Strategic Data Management to Maximise Performance and Funding  
(So the VC wants a dashboard?)

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1. Introduction

Planning the strategic directions of Universities in today’s fast changing Higher Education environment relies on responsive analysis of performance measures and funding formulae. Closing the gap between strategic plans, operational plans, chosen key performance indicators, complex funding formulae and the vast amounts of underlying data from numerous corporate transactional systems is a challenging task. Senior management are more frequently pressing for strategies, plans and indicators to be tied closely to evidence based data. They require the information to be presented to them quickly and succinctly. It is increasingly important for universities to have a centralised data management strategy in place in order to create a fast, flexible analysis and reporting environment producing good quality data to support timely and accurate strategic decisions. The need is increasing as the competitive nature of world wide higher education develops.

University data is stored, extracted and analysed to produce reports, results and projections for the university, which in turn are used by management for decision making, and by regulatory bodies to determine performance, funding and rankings. The results of internal analysis are compared with strategic goals and directions of the institution. Key corporate decisions can be driven by the results. If the data produces misleading results, decisions can be costly by way of economic damage, lost opportunities, bad publicity and risk to reputation. Therefore data should be treated as a strategic corporate resource. Information is a product that can be actively managed, measured and resourced like any other product of an organisation.

2. Strategic Planning as a management tool

2.1 The Strategic Planning cycle

Strategic planning is well known as a powerful tool for improving an organisation’s long-term performance. However the actual implementation of the plans often proves to be the downfall in execution and results. A joint report from the Cranfield University School of Management and Accenture indicated that planning and budgeting for a typical $1 billion company consumes approximately 25,000 person-days annually yet 80 percent of companies are dissatisfied with their planning and budgeting processes. (1. Coveney, Ganster, Hartlen, King, 2003)

If we review the steps in the basic strategic planning cycle, we will see that data plays an important role.

- Formulate the strategy (using decisions from evidence based data)
- Communicate the strategy
- Analyse scenarios
- Prepare plans and budgets
- Monitor, forecast, report against actual data
- Feedback the results for the next strategy cycle

One of the keys to monitoring the strategic performance of the organisation is reliable, up to date information on key performance indicators and other strategic data.
2.2 Maximising performance

Every organisation uses some key performance indicators to monitor its success or otherwise towards its corporate targets and goals. Many of the indicators are based on data measurements sourced from various transactional systems and other sources. Some indicators may also be subject to reasonably complex business rules defining the scope of the data to be used in the indicator. Unless the entire organisation calculates the same indicators in the same way, a single view of performance against the indicator cannot be achieved. Different versions of the truth can slow decision making responsiveness or the ability to react to new opportunities and market forces. Data that is used to derive critical business information needs to be carefully managed to ensure enterprise-wide integrity. An organisation must establish strong cross business links between those units that are responsible for ownership of the various contributing data. It is also important that the underlying transactional data and other secondary sources can be accessed easily and rapidly through data integration and other techniques to enable further analysis for decision making. Wherever an indicator is derived from more than one measure, it is necessary to be able to drill into all underlying data to see if they are tending to increase, decrease or a combination of both. This is essential to determine the reasons behind changes in performance.

Table 1 illustrates some typical key performance indicators for an Australian University. Even a standard indicator such as equivalent full time student load (EFTSL) needs to be monitored by both load and number of students. EFTSL may show a decrease when in fact more students are being taught if the number of part time students increases dramatically. This information may be important to economic viability.

### Table 1. Typical Key Performance Indicators for an Australian University

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Indicator Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local undergraduate demand</td>
<td>Proportion of top 10% of School Leaver applicants</td>
</tr>
<tr>
<td></td>
<td>First preferences to quota ratio</td>
</tr>
<tr>
<td>International performance</td>
<td>Onshore load (EFTSL)</td>
</tr>
<tr>
<td></td>
<td>Offshore load (EFTSL)</td>
</tr>
<tr>
<td>Perceived teaching quality</td>
<td>% of graduates who are satisfied: Good Teaching, Overall Satisfaction,</td>
</tr>
<tr>
<td></td>
<td>Generic Skills</td>
</tr>
<tr>
<td>Graduate employment outcome</td>
<td>% of graduates in full time employment</td>
</tr>
<tr>
<td>Student retention</td>
<td>Students who continue from the previous year as a proportion of those</td>
</tr>
<tr>
<td></td>
<td>who were enrolled in the previous year excluding those who completed</td>
</tr>
<tr>
<td>Student success</td>
<td>Student load passed as a proportion of Student load attempted excluding</td>
</tr>
<tr>
<td></td>
<td>units of study not completed or withdrawn without penalty</td>
</tr>
<tr>
<td>Research performance</td>
<td>Number of Research Degree Completions</td>
</tr>
<tr>
<td></td>
<td>Research Income ($) per Acad staff FTE (B+)</td>
</tr>
<tr>
<td></td>
<td>Publications per Acad staff FTE</td>
</tr>
<tr>
<td>Income diversification</td>
<td>Percentage of gross income from non-DEST sources</td>
</tr>
<tr>
<td>Student Staff Ratio</td>
<td>Student to Teacher Ratio For Academic Staff with Teaching function</td>
</tr>
<tr>
<td></td>
<td>Includes fractional and full-time staff with ‘teaching and research’ or</td>
</tr>
<tr>
<td></td>
<td>‘teaching only’ function. Does not include FTE for staff employed ‘directly’</td>
</tr>
<tr>
<td></td>
<td>by universities (e.g. offshore teaching staff). Does not include load for</td>
</tr>
<tr>
<td></td>
<td>students who are doing ‘work experience in industry’</td>
</tr>
</tbody>
</table>

2.3 Maximising funding

Higher Education institutions are somewhat unique in that government formulae for funding are often based on non financial measures. For example, Commonwealth Grant Scheme (CGS) funding is based on student load in the various discipline groups of units of study each student selects. Research Training Scheme (RTS) funding includes completions of research awards and staff publications, the Learning and Teaching Performance Fund (L&TPF) uses student retention, success (progression, pass or fail) and student satisfaction, the new Research Quality Framework (RQF) includes research impact measured by citations. None of these are direct financial measures and yet the organisation must be able to monitor, report and forecast on these to measure its performance and develop the necessary strategies to retain and improve the funding derived from them. Table 2 illustrates some examples of funding formulae.
Table 2. Typical Government Funding formulae for Australian Universities

<table>
<thead>
<tr>
<th>Fund</th>
<th>Funding Formula Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commonwealth Grant Scheme (CGS)</td>
<td>Funding Agreement total = Sum across all clusters of (CGS student load (EFTSL) per cluster x cluster funding rate ($)</td>
</tr>
<tr>
<td>Research Training Scheme (RTS)</td>
<td>HEP’s specific performance index = (HDR completions x 0.5) + (Research Income x 0.4) + (Research Publications x 0.1)</td>
</tr>
<tr>
<td>Learning and Teaching Performance fund (L&amp;TPF)</td>
<td>A Standardised score is produced for each of performance indicator for each university within each of 4 major discipline areas Performance indicators include Student demand (applications, load) Student experience (CEQ overall satisfaction, generic skills, good teaching) (GDS employment and further study) Student progression (success rate, retention rate, level of study)</td>
</tr>
</tbody>
</table>

3. Strategic data management to assist strategic planning

3.1 Focussing on key issues and critical facts

Today’s executives are overwhelmed by the amount of data that technology allows organisations to generate. When information overflow is combined with dramatically shortened business cycles, increased competitive activity and a volatile business climate, managers and senior executives cannot keep up and can become frustrated and ineffective. Yet technology systems that support an organisation’s corporate performance management can be used to focus staff on key issues and critical facts and measures rather than overloading them with data from every aspect of the organisation. The right information must be delivered to the right people at the right time and in the right context. Data from transactional systems cannot do this. Time and effort invested in strategic data management processes and systems can help this occur more efficiently. Focus must be from both the top down (KPI and other strategic data) and the bottom up (all data from which the KPIs are derived). Data must include internal, external, national and international data. Both official statutory data (with the inevitable time lag of up to a year or more) and internal ‘live’ system data should be available as appropriate.

3.2 Integrated processes supported by technology

To manage the strategic direction, processes and evidence based data to support plans effectively requires interdependence between methodology and technology. Senior executives, business analysts and IT specialists within an organisation need to work together to achieve the best outcomes. One of the keys to success is to incorporate the carefully managed support of information technology. Many data management strategies can be used to improve the link between plans and implementation. To reduce time between formalising the plans and implementing them, organisations need to tie together the computer applications and business processes related to key measures in one continuous flow, and be able to analyse and report on the results in a timely and accurate manner.

For example when collecting and prioritising the data requirements for a data warehouse, the data needs to be sorted into major business process areas and linked to the key performance indicators (KPIs) and strategic directions of the organisation. Table 3 below indicates design of a staged schedule for organising university data into a warehouse by relating it to key business processes and KPIs.
Table 3. Recommended priority and staging of data into a data warehouse

<table>
<thead>
<tr>
<th>Stage 1 (Year 1)</th>
<th>Stage 2 (Year 2)</th>
<th>Stage 3 (Year 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommended Data</strong></td>
<td><strong>Recommended Data</strong></td>
<td><strong>Recommended Data</strong></td>
</tr>
<tr>
<td>Reference files</td>
<td>Workforce data (continuing, fixed term and casual)</td>
<td>Timetabale data</td>
</tr>
<tr>
<td>Research Publications data</td>
<td>Student applications and entry path data</td>
<td>Space utilisation data</td>
</tr>
<tr>
<td>Research Activity data</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student bio/demographic data and funding data</td>
<td>Student Survey data</td>
<td>Student grades and completions data</td>
</tr>
<tr>
<td>Student Program and Course enrolments</td>
<td>Financial data: research and projects</td>
<td>Financial data: clients</td>
</tr>
<tr>
<td>Finance data: student</td>
<td>DEST staff data</td>
<td>DEST student data</td>
</tr>
<tr>
<td>Proof of concept data: AVCC external benchmarking</td>
<td>External SATAC data</td>
<td>External ATN and AVCC data</td>
</tr>
</tbody>
</table>

**Examples of corporate reporting addressed**

KPIs: EFTSL, Access, Participation, Retention, International performance, Research training, Equity, Income diversification

KPIs: Local undergrad demand, Perceived teaching quality, Graduate employment outcome, Research performance, Staff gender ratio, Academic staff qualifications

KPIs: Compare "daily" KPI data against targets and latest official achievements

**Examples of business process features**

Organisation Structure standardised

Reporting across applications; Offers and enrolments by student

Student life cycle: Application to completion

Program and Course names standardised

Reporting across students and workforce by course, program, and organisational structure

Reporting financial data across students, workforce and projects by organisational unit

3.3 Effectively communicating the plan

Even with the best technological system to assist in strategic planning, implementation of plans may still fail if not communicated. Giving staff across the organisation access to whatever strategic planning software systems are used is essential, but so is continual communication about the process. All objectives, goals, strategies and tactics should be communicated regularly otherwise time and effort may be allocated to counterproductive initiatives. Employees must have the opportunity to provide feedback regarding their ability to implement the strategy. Failure to communicate the strategy may mean employees do not understand how the strategy impacts them. In research conducted by the creators of the balanced scorecard, Kaplan and Norton, less than 5 percent of the typical workforce understands their organisation’s strategy. (5. Kaplan, Norton, 2001) During the year they need to be able to assess how well they are progressing towards the strategic goals. They can then modify their behaviour accordingly.

4. Computer Systems to support strategic planning

4.1 Why transactional systems cannot help implement strategy

Transactional systems collect and store data on the day to day operational activities of an organisation. For example, most universities have a student administration system and a finance system. While the transactional systems may provide some reporting at a transactional level they do not provide much capability to produce corporate level reports or allow easy analysis of the data stored within the system. Most transactional systems are based on relational databases which are optimised for transactional processing but do not allow fast and easy analysis of data at a corporate level. To do this, the data needs to be remodelled into a dimensional database like those used in a data warehouse. Strategic decisions cannot be made using data in a transactional system. The data is not suitable for corporate analysis, reporting or dashboard applications.

A Gartner report states that while developments in systems have largely addressed the needs of transactional users, they have not been able to address the needs of strategic and operational users. (2.
Geishecker, 2001) The reasons are the complexity for users and the closed architecture which makes it difficult to integrate external data. To implement strategy, users require the dissemination of goals, objectives, strategies and tactics. Many current corporate reports compare the performance of the organisation with budget, but not with competitors and the market. Strategy is almost always based on a combined internal and external view that includes market and competitor assumptions. Without this, a view of performance may be too narrowly focussed, and goals may not be achieved. For example, RTS funding relies on the share of research performance for each institution. A university may improve its own performance, but if all other institutions improve more, the share will decrease and the university will receive reduced funding, despite its improvement.

4.2 Electronic decision support tools

After having computers at our beck and call for over 50 years we still mainly utilise them for transactional processing and data collection. While 76 percent of executives cite strategic planning as the top management tool to improve long term performance and strengthen integration across an organisation, a business survey in 2002 indicated that only 33 percent of executives use electronic decision support tools that could help them in managing performance (4. Hackett, 2002). More organisations are now considering moving beyond transactional processing systems to incorporate key managerial processes into technology. There is a move towards integrating applications for better utilisation of organisational resources and more efficient processing.

At the current time a number of computer packages are required to integrate data, business processes, monitoring, analysis, forecasting, reporting, scorecarding, key performance indicators, etc. These days, various packages may perform one or a number of these functions and the combinations available are changing constantly as more organisations demand better overall performance and integration of their data and strategy. The hierarchy of the major functional systems available is listed in Table 4.

Table 4. Computer Systems to support strategic planning

<table>
<thead>
<tr>
<th>System</th>
<th>Major Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Planning control</td>
<td>To integrate strategic planning documents, organisational processes, targets and responsibilities</td>
</tr>
<tr>
<td>Dashboard system</td>
<td>For senior managers to customise key views of performance in their area of responsibility</td>
</tr>
<tr>
<td>Benchmarking and Scorecarding system</td>
<td>To record and monitor key performance indicators against targets and indicate success, failure and alerts</td>
</tr>
<tr>
<td>Budgeting and Forecasting system</td>
<td>Using actual data to model scenarios and predict future trends</td>
</tr>
<tr>
<td>Business Intelligence presentation layer</td>
<td>To enable user access to information via data, analysis and reports</td>
</tr>
<tr>
<td>Data Warehouse</td>
<td>Reorganises transactional data into logical business models for corporate analysis and reporting needs. Combines data required for KPI’s, adds value through external data and conformed standard code sets, etc.</td>
</tr>
<tr>
<td>Metadata system</td>
<td>To provide users context about the data. To record data source, lineage, definitions, business rules, etc.</td>
</tr>
<tr>
<td>Master Data Management system</td>
<td>To centrally store and maintain the major common data dimensions used by all areas of the organisation</td>
</tr>
<tr>
<td>Data Quality system</td>
<td>To conform and standardise common data dimensions across the organisation, and identify data errors and anomalies</td>
</tr>
<tr>
<td>Transactional systems</td>
<td>To collect source data and process day to day transactions for the organisation</td>
</tr>
</tbody>
</table>
Figure 1 gives an indication of the number of Australian Universities using various decision support systems as at Jan 2006. (8. AAIR Data Warehousing SIG Survey, 2006). Although all respondents had transactional systems and were using a BI presentation layer of some kind for reporting, the use of other decision support systems is very limited.

Figure 1. Australian universities using electronic decision support systems (out of 23 responses), January 2006

4.3 Dashboard systems

The concept of dashboard type information is becoming more and more popular with senior management requesting this type of presentation to assist their assessment of the organisations position. But is dashboard information appropriate to track an organisations progress against the strategic plan? And what information is required to reliably support dashboard views of data and provide immediate analysis of what the dashboard is showing? Although on the surface dashboard presentation of key data appears to be the ultimate strategic management tool, organisations should question how appropriate this is for their organisation before rushing out and buying the product. Dashboards are only appropriate for data that changes rapidly over time. If it is only a yearly or monthly result that is significant, the dashboard will not change often enough for it to be even interesting. The usefulness of a dashboard tool also relies on access to all the underlying data contributing to each measure and the ability to drill into it for further analysis (6. Kimball, 2007). Many tools can show data as an exciting and colourful display, but it is having the underlying data in an accessible and standardised format that makes the data become meaningful information.

5. Costs, resources and ROI

5.1 Resources

As demonstrated by the previous discussion, organisations have choices to make about their data management strategy. All organisations consider transactional systems to store their source data a necessity, but have differing opinions on the value of other systems to leverage the value of that data to assist corporate decisions and strategic directions. It is obvious from the previous discussion that transactional systems only play a small part in the overall strategy management of an organisation. Unfortunately many organisations do not realise the important role other systems can play and tend to over allocate resources to the transactional systems. This leaves the strategic functions relatively unsupported financially and without sufficient experienced resources. The result is that while the transactional systems are well resourced, supported and upgraded regularly, management continually complains about the lack of reports and analysis, lagging timeliness of information, consistency and standardisation of results and definitions, lack of forecasting and scenario planning, lack of competitor data and benchmarking. If looked at realistically, Figure 2 illustrates the situation at most organisations today.
Figure 3 shows the approximate number of staff dedicated to developing business intelligence and data warehousing at Australian Universities as at January 2006 (8. AAIR Data Warehousing SIG Survey, 2006). In most organisations the number of staff dedicated to supporting transactional systems would be much higher. Once the imbalance is improved, the availability of appropriate information will increase, and eventually senior management will get their dashboard fully functional with accurate data and full analytic capability.

Figure 3. Staff FTE involved in developing Business Intelligence and Data Warehousing at Australian universities (out of 23 responses), January 2006
5.2 Costs

With the proliferation of software available to ‘help’ an organisation achieve good corporate performance management it is often difficult to make decisions about what to use and how to use it. Some software products appear to be prohibitively expensive, whereas others are provided ‘free’ as part of the general licensing package or open source software. The cost of the software usually does not include the necessary hardware and architecture to run the application, or the data and resources required to configure it, implement it, run it and maintain it into the future. These costs can vary significantly for each individual organisation so software vendors will not provide you with these costs. There is often also the impression that if you purchase the software it will do everything for you whereas in almost all cases organising the data for the software to run with, configuring the implementation and integrating it with other packages is where the bulk of work lies. You will need to do this regardless of which package you buy or develop.

Figure 4 shows the approximate annual spend on projects developing business intelligence and data warehousing at Australian Universities as at January 2006 (8. AAIR Data Warehousing SIG Survey, 2006). In most organisations the spend on supporting transactional systems would be significantly higher.

Figure 4. Funding amount per year allocated for Business Intelligence and Data Warehousing projects at Australian universities (out of 23 responses), January 2006

5.3 Return on Investment

For strategic data management projects measuring return on investment (ROI) is not easy. The main advantage to be gained is in much increased efficiency of integrating key data from major business processes. It is about mainstreaming planning, analysis, and forward looking processes such as forecasting, predictive analysis and data mining. An interesting comparison to make when looking at return on investment is the annual spend on such projects and products compared to that on transactional systems as a percentage of the organisations total revenue.

6. Strategic data management evolution: becoming the analytic organisation

Most organisations these days have an increasing desire to base their strategic decisions on analytic information. The value realised by turning data into information to create knowledge makes an organisation analytic. A recent article in the DM Review (3. Graham, July 2007) describes three evolutionary phases of organisations becoming analytic over the last 20 years.

The first phase is known as the ‘efficiency’ stage where the organisation starts to leverage data by introducing data warehousing and business intelligence initiatives. The focus is to get current and past
performance (or lagging) information into the decision makers hands so they can see trends. The aim is to create a flexible environment for analysis of the data. A data warehouse gets data in order ready for analysis. It collects, organises, aggregates and makes meaning out of data. It creates a connection between operational data, performance management information and the creation of knowledge.

The second phase starts looking at analytics as a core competency to differentiate from the competition. The organisation uses scenarios to predict outcomes and creates business models to help make decisions on which way to move in the future. This ‘effectiveness’ stage of evolution uses business modelling, scenario planning, data mining, predictive analysis and root cause analysis. The organisation should look for solutions which address the entire organisation’s needs. Different users will consume different analytics. For example ad-hoc reports, static reports, guided analysis, scorecards, dashboards and alerts will have different audiences.

The third phase is when the organisation adds more value by making analytics serve as a function (like finance or marketing) and not just a competency – the ‘analytic’ stage. This requires a dedicated group of functional and technical individuals who are responsible for how data, information and knowledge are used to create organisational differentiation from the competition. The analytics group would need to understand the intricacies of the business and how core business processes impact the financial, customer, learning and growth perspectives of the organisational strategy. They should focus on increasing the ability to make fact based decisions and ensure analytic concepts are applied across the entire organisation. The aim is to educate, enable and drive adoption of analytics so it becomes ingrained within the culture of the organisation.

**Figure 5. Evolution of the analytic organisation**


**7. Conclusion - Checklist for good Strategic Data Management**

1. Determine the data required for the organisations strategy (KPI’s, Statutory, external)

2. Communicate the strategy to all staff, give staff ownership and responsibility for relevant data

3. Educate senior management about the need for appropriate resources
4. Encourage an analytic organisation

5. Develop standard definitions and processes which are consistent across the organisation

6. Standardise and conform the data so it can be combined from all systems

7. Organise the data into logical business dimensions and measures

8. Evaluate and select tools carefully aligned to business needs

9. Make the organised data available to staff trained at appropriate skill levels

10. Apply data quality checks to the data

11. Have metadata easily available to users
Abbreviations

AAIR Australasian Association of Institutional Research
ATN Australian Technology Network
AVCC Australian Vice Chancellor’s Committee
BI Business Intelligence
CEQ Course Experience Questionnaire
CGS Commonwealth Grant Scheme
DEST Department of Education, Science and Training
EFTSL Equivalent Full Time Student Load
FTE Full Time Equivalence
GCEQ Graduate Course Experience Questionnaire
HDR Higher Degree Research
HEP Higher Education Provider
IT Information Technology
KPI Key Performance Indicator
L&TPF Learning and Teaching Performance Fund
ROI Return on Investment
RQF Research Quality Framework
RTS Research Training Scheme
SATAC South Australian Tertiary Admissions Centre
SEQ Student Experience Questionnaire
VC Vice Chancellor

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8. AAIR Survey of Data Warehousing and Management Information environments currently in use at Australian universities, Australasian Association of Institutional Research, Data Warehousing SIG, Jan 2006