community do to broaden the database field to its full scope and to take its proper role in developing the next generation of computing? SIGMOD has recently adopted a strategy with objectives similar to VLDB's Broadening Strategy. The purpose of this panel is to provide an open forum to discuss these challenges and to identify effective directions for future VLDB conferences.

### 1.6 Grand Challenges

To leap beyond conventional data management requires a depth of understanding of specific domains before the solutions can be generalized. Hence, researchers should choose an application domain within which to investigate new challenging data management requirements. Biodiversity is an ideal domain in which database researchers, in cooperation with biodiversity experts, could contribute to good computer science and significantly contribute to improving the world for all living creatures. Such multidisciplinary work requires significant time and effort to understand the domain requirements and the potential that data management could bring. Biodiversity and biodiversity informatics were chosen as themes of VLDB2000 to illustrate the Broadening Strategy. Biodiversity involves a worldwide network of people, computers, and information bases that are vastly more effective used cooperatively than separately. The Biodiversity keynote by Dr. Ebbe Nielsen, the Biodiversity Domain Session, and the Applications Industrial Session pose relevant challenges to the database community.

Over its 50-year history, computer science has produced an amazingly rich and powerful set of general-purpose tools. As general-purpose tools, they are somewhat sterile. It may now be time for computer scientists to apply these tools in specific domains to attempt to address the Grand Challenges of Man that arise in those domains. Computer science today is much like mathematics at the turn of the century. Advances in mathematics paved the way for solving major problems in physics, chemistry, astrophysics, engineering, pharmaceuticals, etc. Computing is now in position to enable progress toward solutions to the Grand Challenges of Man as long as the relevant domains are fully understood.

## 2. References

[Bro00-1] Brodie, M.L.: Paper Reviewer Guidance, http://www2.aucegypt.edu/vldb2000, February 2000.

# Appendix
## Submission and Acceptance Statistics from Recent VLDB Conferences

| Submitted Papers | Research | Vision | Experience/ Application | Total Over Categories | Little or No Broadening | Modest Broadening | Strong Broadening | Total Over Broadening Score | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|---|---|---|
| Americas | 156 | 11 | 17 | **184** | 41 | 85 | 58 | 184 | 143 | 78% |
| Europe, Africa, and the Middle East (two research papers withdrawn) | 94 | 5 | 14 | **113** | 27 | 58 | 26 | 111 | 84 | 76% |
| Far East, Asia, and Australia | 51 | 0 | 3 | **54** | 10 | 32 | 12 | 54 | 44 | 81% |
| **Total** | **301** | **16** | **34** | 351 | **78** | **175** | **96** | 349 | 271 | 78% |
| **Accepted Papers** | | | | | | | | | | |
| Americas | 22 | 1 | 4 | **27** | 4 | 12 | 11 | 27 | 23 | 85% |
| Europe, Africa, and the Middle East | 16 | 0 | 2 | **18** | 2 | 7 | 9 | 18 | 16 | 89% |
| Far East, Asia, and Australia | 8 | 0 | 0 | **8** | 0 | 3 | 5 | 8 | 8 | 100% |
| **Total** | **46** | **1** | **6** | 53 | **6** | **22** | **25** | **53** | 47 | **89%** |
| **Paper Acceptance Rate** | | | | | | | | Average Broadening Score | Acceptance Rates | |
| Americas | 4.10% | 9.09% | 23.53% | 14.67% | 9.76% | 14.12% | 18.97% | 1.77 | 16.08% | |
| Europe, Africa, and the Middle East | 7.02% | 0.00% | 14.29% | 15.93% | 7.41% | 12.07% | 34.62% | 1.85 | 19.05% | |
| Far East, Asia, and Australia | 5.69% | 0.00% | 0.00% | 14.81% | 0.00% | 9.38% | 41.67% | 1.85 | 18.18% | |
| **Total** | **.28%** | **6.25%** | **17.65%** | **15.10%** | **7.69%** | **12.57%** | **26.04%** | **1.81** | **17.34%** | |

Figure 2000-1: VLDB2000 Paper Submission and Acceptance by Category and Broadening

| VLDB Sessions | Submitted | Solicited | Total | Target / Accepted | Acceptance Rate | Broadening Score | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|---|
| Papers | 349 | 0 | 349 | 53 | 15.19% | 1.81 | 47 | 89% |
| Demonstrations | 33 | 0 | 33 | 16 | 48% | 1.81 | 9 | 56% |
| Panels | 3 | 3 | 6 | 3 | 50% | 2.67 | 3 | 100% |
| Tutorials | 13 | 3 | 16 | 5 | 38% | 2.40 | 4 | 80% |
| Industry/Domain Presentations | 6 | 18 | 24 | 18 | 75% | 2.25 | 13 | 72% |
| 10-Year Award | 0 | 1 | 1 | 1 | N/A | 2.00 | 1 | 100% |
| Keynotes | 0 | 6 | 6 | 2 | **N/A** | 2.50 | 2 | 100% |

Figure 2000-2: VLDB2000 Contribution Submission and Acceptance Statistics

| Program Committee Statistics | Americas | Europe, Africa, and the Middle East | Far East, Asia, and Australia | Total |
|---|---|---|---|---|
| PC Size | 44 | 39 | 22 | 105 |
| PC Papers | 43 | 26 | 16 | 85 |
| Reviewer Load (3/Paper) | 13.5 | 9 | 8 | 10 |
| Late Papers Rejected | 1 | 1 | 1 | 3 |
| Submission Problems | 5 | 6 | 0 | 11 |
| PDF Printing Problems | 5% | 2% | 20% | 9% |
| Abstracts Submitted | 230 | 137 | 64 | 431 |
| Papers Submitted | 184 | 111 | 54 | 349 |
| % Abstracts Only | 20% | 19% | 16% | 19% |

Figure 2000-3: VLDB2000 Program Committee Statistics

| Submitted Papers | Research* | Vision* | Experience/ Application* | Total |
|---|---|---|---|---|
| Americas | | | | **210** |
| Europe, Africa, and the Middle East | | | | **116** |
| Far East, Asia, and Australia | | | | **60** |
| **Total** | | | | **386** |
| **Accepted Papers** | | | | |
| Americas | | | | **33** |
| Europe, Africa, and the Middle East | | | | **15** |
| Far East, Asia, and Australia | | | | **8** |
| **Total** | | | | **56** |
| **Acceptance Rates (%)** | | | | |
| Americas | | | | 15.71% |
| Europe, Africa, and the Middle East | | | | 12.93% |
| Far East, Asia, and Australia | | | | 13.33% |
| **Total** | | | | **14.51%** |

*VLDB99 used three categories. The General PC Chair did not provide statistics, feeling that the use of categories was not significant.

Figure 99-1: VLDB99 Paper Submission and Acceptance by Category

| VLDB Program Components | Submitted | Solicited | Total | Accepted | Acceptance Rate | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|
| Papers | 387 | 0 | 387 | 57 | 14.73% | 8 | 14% |
| Demonstrations | 16 | 0 | 16 | 8 | 50% | 2 | 25% |
| Panels | 2 | 1 | 3 | 1 | 33% | 0 | 0% |
| Tutorials (1/2 day) | 6 | 4 | 10 | 5 | 50% | 5 | 100% |
| Industrial Sessions | 0 | 9 | 9 | 9 | 100% | 5 | 56% |
| 10-Year Award | 0 | 1 | 1 | 1 | N/A | 0 | 0% |
| Keynotes | 0 | 2 | 2 | 2 | N/A | 2 | 100% |

Figure 99-2: VLDB99 Contribution Submission and Acceptance Statistics

| Submitted Papers | Research | Vision | Experience/ Application | Total | Industrial Sessions |
|---|---|---|---|---|---|
| Americas/Australia | 154 | 11 | 15 | **180** | 19 |
| Africa/Asia/Europe | 140 | 1 | 7 | **148** | 6 |
| **Total** | **294** | **12** | **22** | **328** | 25 |
| **Accepted Papers** | | | | | |
| Americas/Australia | 27 | 1 | 0 | **28** | 13 |
| Africa/Asia/Europe | 22 | 0 | 1 | **23** | 5 |
| **Total** | **49** | **1** | **1** | **51** | 18 |
| **Acceptance Rates (%)** | | | | | |
| Americas/Australia | 18% | 9.09% | 0.00% | 15.56% | 68.42% |
| Africa/Asia/Europe | 15.71% | 0.00% | 14.29% | 15.54% | 83.33% |
| **Total** | **16.67%** | **8.33%** | **4.55%** | **15.55%** | **72.00%** |

Figure 98-1: VLDB98 Paper Submission and Acceptance by Category

| VLDB Program Components | Submitted | Solicited | Total | Accepted | Acceptance Rate | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|
| Papers | 328 | 0 | 328 | 51 | 15.55% | 1 | 2% |
| Demonstrations | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Panels | 3 | ? | 3 | 2 | 66.67% | 3 | 100% |
| Tutorials (1/2 day) | 26 | 0 | 26 | 7 | 26.92% | 6 | 86% |
| Industrial Sessions | 25 | 0 | 25 | 18 | 72.00% | 6 | 35% |
| 10-Year Award | 0 | 1 | 1 | **1** | N/A | 0 | 0% |
| Keynotes | 0 | 2 | 2 | **2** | N/A | 2 | 100% |

Figure 98-2: VLDB98 Contribution Submission and Acceptance Statistics

| Submitted Papers | Research* | Total |
|---|---|---|
| Americas | 170 | **170** |
| Europe, Africa, and the Middle East | 110 | **110** |
| Far East, Asia, and Australia | 75 | **75** |
| Total | **355** | 355 |
| **Accepted Papers** | | |
| Americas | 29 | **29** |
| Europe, Africa, and the Middle East | 18 | **18** |
| Far East, Asia, and Australia | 6 | **6** |
| Total | **53** | 53 |
| **Acceptance Rates (%)** | | |
| Americas | 17% | 17.06% |
| Europe, Africa and the Middle East | 16.36% | 16.36% |
| Far East, Asia, and Australia | 8.00% | 8.00% |
| Total | **14.93%** | **14.93%** |

*VLDB 97 had Research and Experience/Application categories but received only three Experience/Application papers.

Figure 97-1: VLDB97 Paper Submission and Acceptance by Category

| VLDB Program Components | Submitted | Solicited | Total | Accepted | Acceptance Rate | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|
| Papers | 355 | 0 | 355 | 53 | 14.93% | 5 | 9% |
| Demonstrations | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Panels | 2 | 1 | 3 | 2 | 67% | 1 | 50% |
| Tutorials (1 day) | 23 | 0 | 23 | 6 | 26% | 4 | 67% |
| Industrial Sessions | 20 | 4 | 24 | 12 | 50% | 10 | 83% |
| 10-Year Award | 0 | 1 | 1 | **1** | N/A | 0 | 0% |
| Keynotes | 0 | 2 | 2 | **2** | N/A | 1 | 50% |

Figure 97-2: VLDB97 Contribution Submission and Acceptance Statistics

| Submitted Papers | Research | Experience/ Application | Total |
|---|---|---|---|
| Asia/Australia | 93 | 0 | **93** |
| Americas | 143 | 9 | **152** |
| Europe | 104 | 0 | **104** |
| Total | **340** | **9** | **349** |
| **Accepted Papers** | | | |
| Asia/Australia | 10 | 0 | **10** |
| Americas | 18 | 4 | **22** |
| Europe | 16 | 0 | **16** |
| Total | **44** | **4** | **48** |
| **Acceptance Rates (%)** | | | |
| Asia/Australia | 10.8% | 0.0% | 10.8% |
| Americas | 12.6% | 44.4% | 14.5% |
| Europe | 15.4% | 0.0% | 15.4% |
| Total | **12.9%** | **44.4%** | **13.8%** |

Figure 96-1: VLDB96 Paper Submission and Acceptance by Category

| VLDB Program Components | Submitted | Solicited | Total | Accepted | Acceptance Rate | Modest or Strong Broadening Score | % Modest or Strong Broadening Score |
|---|---|---|---|---|---|---|---|
| Papers (Research, Experience) | 349 | 0 | 349 | 48 | 13.8% | 9 | 19% |
| Demonstrations | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Panels | 4 | 2 | 6 | 3 | 50% | 1 | 33% |
| Tutorials | 31 | 0 | 31 | 7 | 23% | 5 | 71% |
| Industrial Sessions | 0 | 6 | 6 | 6 | 100% | 6 | 29% |
| 10-Year Award | N/A | 1 | 1 | **1** | N/A | 0 | 0% |
| Keynotes | N/A | 2 | 2 | **2** | N/A | 2 | 100% |

Figure 96-2: VLDB96 Contribution Submission and Acceptance Statistics

| Submitted Papers | Research |
|---|---|
| Asia/Australia | 49 |
| Americas | 146 |
| Europe | 102 |
| Total | 297 |
| **Accepted Papers** | |
| Asia/Australia | 9 |
| Americas | 25 |
| Europe | 18 |
| Total | 52 |
| **Acceptance Rates (%)** | |
| Asia/Australia | 18.37% |
| Americas | 17.12% |
| Europe | 17.65% |
| Total | 17.51% |

Figure 95-1: VLDB95 Paper Submission and Acceptance Statistics

| VLDB Program Components | Solicited | Submitted | Accepted | Acceptance Rate |
|---|---|---|---|---|
| Papers | 0 | 297 | 52 | 18% |
| Demonstrations | N/A | N/A | N/A | N/A |
| Panels | 2 | 4 | 3 | 25% |
| Tutorials | ? | ? | 7 | ? |
| Industry/Application Papers | 3+ | 3+ | 4 | 67% + |
| 10-Year Award | 1 | 0 | 1 | N/A |
| Keynotes/Invited Talks | 3 | 0 | 3 | N/A |
| Solicited Vendor Papers | 12 | 0 | 10 | 83% |

Figure 95-2: VLDB95 Contribution Acceptance Statistics