2003 School of Engineering Review
18 Month Implementation Report

Overview
The 2003 review of the School of Engineering was a watershed for the School. The review report contained many commendations for the School which were highlighted by then Head of School, Professor John Simmons, in his initial response to the review report. These commendations were a reward for many excellent things happening in the school.

The review report also made 15 recommendations, all of which were supported by the school. The most far reaching recommendations related to the school budget difficulties, research in some areas of the school, and the school’s relationships with centres and institutes.

The most dramatic direct outcome of the review was the school restructure in 2004. During this restructure, there were 12 general staff and 7 academic staff redundancies. During the restructuring process, the review recommendations were used explicitly to guide the planning and justify the restructuring outcomes. The faculty and school, particularly the then Head of School, John Simmons, have received wide praise for the way in which this restructuring was carried out. Combined with an 11% increase in income for 2005 over 2004, the reduction in salary costs from restructuring has helped us achieve a dramatic turn around a $1.1 million single year deficit in 2004 to a $200,000 single year surplus in 2005.

2005 is an exciting time for the School of Engineering. In the last three years we have achieved dramatic improvements in research and teaching KPIs and now have our budget under control. A number of strategic changes have been fully or partly implemented and we look to the future with confidence. While some of these improvements are attributable to long standing policies, hard work and some to luck, a significant proportion of our success has come directly from the review process, and the response of the school, faculty and university to the review recommendations.

Below, the School’s implementation of each review recommendation is described in turn. Firstly, however we restate the commendations from the review committee as a reference point. It is important that the implementation of the review recommendations does not negatively impact on the many areas of excellent performance recognized by the review committee.
Commendations of the Review Committee

- The School of Engineering has internationally competitive strengths in numerous areas.
- The Committee endorses the concept of “One School” proposed by the School of Engineering.
- The School should build on its excellence in teaching and learning by . . . . . .
- The School has made a long standing commitment to income generation by attracting full fee paying students largely from South East Asia.
- The existing in-division strength in mineral processing (pyrometallurgy) is of high standing.
- The appointment of Professor Mike Hood as Professor of Mining Engineering has been a very positive step . . . . .
- The School’s ambition to be the Australian leader in engineering education is commended. Current and planned initiatives (Catalyst Centre, Undergraduate Site Learning program and Project Centred Learning) support this objective.
- Overall, undergraduate students expressed strong satisfaction with the engineering programs and this is reflected in the course evaluation data supplied.
- The School attracts students of high calibre . . . . .
- Overall, postgraduate students reported positively on their experiences.
- Overall, research performance in the School is strong with many areas of high international standing.
- The chemical engineering discipline is outstanding nationally and internationally . . . . . research performance is very high by all measures . . . . .
- Materials engineering . . . . . are also outstanding . . . . .
- Environmental engineering as a new grouping are performing well by all measures of research output.
- The mechanical engineering discipline has a unique strength in Hypersonics, an area in which it has become a world leader.
- Smart machines is a growing area showing considerable potential.
- Civil engineering is a mature discipline which, by conventional research measures, is performing reasonably well.
- The committee wishes to commend the efforts of the School in internationalisation in teaching and learning and research linkages.
- The School . . . . has been a pioneer in attracting international undergraduates . . . . .
- International links in research are excellent.
**Review Recommendations and Responses**

**One School**

**Recommendation 1**

*The Review Committee recommends the abolition of the current divisional structure and that the School operate as a single unit with a single Head of Engineering. The Review Committee recommends that the removal of the divisional structure be implemented by January 2005.*

**Recommendation 2**

*The Review Committee recommends that the single new School structure be managed through an Executive Committee based on functional lines with, for example, representatives for Teaching and Learning, Postgraduate Learning, Research and Strategic Planning. The Review Committee expressly would not wish to see an Executive Committee based around pre-existing divisional groups.*

These recommendations were implemented by January 2004. The school has a single school budget. This budget is formed by the Head of School on advice from the School Executive consisting of the Head of School, School Manager, Chair of the Teaching and Learning Committee, Chair of the Research and Postgraduate Studies Committee and other senior school academic staff. Currently there are 9 members on the school executive which is an appropriate size for a diverse school with 200 academic, research and general staff, 300 RHD students and 2000 coursework students in 8 separate programs.

The school executive is the key decision making forum for major decisions eg. new academic and general staff appointments, budget planning, space allocation, strategic directions. The (non-salary) teaching budget is developed and controlled by the School Teaching and Learning Committee. The (non-salary) research budget is developed and controlled by the School Research and Postgraduate Committee. Approximately 45% of the academic staff are on one of the executive, TLC or RPGC which helps to get broad input in decision making (something that is very difficult in a large, diverse school). Administrative staff are all coordinated at the school level, and organized by function, not discipline.

Discipline based divisions retain primary academic ownership of the teaching programs in the school, and give discipline based identity for students, staff and external constituents as recommended by the review committee.
Finances and Resources

Recommendation 3

The Review Committee recommends that the full implementation of the One School structure be facilitated with the assistance of structural adjustment funding.

In response to this recommendation, the school undertook a major restructuring program in 2004 led by then Head of School, Professor John Simmons. Separation packages associated with the restructure were supported by University structural adjustment funding.

Details of the restructure are included in a series of reports already submitted to the university. Key outcomes of the restructuring were:

- Reduction of academic staff numbers by 7
- Reduction of administrative staff numbers by 3.8
- Reduction of School technical staff and Faculty technical services unit buy back staff by 8.5
- Replacement of the Mineral Process Engineering program by a double major in Chemical and Metallurgical Engineering
- Strategic academic appointments in mechanical and civil engineering
- A $1.3 million turn around in the school budget bottom line within 12 months so that the school now has a stable budget with salary costs at less than 80% of total income.

Recommendation 4

The Review Committee recommends that the costs and incomes associated with all activities be made transparent.

This recommendation was implemented in the 2004 budget structure and transparent costs and income were used extensively as a reference point during the 2004 school restructure. This transparent approach is now used routinely in the school executive in budget and human resource planning. Major new initiatives now require a full business plan before they are approved.

Recommendation 5

The Review Committee recommends that the School pursue new sources of income and increased levels from new and existing sources to address the serious financial position.

We have been very successful in implementing strategies to both increase and diversify our income streams as follows:

Increase existing incomes streams

Compared to 2002 (the data on which the review recommendations were based) in 2004 we had achieved the following:

- Increase in research income of 20% to $17 million
- Increase in RHD completions by 14% to 57. [In 2003, SoE had the highest RHD completion rate in the university by a considerable margin.]
- Increase in RHD EFTSU by 5% to 286.3 EFTSL
- Increase in DETYA publication points by 80% to 198
- Increase in domestic course work EFTSU by 9.3% to 864 EFTSU
- Increase in fee paying international student EFTSU by 11.7% to 213 EFTSU

This increased performance has contributed to an 11% increase in income from government subsidy and fee income. Further increases are expected as student load in 2005 has increased over 2004 figures by about 8% on average.

New income streams
The school has been very successful in gaining externally funded academic staff positions including:
- Renewal of the Thiess Chair of Engineering Education for a further 5 years
- Establishment of the Xstrata Chair of Metallurgical Engineering in 2005 funded for 10 years
- Renewal of the Center for Transport Strategies Centre by the State Government for a further 5 years (money used to continue funding the transport chair).
- Funding from the Minerals Council of Australia to support the new National Mining School
- Three academic positions partly funded through the CRC Mining
- Strategic funding from the vice chancellor to support these and other strategic initiatives
- Two federation fellowships and one QEII fellowship for staff with underlying continuous T&R positions

We are actively pursuing external funding for several other academic positions. In 2006, 25% of school T&R positions will be funded from sources other than our main operating account.

The school has in place a strategy to increase the flow of international fee paying students from relatively new markets in Malaysia, China, India and France. The current focus is on China where we are developing partnerships with four 985 universities which include 2+2 articulations for BE degree, and 3+1+1 articulations leading to ME degree.

The development of coursework masters programs is addressed under recommendation 12.

Relationship between the school and centres

Recommendation 6
The Review Committee recommends that Faculty Centres outside the School, University Centres and Institutes, be properly interfaced with School activities. Faculty Centres that have grown out of the School or the departments that pre-dated the School should be reinstated within the School structure or disbanded.
Recommendation 7

The Review Committee recommends that the University establish no new Faculty centres. Where the establishment of university-wide institutes is justified, that specific actions be taken to ensure that such Institutes are fully complementary to School goals.

These recommendations refer mainly to the faculty and the university and were rejected by standing committee, academic board and senate. However, I would make the following comments:

1. The number of faculty centres in EPSA has, in fact, decreased since 2003.
2. The School has excellent working relationships with the Advanced Wastewater Management Centre (faculty centre) including teaching by AWMC in the core curriculum in Chemical Engineering.
3. The School has excellent working relationships with the two CRCs whose headquarters are within the School – CRC Mining and CAST.
4. The relationship with the SMI and JKMRC is addressed under recommendation 9.
5. The development of the AIBN is having a significant impact on the school. The school will supply 7 group leaders to AIBN (5 T&R staff and two federation fellows). A good model for partnership between the AIBN and EPSA has been developed in which these staff will maintain appointments in SoE and the T&R staff will maintain their current teaching loads. It should be noted that this represents a very substantial investment in the AIBN by SoE and EPSA as we will continue to pay the staff salaries but 50% of the secondary research gains will flow to the AIBN. The investment in salaries and federation fellow support is about $1 million per year by SoE/EPSA. With such a substantial investment, it is important that the cost/benefit of the partnership be reviewed at an appropriate time (at the state of 2008).

Mining and Mineral Processing

Recommendation 8

The Review Committee recommends that the focus for mining and mineral processing at the University of Queensland be firmly placed within the School of Engineering.

This has been achieved. A major joint industry-university task force was established in 2004 to implement change and ensure the sustainability of mining and mineral process engineering education. The key outcomes of this task force, and parallel activities were:

1. The establishment of a double major in Chemical and Metallurgical Engineering to replace the single major in Mineral Process Engineering.
2. The establishment of a Chair in Metallurgical Engineering sponsored for 10 years by Xstrata.
3. The establishment of a National Mining School with collaboration of UQ, UNSW and Curtin Universities with substantial financial support from the Minerals Council of Australia.

The new programs have more than doubled the students undertaking these specialities within one year, and the industry support means the programs are close to sustainable under current funding rules with current negotiations for further industrial support in progress.

Leadership of these programs is firmly with the Head of School, the acting Head of Metallurgical Engineering (Professor Peter Hayes) and the Head of Mining Engineering (Professor Mike Hood). The programs have strong support from the SMI Director (Professor Don McKee) and JK Centre Director (Professor Ben Adair).

**Recommendation 9:**
The Review Committee recommends that the Executive Dean and the Head of School encourage the Director or an equivalent senior staff member of the JKMRC to accept a fractional appointment within the School, along similar lines and with similar intent to the recent appointment in Mining Engineering.

Currently, the JKMRC Director does not hold an appointment in the School. However, active discussions are underway for several joint appointments across SoE and JKMRC. The JK Director has been a member of the implementation working party for the new program in chemical and metallurgical engineering. Recommendations from the recent SMI review are likely to encourage further interaction via having the Head of SoE on the board or management committee of the SMI.

**Recommendation 10:**
The Review Committee recommends that the School explore and develop the potential for substantially increased internationalisation of teaching and learning in the mining and minerals processing area.

2004 was spent establishing new curricula and programs in these areas. From 2005, our focus is moving to internationalization. The main thrust is the establishment of 2+2 or 3+1+1 joint programs with major mining and metallurgy schools in top Chinese universities eg. Central South University and Chonqing University. We are also in discussion with universities in Latin America for joint teaching programs. A student exchange program with the University of Arizona in mining engineering has been established. We expect international student numbers to increase substantially in 2006/7.

**Teaching and Learning**

**Recommendation 11:**
The Review Committee recommends that the School reduce course offerings through a process of rationalisation of the delivery of courses covering similar areas of study in all
degree programs offered by the School. A program to implement greater utilisation of common laboratory facilities should also be considered.

The school has substantially reduced its course offerings by 30%. Most of this reduction has been achieved through rationalisation of small enrolment programs in mining, mineral processing and materials engineering. In each case, the rationalization was part of a substantial and constructive curriculum review and greater use is being made of other existing courses in mechanical, civil and chemical engineering. New laboratories have been developed in mechanics (opened in 2005) and biomedical engineering (to open in 2006). There is substantial sharing of laboratories between (a) civil, environmental and mechanical engineering; (b) chemical, materials, metallurgical and mining engineering.

Our 5 year plan includes the development of major, new shared teaching laboratories for which we will first need to attract major funding from the university and externally. The new laboratories will be part of a larger, desperately needed renewal of the engineering precinct.

**Recommendation 12:**

*The Review Committee recommends that the School establish a suite of modular postgraduate coursework offerings in areas of research strength. Collaboration at the postgraduate level with other groups within and beyond this University should be undertaken.*

This is the recommendation on which we have made least progress. This is partly because of the school was consumed by the restructuring process in 2004. However, we have also struggled to develop course work masters models that make business sense because of the limited domestic demand in engineering for these programs.

In 2005 we have formed a working party to develop a limited suite of programs that (a) match our research strength, and (b) are likely to have a sustainable market of at least 15 students a year in order to break even. At the moment we are vigorously pursuing two areas:

- Postgraduate coursework in civil engineering linked to training requirements and career advancement in Queensland Government departments.
- Masters programs built around cohorts of international students in university partnerships eg. 3+1+1 programs with top flight Chinese universities.

It will take 2 to 3 years to see the full benefits of this investment.

**Recommendation 13:**

*The Review Committee recommends that the Head of School ensure that University policies in relation to the supervision, support and monitoring of research students are followed.*

The School has procedures that comply with university policies on supervision, support and monitoring of research higher degree students. Changes have been made in the
documentation and dissemination of these procedures and greater emphasis has been placed on these issues in research student induction programs to ensure uniform compliance across the whole school. A review of postgraduate administration procedures, including space allocation has been undertaken. A postgraduate sub-committee reporting to the School RPGC has been established to ensure proper student support. Scholarship policy has been reviewed and made consistent across the school.

Unfortunately, a reduction in space allocation from the graduate school has stretched us considerably. We have put in place to renovate existing school space and convert it to postgraduate offices over the next six months.

SoE is proud of its reforms in the first year review process and oral examination of theses which allow the school to lead the university in some areas of RHD student supervision and support.

**Recommendation 14:**
*The Review Committee recommends that the School needs to grow at least two new areas of national research strength in mechanical engineering.*

A MEMS characterisation laboratory is being established in Mechanical Engineering following the strategic recruitment of Dr Han Huang and the UQ/Faculty/SoE funding of $400,000 to establish a laboratory including a nano-indentation tester. The synergy with the existing Mechanical Engineering staff interests and the five Materials Engineering staff relocated to the Mechanical Engineering Building after the School restructure will motivate further expansion in this area.

The Smart Mining Machines group is growing as part of the CRC Mining and Dr Ross McAree will assume the leadership of this group after June 2006. Smart machines, especially as it relates to mining technology and equipment is now a school and faculty strength.

A priority area and emerging strength for the school is clean energy. This is a cross disciplinary research area with substantial input from mechanical engineering. In 2003, we appointed Dr Bo Feng to strengthen the critical mass in the area of combustion and gas cleaning. The new ARC Linkage project on Underground Coal Gasification is an indication of the success of the new energy grouping in Mechanical Engineering of Gurgenci, Klimenko and Feng in the energy area, particularly in combustion and fuels. The school is playing a major role in CLET (the Centre for Low Emissions Technology) with mechanical engineering making significant input. Through CLET and ARC, this group has won over $3million in research funding in the last two years. In 2006, Prof Hal Gurgenci (head of mechanical engineering) will take SSP to develop and major centre proposal on energy policy.
Recommendation 15:

The Review Committee recommends that the School of Engineering build on strong industry links and develop forward-looking innovative research programmes in civil engineering; potential areas could include infrastructure, transport and water.

Water and water resources, particularly in the area of groundwater, coastal and estuarine systems is now a school and faculty strength area. Under the leadership of Assoc Prof David Lockington, our school centre for water studies is now recognized as one of the university's key expertise and critical mass in the broad area of “water”. The strength covers traditional civil engineering hydraulics, groundwater and coastal processes, and the interaction of physical with chemical and biological processes in the systems. Therefore, it is an interdisciplinary strength covering civil, environmental and chemical engineering with close links to the AWMC. The appointment of Dr Tom Baldock, Dr Ling Li and Dr Kate O’Brien in 2002 and 2003 to strengthen this area has now born substantial fruit.

A new Chair of Civil Engineering has been offered to Dr Mark Cassidy. If he accepts, he will bring expertise at the interface between geotechnical and structural engineering which links across two current groups in civil engineering. We are also looking to grow geomechanical research across civil and mining engineering, with a possible new school centre led by Assoc Prof David Williams under consideration.

The transport strategies centre has been renewed for a further five years with external funding and will have a greater research focus in its current term. The grant success and number of RHD students has substantially improved in the last 18 months.