Building Investment Decision Support (BIDS)

Cost-Benefit Tool to Promote High Performance Components, Flexible Infrastructures and Systems Integration for Sustainable Commercial Buildings and Productive Organizations

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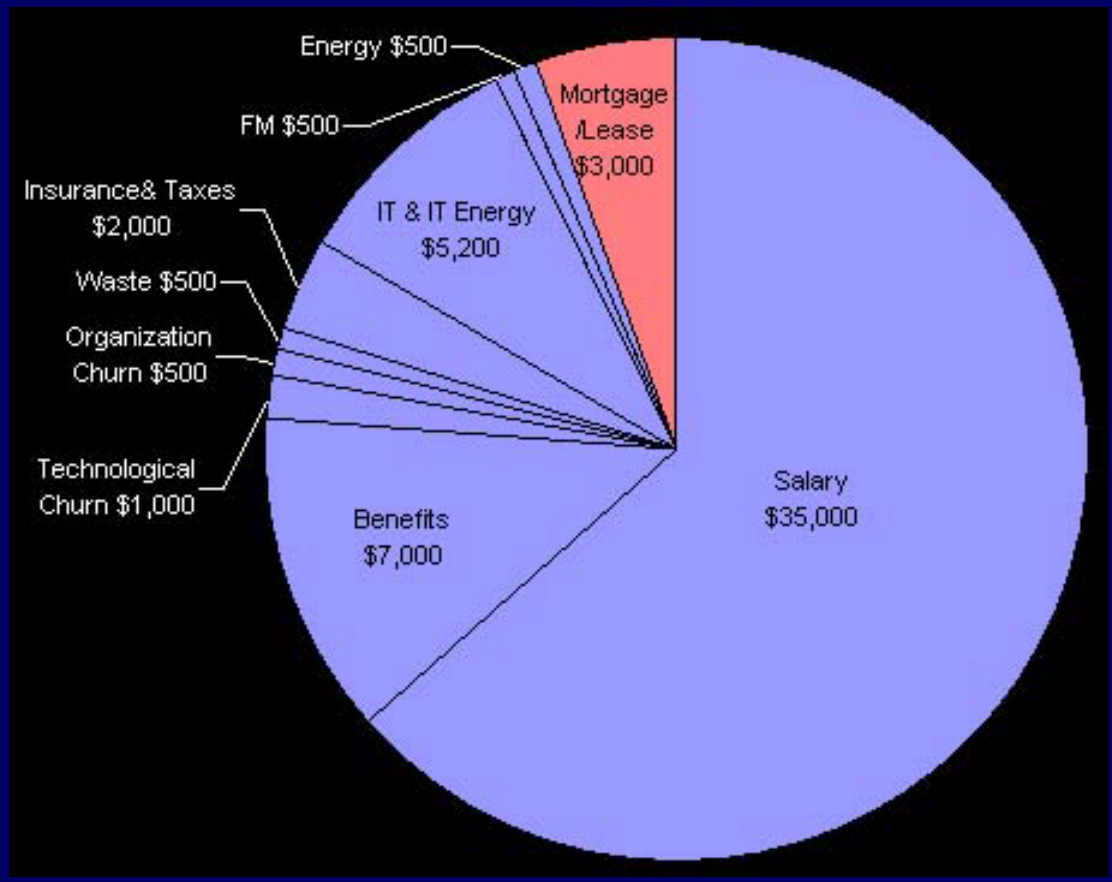
Do you know that investments in high quality workplace have a higher potential ROIs than conventional high-yield corporate investments?

Renewable Buildings are Mission critical

Sustainable Buildings support Human Capital

Life Cycle vs First Cost

Buildings are a small cost with major impact

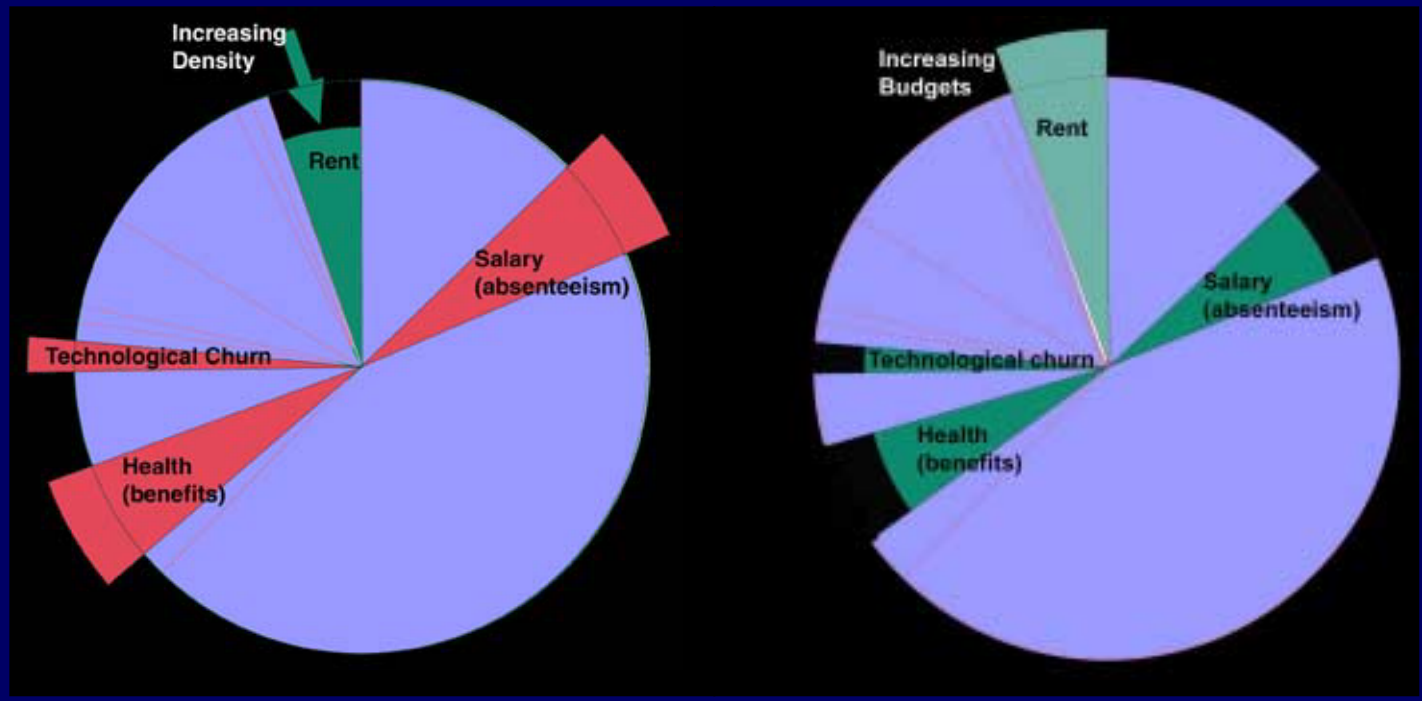


Various Cost Areas

Life Cycle vs First Cost

Buildings are a small cost with major impact

e.g. **Squeezing** facilities budgets vs **Strategically Increasing** facilities budgets



Conceptual Framework

- BIDS™ EVA® Matrix -

Design Options
- Air / Ventilation Control
- Thermal Control
- Lighting Control
- Network Access
- Privacy and Interaction
- Ergonomics
- Access/Nat'l Envm't

X

Benefits
- First Cost
- Operation/ Energy
- Individual Productivity
- Organizational Productivity
- Health
- Attraction/ Retention
- Organizational Churn
- Technological Churn
- Tax/ Litigation/ Insurance
- Salvage/ Waste

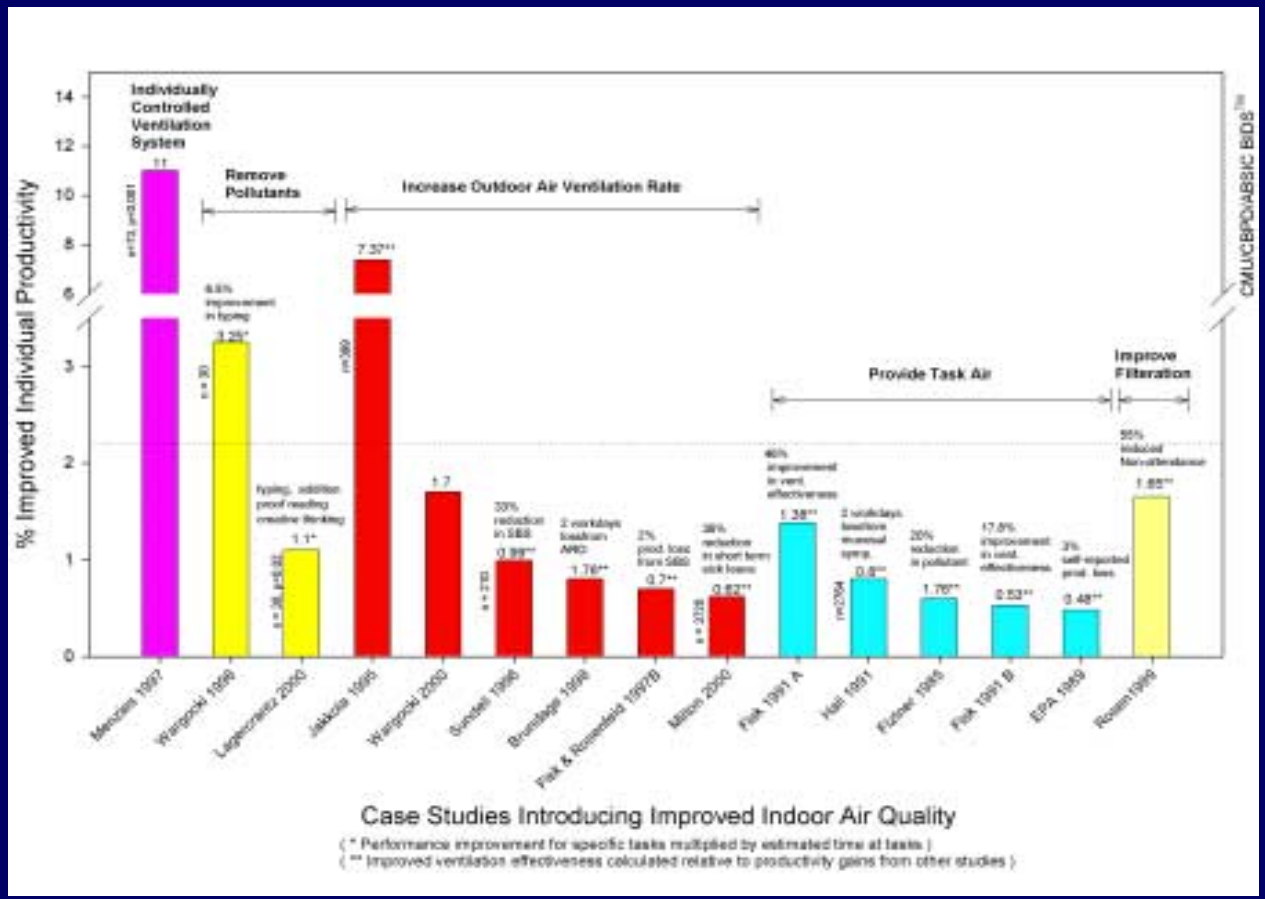
X

Scenarios
- Baseline
- Globalization
- Collaboration
- Technological dynamics
- Organizational dynamics
- Gold-collar orientation
- Environmental agendas
- Merger/ Divestment
- Federal Government

BIDS™ Overview

- 130+ case studies linking environments to life cycle
  - 20 air quality – ventilation control
  - 11 temperature control
  - 25 lighting control
  - 4 flexible connectivity
  - 24 privacy and interaction
  - 20 ergonomics
  - 19 access to natural environment
  - *15 whole building*
- 1000 abstracts, 100 papers, 1 case study
  - Refereed journals, books, research reports, Ph.D. dissertations
  - Laboratory, simulation, field studies, meta-analyses
  - web sites, popular press need verification
- Also building baseline data sets
  - Churn costs
  - Energy costs per building type and climate
  - Attraction-Retention rates, costs
  - Health costs
  - Water, waste, emissions costs

Improved Indoor Air Quality Increases Individual Productivity



Ventilation Strategies

- Design mixed-mode with natural ventilation
- Decouple thermal and ventilation
- Provide task air
- Increase outdoor air ventilation rate
- Reduce pollutants
- Install innovative controls

15 international case studies demonstrate that ventilation strategies increase individual productivity between 0.48-11%.

6 studies demonstrate 0.48-11% productivity gains with the provision of task air
5 studies demonstrate 0.62-7.4% productivity gains with the provision of increased outside air rates
3 studies demonstrate 1.1-3.25% productivity gains with the removal of primary pollutants

Guideline: provide task air for thermal and air quality

Personal Environmental Module

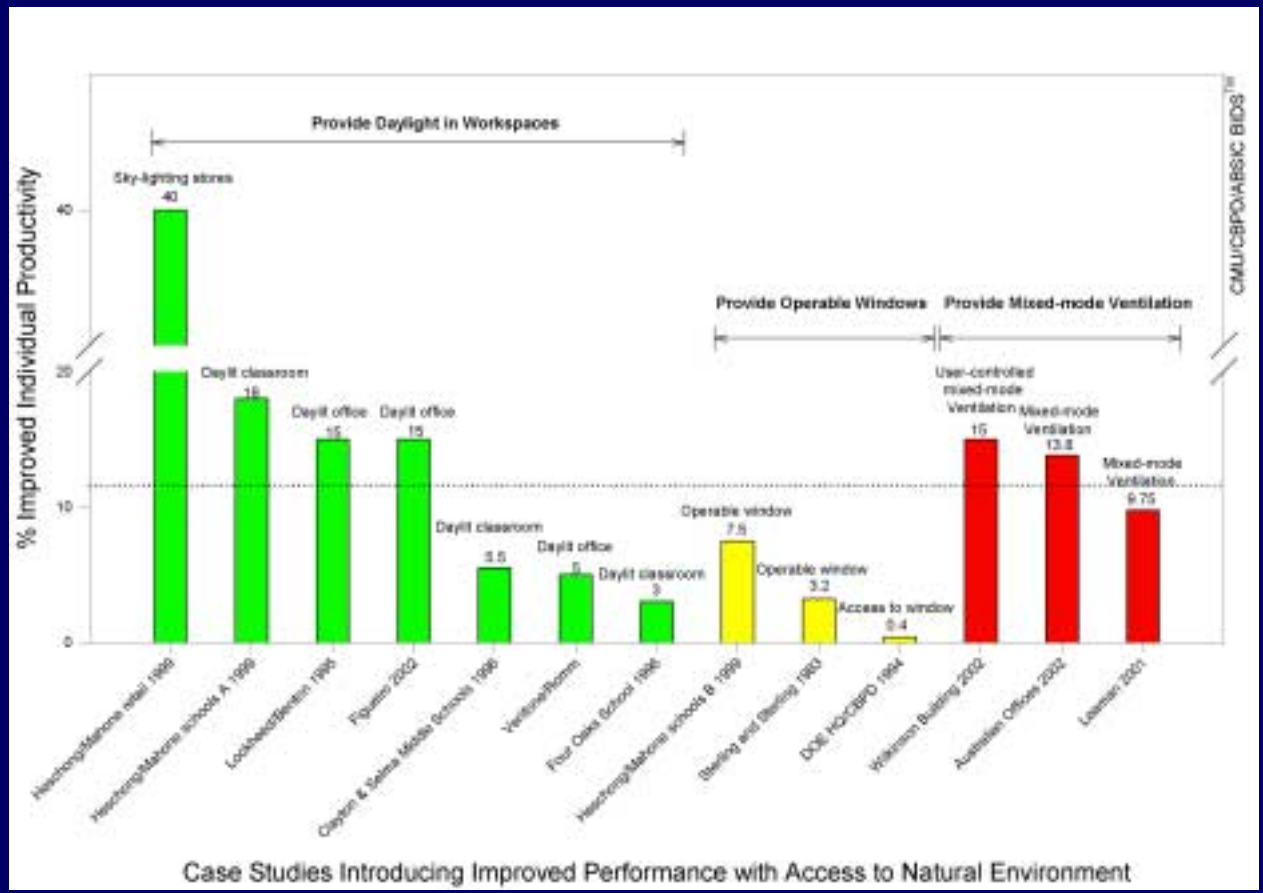
Johnson Controls

Floor-Based Air Diffuser - Tate

Floor-Based VAV Box- Tate

Climadesk™

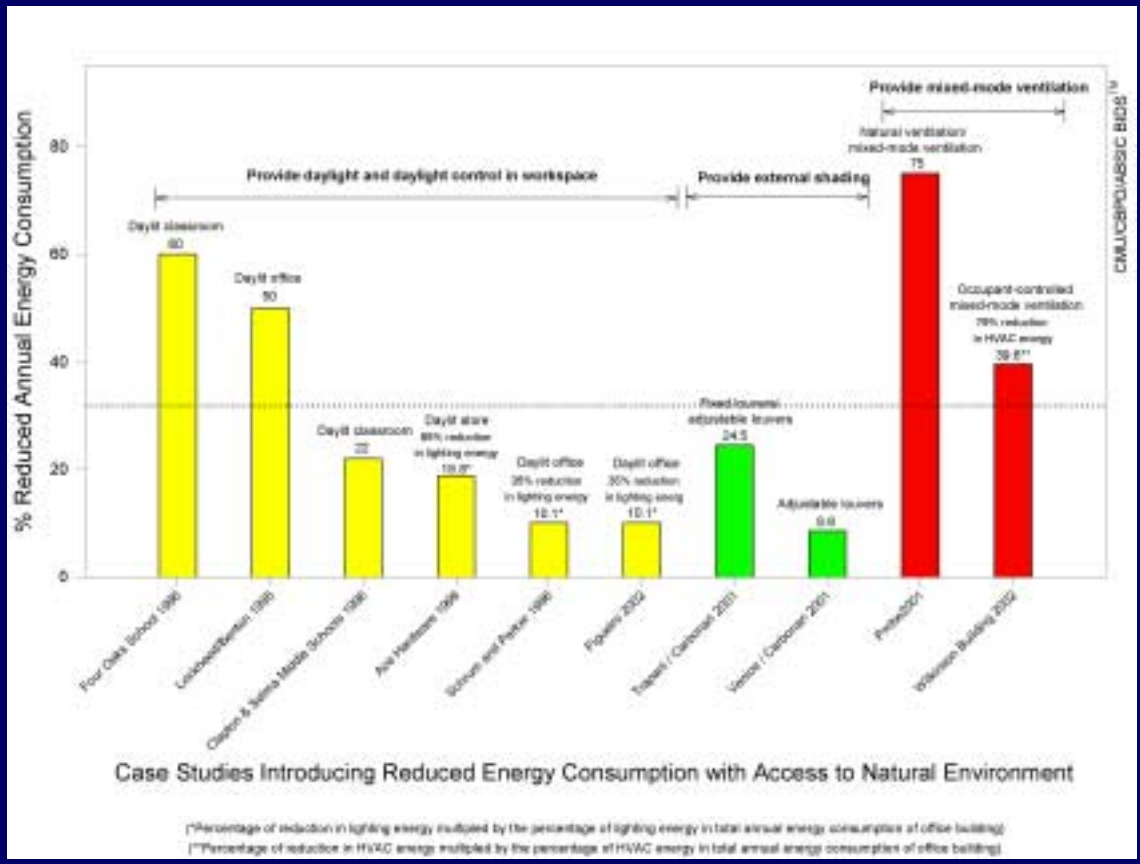
Access to the Natural Environment Increases Individual Productivity



13 international case studies demonstrate that access to natural environment increases individual productivity between 0.4-18%.

7 studies demonstrate 3-18% productivity gains with the introduction of daylight in the workplace
6 studies demonstrate 0.4-15% productivity gains with the addition of operable windows
10-15% productivity gains are achieved in mixed-mode buildings

Access to the Natural Environment Reduces Energy Use

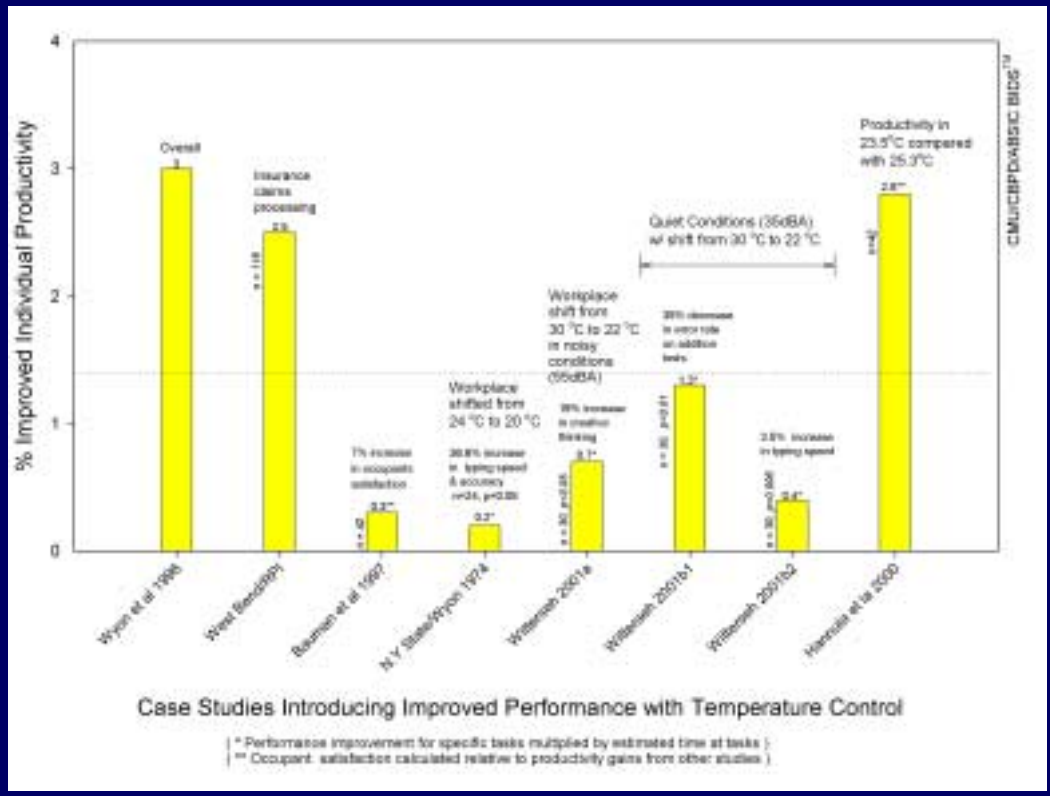


10 international case studies demonstrate that access to natural environment reduces annual energy loads by 8.6-75%.

8 studies demonstrate 8.6-60% reductions in annual lighting energy consumption with effectively designed daylighting and daylight control

2 studies demonstrate 39.6-75% reductions in annual HVAC energy consumption with mixed-mode HVAC

Temperature Control Increases Productivity and Reduces Energy Use

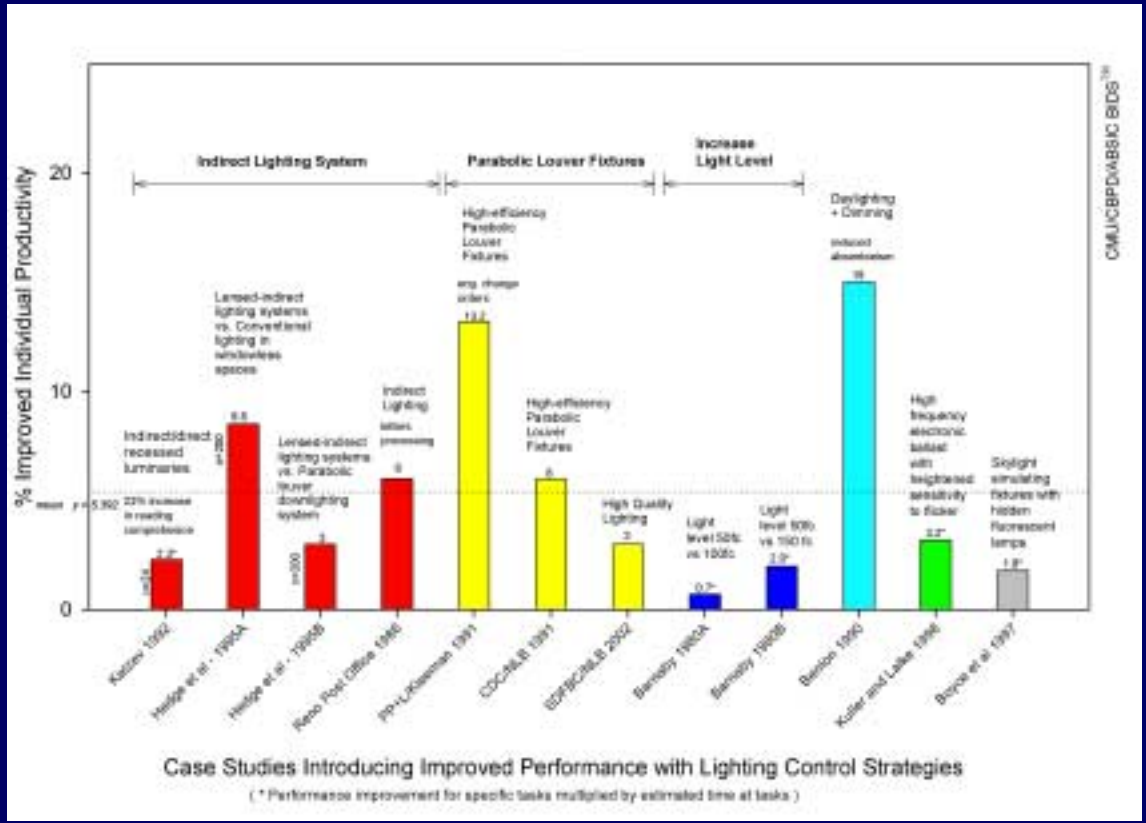


8 international case studies demonstrate that providing individual temperature control for each worker increases individual productivity by 0.2-3%.

1 study demonstrates that individual temperature control combined with responsive central systems can also yield energy savings of 43%

1 simulation study identified a 14% reduction in HVAC energy use with smaller HVAC zone sizes, occupancy sensors and broadband set points

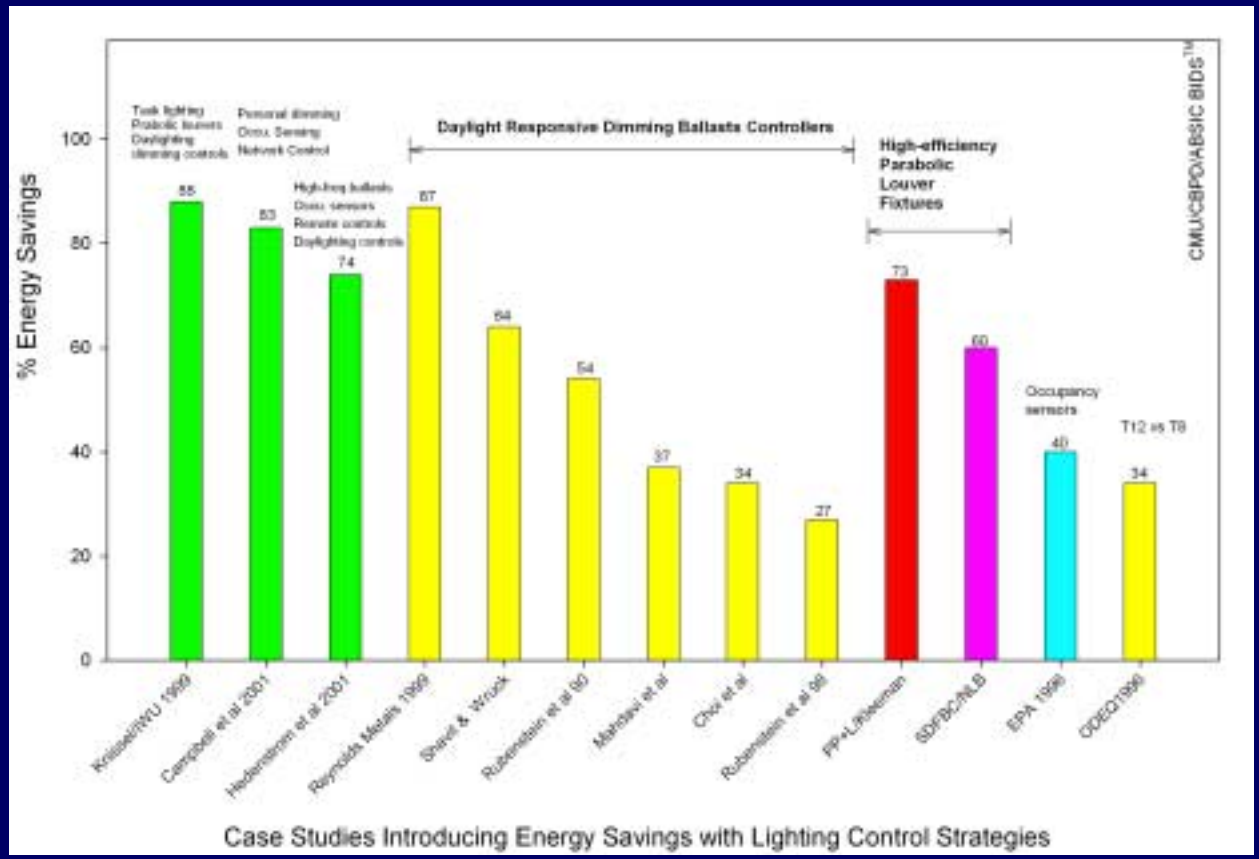
Lighting System Quality Increases Individual Productivity



12 international case studies demonstrate that improved lighting design increases individual productivity between 0.7-23%.

4 studies demonstrate 3-23% productivity gains with the introduction of indirect-direct lighting systems
4 studies demonstrate 3-13.2% productivity gains with the higher quality fixtures
4 studies demonstrate 0.7-2% productivity gains with the the contributions of higher lighting levels and daylight simulating fixtures

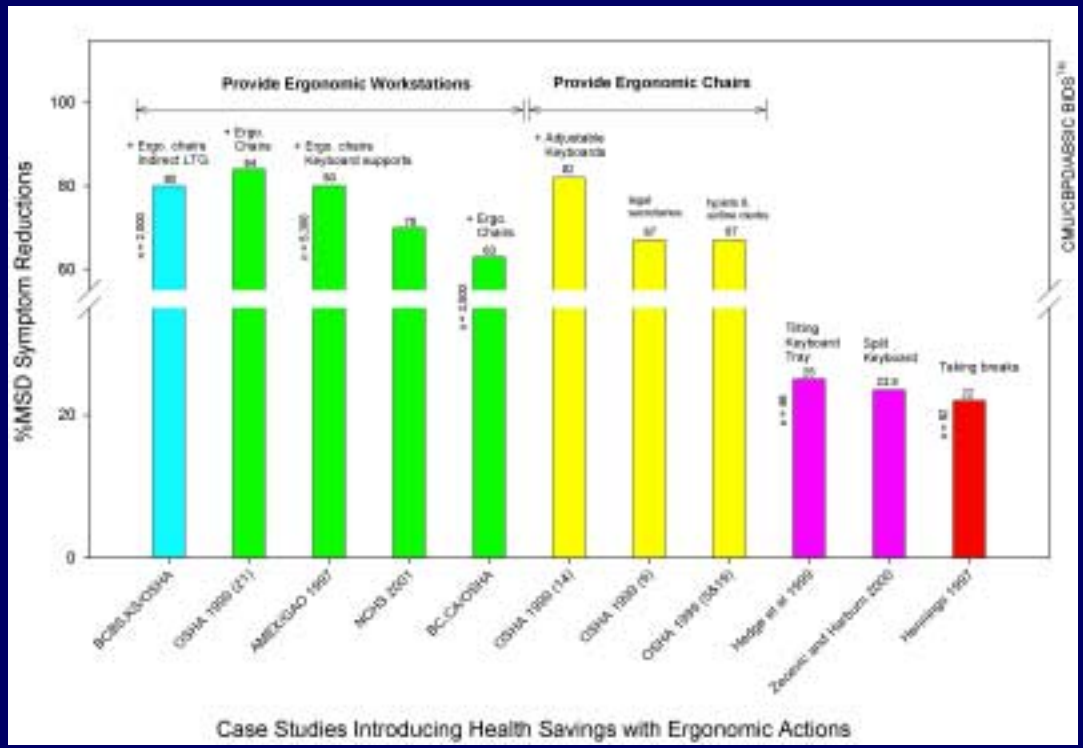
Lighting System Quality Reduces Energy Use



13 international case studies demonstrate that improved lighting design reduces annual energy loads by 27-88%.

6 studies demonstrate 27-87% improved lighting design decisions
4 studies identify 40-88% energy savings through innovative control systems
3 studies illustrate 34-73% energy savings from higher quality fixtures

Ergonomic Quality of the Workplace Reduces Health Costs



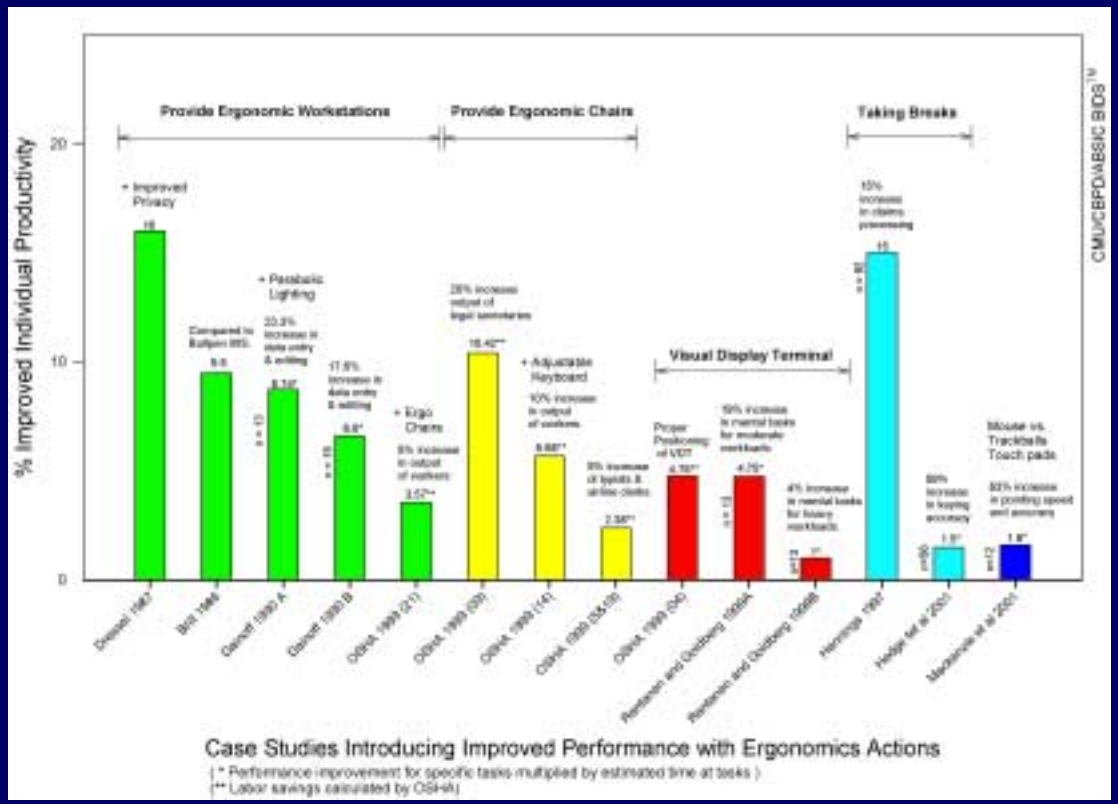
11 international case studies demonstrate that improved ergonomic furniture reduces MSD symptoms by 22-84%.

5 studies demonstrate 63-84% MSD symptom reductions with the introduction of comprehensive ergonomic workstations

3 studies illustrate 67-82% MSD symptom reductions with the introduction of ergonomic chairs alone

3 studies identify 22-25% MSD symptom reductions through introduction of articulated keyboards, breaks and exercise

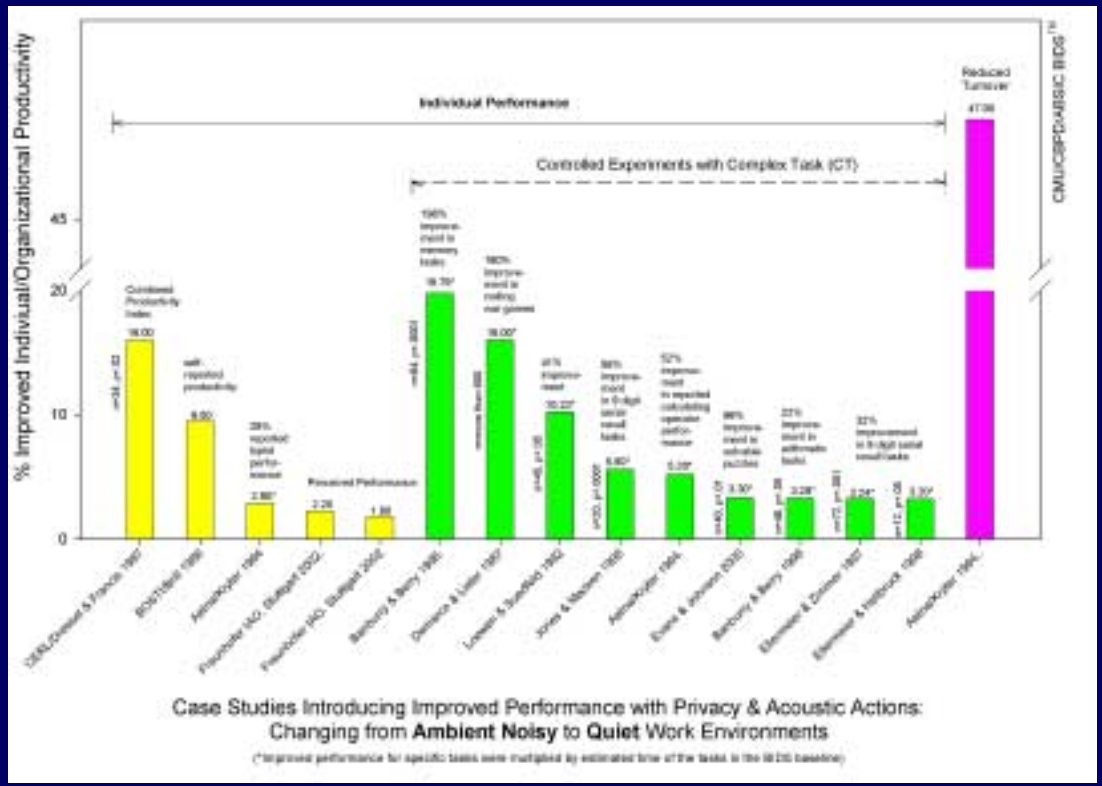
Ergonomic Quality of the Workplace Increases Individual Productivity



14 international case studies demonstrate that improved ergonomic furniture increases individual productivity between 4-63%.

4 studies demonstrate 6.6-16% improved productivity with the introduction of comprehensive ergonomic workstations
3 studies demonstrate 2.4-10.4% increased output with the introduction of ergonomic chairs
4 studies identify 1-4.8% productivity improvements through the improvement of video display terminals and ‘mousing’ devices on the desktop
2 studies demonstrate the importance of breaks and exercise to 1.5-15% of an individual’s productive output

Acoustic Control Increases Individual Productivity



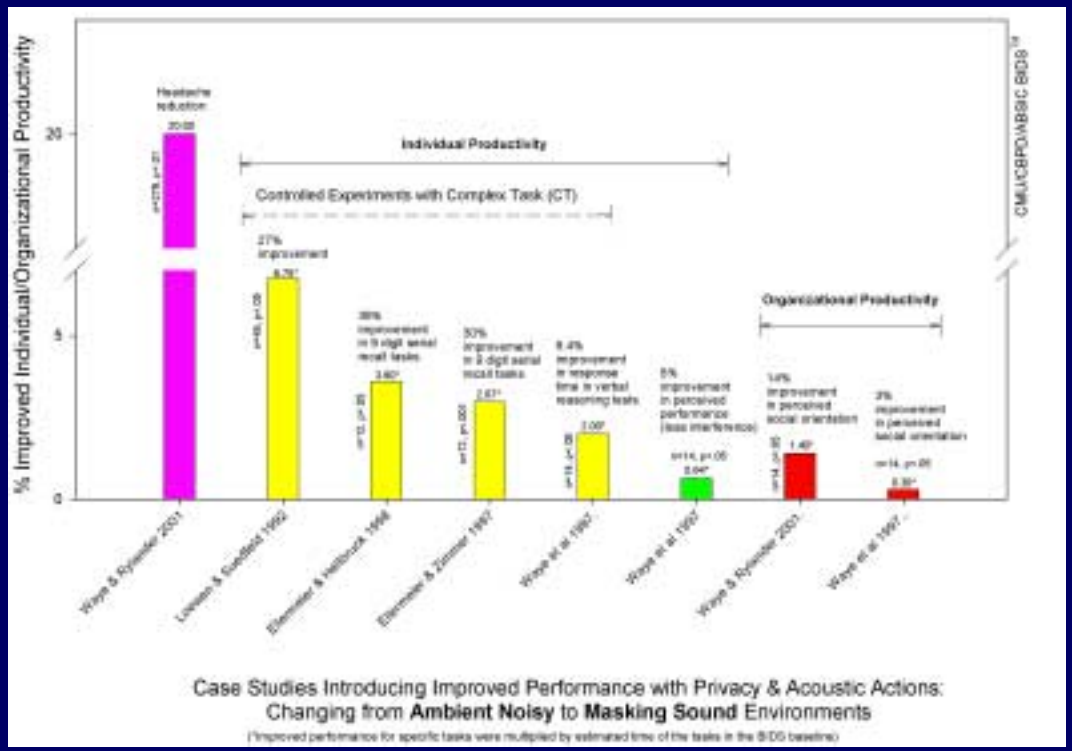
15 case studies illustrate the importance of working quiet, typically with closed offices, for individual performance at complex tasks and self reported productivity.

9 studies demonstrate that individual performance at complex tasks is 3.2-19.8% higher in quiet environments than open offices without sound masking systems

5 studies demonstrate that self reported individual productivity in quiet environments is 1.8-16% higher than in open offices with typical open office noise conditions

1 study also demonstrates a 47% decrease in turnover in quiet work environments

Acoustic Control Increases Individual Productivity



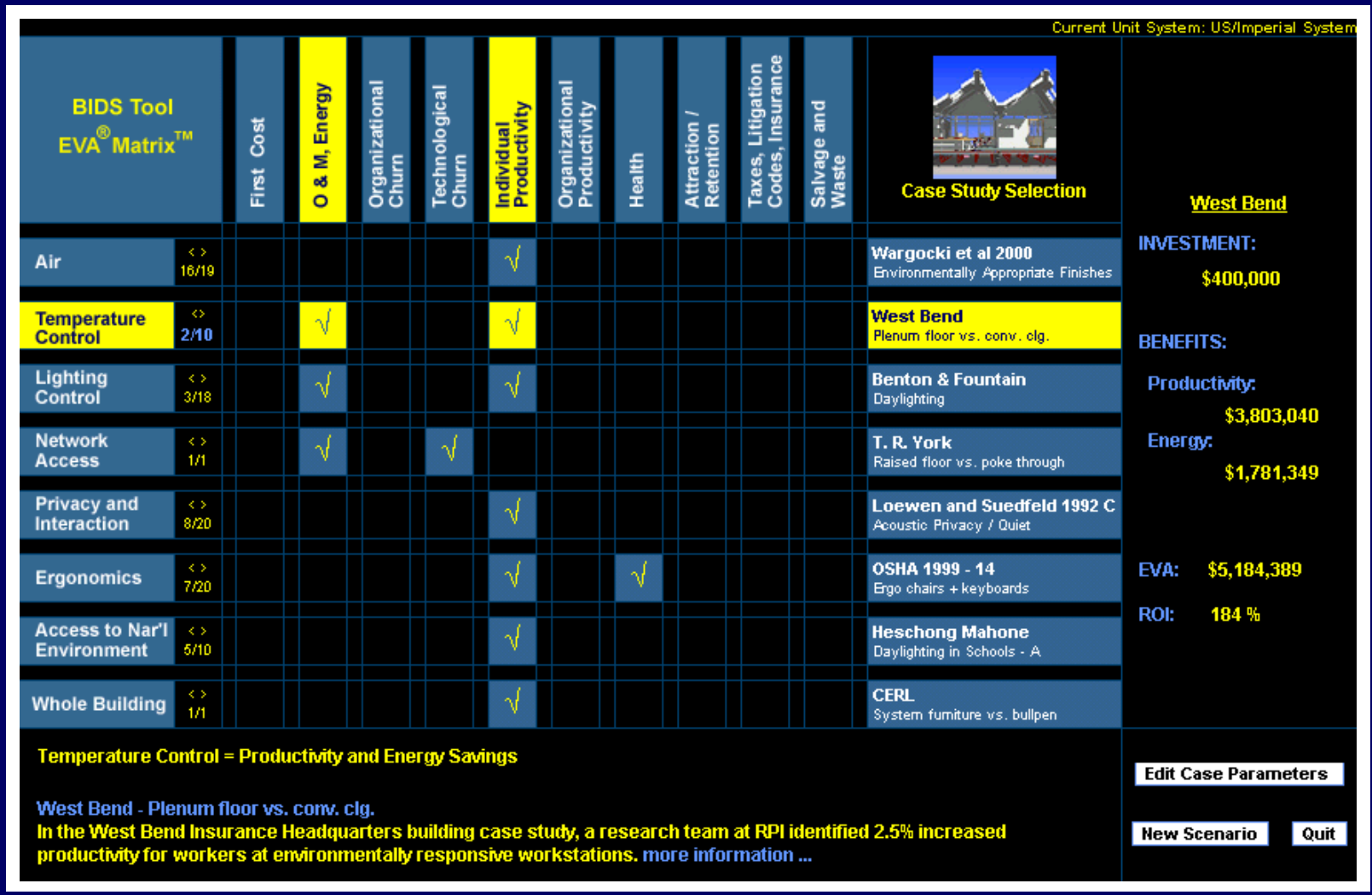
8 case studies illustrate the importance of masking sound in open plan, noisy work environments for individual performance at simple and complex tasks and self reported productivity.

5 studies demonstrate that individual performance at complex tasks is 0.64-6.75% higher in noisy, open offices with sound masking systems as compared to open plan offices without sound masking

1 study indicates that introducing sound masking in noisy, open plan offices can result in a 20% reduction in headaches, with measurable cost-benefits for the organization

2 studies demonstrate that eliminating low frequency mechanical noise (not an effective masking sound) improves perceived social orientation 3-14% which is key to effective collaboration.

BIDS Interface



BIDS Interface

BIDS On Web

Get an overview of the BIDS tool at:

http://nodem.pc.cc.cmu.edu/bidstrial/