A Comparison of the Application of Performance Indicators, System Dynamics Models and the Holon Framework to Quality Assessment in Higher Education

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Abstract

This paper examines issues in the quality assessment and audit process in higher education institutions. Quality assessment management is an important issue for higher education institutions. In the UK, various structures have been established or proposed to attempt to measure the resources deployed and the impact on quality. Most current comparative structures are based on performance indicators (PIs) but those used suffer from technical difficulties and the fundamental limitations that they do not link the 'levers' that management can deploy with the 'outcomes' that are observed. They are not therefore a good method for policy appraisal. SD models may provide this linkage but in this complex environment framing the model and calibrating it is often difficult. It is proposed that the 'Holon Framework' may compliment and enhance the SD models so as to provide a useful and usable management tool.

1. Introduction

A great deal of energy and resources in higher education is currently devoted to quality assurance and audit. In the UK this partly resulted from a number of studies, most notably that of Lord Dearing (National Committee of Inquiry into Higher Education, 1997), recommending greater application of standards across higher education as part of the general mood of quality enhancement. The aim was to ensure that the various stakeholders, including the Government, employers of graduates and current and potential students, had the confidence that a degree awarded by a UK university met certain minimum standards. The Quality Assurance Agency (QAA) was set up in 1998 and has recently revised methods of subject based quality assurance and institution based quality audit. Further work has resulted in the development of a national qualifications framework and of benchmarks for degree level study in each discipline. The QAA have also introduced a requirement for universities to adopt standard methods of programme specification. In addition, there has emerged, over the past eighteen months, a series of "codes of practice" (Quality Assurance Agency, 2000a) covering a variety of university activities such as validation of courses, assessment strategy and external examiner systems.

Most of the processes to date have involved self-assessment by the institution coupled with peer review, with the emphasis on qualitative methods of review. This has led to criticisms of inconsistency, where there have been suggestions that the outcome of the review, and under the previous system, the grades awarded to the university, can be influenced by the make-up of the team and the ability of the team leader (the

reporting assessor or review Chair). To date, there has been no attempt to incorporate more quantitative elements, such as performance indicators, into the formal academic review process.

In a wider context, the authors have previously commented (Kennedy and Clare, 1999) on the controversial nature of Higher Education Management in the UK. Since the 1980s there has been a political process involving the government, and the Universities. Cave et al. (1997) state that, "Government determined to bring to bear on higher education the principles it was seeking to install across the public sector: strong central direction; accountability for the economic, efficient and effective use of public money; the measurement of performance against outcome criteria and the substitution of the concepts and methods of management for those of administration or professionalism."

This political process led to the Jarratt Report (1985), which recommended that universities must work to clear objectives and achieve value for money. Jarratt also made far-reaching recommendations about the governance and management of universities. Cave et al. (1997) state that, "Universities had long been regarded as diarchies in which the power of the collegium, as represented by Senate and the academic autonomy of individual teachers, worked in tandem with the hierarchy embodied in the vice-chancellor, deans and heads of departments. …Jarratt now proposed institutions' Vice Chancellors would, in turn, become chief executives, overseeing the corporate management of the university."

This debate between the "managerialists", favouring strong central direction and the "collegiumists", who see the university as a community of scholars continues. Some of the criticism of the Dearing Report (1997) centres on the contention that the committee implicitly adopted the "managerialists" mindset (see, for example, Blake, Smith & Standish (1998) in "The Universities we need – Higher Education after Dearing")

Issues of quality and standards in Higher Education Institutions cannot be separated from issues of resource management. Diana Green (1994) stresses that since the mid-1980s, public interest in and concern about quality and standards has been intensified by the increasing attention given by successive British governments to reforming higher education. The reasons for this growing concern are:

- Rapid expansion of student numbers against a backlog in public expenditure.
- The general quest for better public services.
- Increasing competition within the educational 'market' for resources and students.
- The tension between efficiency and quality.
- Managing institutions of higher education is a complex task in maintaining their effectiveness. Institutional managers have a crucial role to play in relation to quality in the following ways:
    - Finding ways of using the institution's resources to better effect and generate more resources.
    - Being accountable to the wider society, through use of effective means of assuring academic standards.
    - Developing improved systems of strategic planning and institutional management.

2. Quality in UK Higher Education

In reviewing the use of performance indicators in Higher Education, it is worth looking at some of the history of quality assessment and audit and how this influenced the proposed indicators. Much of this material is drawn from the ongoing research of one of the authors with the Open University (Clare, 2003).

Despite the many changes in the higher education environment in the 1960s and 1970s, it was not until the start of the 1980s that the idea of performance indicators started to emerge. At that time, the belief in the need to increase efficiency in higher education developed, as a consequence of general Government policies to improve public accountability and performance and adopt a more market-oriented approach in all public services. This was part of the policy intended to cut public spending and this led to the severe cuts in higher education funding of 1981. Increased criticism of, and more direct involvement in, higher education by various government bodies including the Department of Education and Science, the Department of Trade and Industry and the Department of Employment (through the Manpower Services Commission) (Maclure, 1989, p. 93) was one aspect of the pressures to bring greater Government control to the sector.

Both the green paper in 1985, and the 1987 white paper stressed the need for higher education to be geared towards the needs of business and industry and for greater scrutiny of efficiency of performance of universities (Department of Education and Science, 1985, p. 49; Department of Education and Science, 1987, pp.18-23). A great deal of the criticism was directed towards the university as opposed to the public sector (polytechnics). At the time, the polytechnics were under the jurisdiction of the Council for National Academic Awards (CNAA) who had overall responsibility for course validation. They were also scrutinised by the Department of Education and Science and were subject to formal inspection of teaching and other operations by "Her Majesty's Inspectors" (HMI). However, the white paper, and the subsequent Education Reform Act (1988), followed by the Further and Higher Education Act (1992) effectively led to the disbanding of the CNAA as a national quality assurance body through the granting of autonomy to the ex-polytechnics (Department of Education and Science, 1988; Department of Education and Science, 1992).

The 1992 Act unified the higher education sector by removing the last traces of direct control by Government or local authorities from the polytechnics. Although indirect control via the funding councils remained, they became autonomous institutions. The Act also enabled them to adopt "university" titles, and have the full degree awarding powers of the traditional universities. Funding for the new unified sector was channelled through the Higher Education Funding Council (HEFCE) who were also charged with ensuring value for money in the grants that were channelled to the universities.

3. Quality Assessment and Audit in Higher Education

At the start of the 1980s, the public sector (the former polytechnics) already had considerable quality assurance mechanisms in place that provided accountability and attempted to ensure some comparability of standards across the system. So, in order to discharge their duties of ensuring value for money, HEFCE set up mechanisms for quality assessment on a subject by subject basis, centred on qualitative self-

assessment, coupled with inspection visits along the lines of the former CNAA/HMI. However, the approaches to quality management and enhancement adopted by other industries at the time also included the measurement and testing of an organisation's own systems of quality audit and, to cater for this aspect, a separate organisation for higher education was set up. This organisation was the Higher Education Quality Council (HEQC) and was owned and part-funded by the universities themselves. Thus the responsibility for "quality" in English universities was vested in two essentially separate organisations, each of which adopted a different approach to its work and placed different demands on the universities to prove compliance with their defined quality standards (HEQC, 1996).

Through the mid 1990s, both organisations developed systems that involved universities in producing written self-assessments, backed by substantial amounts of evidence in the form of documentation, and followed by a visit from a group of peer reviewers. These reviewers would have the authority to interview staff and students, observe teaching sessions or other activities and request additional documentation. Both assessment and audit resulted in a published report detailing areas of good practice and areas where some improvement was thought necessary. In addition to the part-time reviewers and auditors drawn from existing higher education staff, full time staff members were recruited to both organisations.

The HEQC approach centred on institution-wide visits, as part of a rolling programme of audit. The overall aim was to investigate the institutions' own systems of quality management and control in order to be able to satisfy itself of the broad comparability of standards across UK institutions of higher education. The resulting report commented on various parts of the institution's operational procedures. These included the institution's teaching and learning strategies, development, validation and review of programmes of study, and assessment, progression and award procedures. It also commented on the institution's staff development procedures and general information and feedback mechanisms. The reports included sections where examples of good practice were highlighted and areas where improvements may have been necessary, were published, and made available in the public domain. They provided comment and constructive criticism, but did not mark or otherwise rate the institution (HEQC, 1995).

The first system for teaching quality assessment was proposed by HEFCE in 1993. The process involved setting up a rolling programme of subjects to be reviewed. Each academic department or unit covering the subject under review was required to write a document in the form of a self-evaluation, which addressed a number of areas relevant to teaching and learning. Departments were allowed to claim that their provision was "excellent" and if so, they were expected to provide evidence to back the claim in the document. Reviewers read each document and formed an initial judgement. All departments claiming excellence were subject to a visit by a team of reviewers who would interview staff, observe teaching, speak to students and look for other forms of supporting evidence. Departments deemed likely to be unsatisfactory from their document were visited as were a random sample of other departments. At the end of the process, all departments were graded "excellent", satisfactory", or "unsatisfactory" (HEFCE, 1993).

A revised method for teaching quality assessment was proposed by HEFCE to start from 1995. Again, subjects were programmed for scrutiny on a rolling basis, and the

new method still required the department to complete a self-evaluation document. Six core aspects of provision were specified and these had to be addressed in the document. The main difference with the new methodology was that all departments were subject to a visit by a team of reviewers. They looked for evidence on which to judge the six aspects and, at the end of the visit; the department was awarded a mark out of four for each of the six aspects, together with detailed commentary on the aspects and comments on the standard of the provision (HEFCE, 1994). Departments scoring 22 or more out of the possible 24 were unofficially deemed as excellent.

In an attempt to ease the burden on institutions, simplify what had become a rather cumbersome "industry", but maintain an independent review function, it was agreed to merge the two bodies and the Quality Assurance Agency for Higher Education (QAA) was formed in 1998. The QAA also reassessed its approach to quality assessment and audit in an attempt to reduce the burden on institutions that the time and costs of producing the documentation and of participating in the visits required.

During 1999 and 2000, a new methodology academic review was developed and announced by the QAA (Quality Assurance Agency, 2000b). Although the methodology was tested in a number of Scottish universities, it attracted a considerable amount of criticism from a group of research-intensive universities (known as the "Russell Group") and others, who saw it as placing excessive demands on institutions for what they viewed as a flawed method of quality review. As a result of this and other pressure from the sector, the then Secretary of State announced that the approach should be reviewed, allowing for a "lighter touch" in those institutions deemed to have the confidence of the QAA and other stakeholders in the sector in the quality of their provision. As a consequence, the HEFCE wrote to institutions inviting comment on a "lighter touch" approach, which placed greater emphasis on institutional audit and less on subject based review (HEFCE, 2001).

The responses to consultation indicated that the emphasis for future activity should be on the audit of an institution's own quality management and enhancement systems as a way of assuring the Government and other stakeholders that the education provided is fit for purpose and conforms to specification.

In March 2002 the QAA finally published the operational description of their new audit based approach to quality assessment (QAA, 2000b). The method is based around institutional audits that will examine three main areas. The first is the determination of how effective the institution's own quality assurance processes are. This will look at a number of areas including the extent to which the institution can demonstrate that it complies with the QAA codes of practice, and the ways in which the institution reviews the quality of its educational programmes and the standards of its awards.

The second area of examination concerns the accuracy, the completeness and the reliability of the information that the institution publishes about the quality of its programmes and the standards of its awards. The aim is to determine the degree of trust that can be put in those institutional descriptions of quality and standards. The third aspect of the audit is the examination of a number of the institution's internal quality assurance processes at work. These can be at the level of the educational programme or more general processes covering an area of activity that contributes to the assurance, such as the management of collaborative programmes. Again, the aim

is to determine the level of confidence in the institution's processes for assuring quality and standards.

Judgements will be made about the soundness of the management of the quality of the programmes and the standards of the awards at the institution and at the level of confidence that can be placed in the reliability of the institution's documentation. The auditors report either "broad confidence" in the institution and its processes or qualified confidence with indications of those areas where the auditors may have some concern.

Concurrent to these developments, the QAA also set up a series of working groups to produce "benchmark specifications" for degree courses in each discipline (Quality Assurance Agency, 2000c). The other areas of activity of QAA was in the development of a series of "codes of practice" covering various aspects of the operations of universities (Quality Assurance Agency, 2000a), and the formulation of a national qualifications framework.

Many of these initiatives were a direct result of changes in Government attitude to the public sector in general and higher education in particular heralded by the first Conservative Government, under Margaret Thatcher in 1979 (Cave et al, 1997, p. 3). Some of the motivation for this was for the Government to be assured of the fundamental purposes of a quality assurance process which included the need to secure value for the money invested, the need to encourage continuous improvement and the need to provide accessible information on the quality of higher education for all stakeholders in the system (Clark, 1997, p. 219).

Throughout the 1980s and 1990s, the pressure on resources, together with the need for greater diversity as part of a general expansion and increased international activity and competition in higher education all contributed to a general growth of interest in quality assurance and management. The majority of institutions had yet to realise the significance of competition in higher education. The environment had become more competitive with institutions trying to hit their targets for student recruitment, if necessary at the expense of their neighbours. Since many institutions offer broadly the same type of courses, it is the quality of what they have to offer which will determine whether they are successful in attracting students and other contracts. The successful university must increase its reputation as an institution that provides a high quality learning experience for students. Traditionally, there has been little argument that this encompasses quality of the academic programmes, but it must now also mean quality in how well students are treated in all other aspects of the service provided by the University; in other words the quality of the total service package (Clare, 1995, p. 442). Welsh and Dey also cite increased competition between institutions and the need to increase student recruitment and retention as one of the main drivers of increased interest in quality assurance. They also see institutions using a high quality rating as a weapon of competitive advantage (Welsh and Dey, 2002, p. 18). Different approaches to the issue became apparent, including focus on academic subject, focus on the quality of pedagogy, on institutional management and on the outputs of the system in terms of the employability of the graduates. (Brennan and Shah, 2000, pp. 11-14).

Institutions have different mixes of subjects and processes of quality assessment and management can be affected by subject disciplinary features. Hard sciences and

engineering have features that may be more amenable to measure than humanities subjects (Kekale, 2000, p. 484). As well as intra institutional there are inter institutional differences. Brennan and Shah comment "the large variations which exist in institutional contexts make it difficult to predict the effects of the introduction of quality assessment in any particular institution and make it desirable to adapt assessment methods to the context of the institution" (Brennan and Shah, 2000, p. 49). There are also issues that arise from the fact that the benefits of higher education are not all short-term. The performance of a particular lecturer in a certain class session may be rateable in a quality sense. However, the medium term aspects (for example, is the student equipped for further study or appropriate employment) and the longer term (has the student acquired the critical thinking skills necessary for life-long learning) are much more difficult to rate (Lawrence and McCullough, 2001, pp. 141-148).

Another area where there are difficulties in measuring quality in higher education centres on the notion of peer review. This is at the heart of most processes of quality assurance in higher education, mainly because of the lack of any universally accepted performance indicators or other metrics upon which to base judgement. The main problem is one of subjectivity. As Cave et al put it "the essence of peer evaluation is that it is connoiseurial: evaluators apply their own values, knowledge and beliefs formed within their own practices and experience to the judgements they make (Cave et al, 1997, p. 117). These experiences will have been formed by the evaluators' own institutional environment, which can be very different to the one under scrutiny. Much depends on how the "peers" in peer review are defined (Clark, 1997, p. 221), and some writers do acknowledge the opportunity for exploration of issues in a professional and focussed manner with colleagues as a benefit of peer review (Bingham and Otterwill, 2001, p. 36).

Attempts by HEFCE, QAA and others to overcome the issue of reviewer subjectivity by defining various forms of evidence (institutional documentation both specifically drafted and "off-the-shelf") have led to criticisms of institutions being overburdened. This, together with the often excessive time and staff effort needed to prepare for and participate in quality assessment exercises has been a major area of criticism of the process and its agents and has led to a number of UK universities threatening non-participation in the QAA revised procedures for academic review. As Brennan comments "quality is taking up a lot of time. Across the world academics are busy assessing each other." (Brennan, 1997, p. 23).

4. Identifying the Stakeholders & Customers

Whereas the stakeholders of many commercial organisations can be easily identified, a university's stakeholders (in addition to it's faculty) fall into four distinct groups, according to Clare (1995). Firstly, the students of the institution are stakeholders (as well as its product). They look to the institution to provide a service in the form of a course of study leading to a recognised qualification and a general educational benefit. Recent informal interviews carried out at South Bank, indicate that the applicant of the late 1990s is far more discerning about their course of study and the host institution than their predecessors. Part of the reason is the awareness of graduate unemployment which leads students to seek courses that will minimise the risk of unemployment. The severe pressure on student finance (including the recently

introduced student fees), leading to the necessity to take out loans or be subsidised by parents also tends to focus the mind towards looking for value for money.

The second category of stakeholders are the employers of graduates and diplomates. Their needs for well qualified, well-educated and adaptable employees in the shape of new graduates have to be satisfied. Success in this area reaps other benefits such as investment by employers in research, development, consultancy and short courses with the institution. Here, a careful balance needs to be struck. The natural instinct for the "old" universities was to build courses around the latest theoretical research; indeed this has been the standard approach for many years and can be seen to have been successful in providing the UK with first-rate scholars. The direct needs of industry have often been seen as being satisfied with direct training courses that are not the province of the universities. "New" universities (ex-Polytechnics), on the other hand, have always sought to try to satisfy some of the needs of industry directly as part of the degree and diploma courses they offer. Over the years, they have managed to develop a balance between up-to-date material that will enable the graduate to become immediately useful to an employer, and material designed to provide a firm under-pinning, to enable the student to be able to adapt to future changes in the industry or in technology.

The third group of stakeholders are the Government (via the funding councils), local Government and Government agencies (the Research Councils, Training and Enterprise Councils etc.). For the foreseeable future, these bodies will be the major providers of funds to a university. Consequently, they should be regarded as stakeholders with needs to be satisfied. The main way in which this is currently achieved is by the institutions recruiting to target, graduating quality students, completing the funded research and so on.

The final group of stakeholders for the services of a higher education institute is the wider community. Each institution has obligations (although it may not have realised them) in the areas of:

(i) access to the facilities of the institution for the local community
(ii) contribution to the wider academic community
(iii) providing services to the international community via the enrolment of overseas students, collaborative research, consultancy and other projects
(iv) the welfare of society in general.

5. Performance Indicators

The use of performance indicators for higher education was one of the aspects of Government plans to emphasize efficiency and effectiveness during the 1980s. Some sections of the Green paper ‘The Development of Higher Education Into the 1990’s’and the 1987 White Paper ‘Higher Education: Meeting the Challenge’ illustrate this.

“The essential purposes of performance measurement in higher education into the 1990’s are to introduce into consideration of policy and the management of the educational system at national and institutional level some concrete information on the extent to which the benefits expected from education expenditure are actually

secured and to facilitate comparisons in terms of effectiveness and efficiency as between various points of the systems and as between different points in time"
(Department of Education and Science, 1985: p. 49)

"Essential data on performance in each institution should be published so that its record can be evaluated by the funding agencies, governing bodies, students and employers"
(Department of Education and Science, 1987: pp. 18-23)

Various other groups and bodies have made proposals on the use of metrics and quantitative indicators over the past twenty years and Cave et al provide a comprehensive summary of these (Cave et al, 1997, pp. 9-21). In stating that universities should be expected to work to clear objectives and to achieve "value for money", the Jarratt report (CVCP, 1985) proposed the introduction of performance and other indicators for use by institutional managers. The National Advisory Body for Public Sector Higher Education (NAB) published a report by its Good Management Practice Group which proposed a series of performance indicators on both resource management and academic operations for use in the polytechnics (NAB, 1987). From 1987 until 1995, the CVCP and UGC published annual "management statistics" for the universities, which consisted mainly of comparative costing data derived from annual returns (CVCP/UGC, 1987). The Warnock report, sponsored by PCFC recommended the development of metrics to be used in assessing teaching quality (PCFC, 1990a). In the same year, a group chaired by Alfred Morris undertook a detailed investigation into the potential use of performance indicators for institutional management but also to be published as part of an institution annual report (PCFC, 1990b).

The initial work of HEFCE in proposing systems of quality assurance and management did not directly involve the use of management statistics or performance indicators. It was the publication of the Dearing Report (National Committee of Inquiry into Higher Education, 1997) that provided the impetus for renewed interest in Performance Indicators. Among its recommendations was a further call for the development of performance indicators to enable assessments of the efficiency and effectiveness of universities in the delivery of higher education. In response, both HEFCE and the Committee of Vice Chancellors and Principals (CVCP) set up working groups and a number of reports heralded the introduction of sector-wide performance indicators. A group was set up by CVCP called the 'Higher Education Management Statistics Group (HEMS)', which produced a report on the topic (Higher Education Statistics Agency, 1999). As a prompt response to the Dearing Report, the HEFCE set up a 'Performance Indicators Steering Group' that issued an interim report in February, 1999 (The Higher Education Funding Council, 1999a) followed by a more comprehensive response in December, 1999, with modifications in 2000 (The Higher Education Funding Council, 2000b).

In this latter report, the group proposed some initial indicators covering four areas:

(i) Widening Access
(ii) Non-continuation of students (retention)
(iii) Projected outcome and efficiencies
(iv) Research

with a suggested method by which the indicators can be moderated to take account of the differences between institutions resulting from the diversity of higher education. These are referred to as "Adjusted Sector Benchmarks" (The Higher Education Funding Council, 1999b) The data used as a basis for these indicators are drawn, as far as is possible from common sources such as the Higher Education Statistics Agency (HESA).

Performance indicators measure, either qualitatively or quantitatively, an object, unit or process in order to appraise it in terms of defined objectives. The Morris report provides a good general definition for Performance Indicators as

"statistics, ratios, costs and other forms of information which illuminate or measure progress in achieving the mission and corresponding aims and objectives" (PCFC, 1990b, p. 110).

Distinctions can be drawn between simple indicators, performance indicators and general indicators. Simple indicators were used by the old universities for a number of years under the name of management statistics (CVCP/UGC, 1987). Further classification of performance indicators into "internal"(graduation rates, progression rates etc), "external"(graduate employability, staff publications etc) and "operating"(staff-student ratios, unit costs etc) was later modified to the more conventional "input", "process" and "output" categories (CVCP/UGC, 1986). Much of the literature concerns itself with this type of categorisation and definition, rather than about how the indicators were to be used effectively in a diverse higher education system. Such discussion is particularly important given that the essence of a performance indicator is some form of value judgement of what the standard or norm for that aspect of performance should be.

For the most part, consideration of quality assurance and of Performance Indicators has not been directly linked. Whereas the former has mainly been concerned with academic standards and the quality of the learning experience, the latter seems to have had its emphasis of the efficiency and effectiveness of institutional management. Some authors have attempted to provide the link. Sizer states, "Various PIs, not necessarily publishable, can be developed relating to… a teaching quality culture in terms of adequacy of provision (and) quality of provision"(Sizer, 1989, p. 17). On discussing the potential use of Performance Indicators in quality audit and assessment, Cave et al state "PIs might have a range of functions…They might provide background or contextual information…they might be a distinct component of the judgments formed" (Cave et al, 1997, p. 111). Allsop and Findlay feel that "PIs constitute a contribution to the systematic organization of information that is needed to improve the quality of work in an institution" (Allsop and Findlay, 1989, p. 105).

There are, however, a number of commentators who do not see obvious ways in which Performance Indicators can play a part in quality assessment. The Morris report acknowledged the widespread institutional concern about the use of Performance Indicators for quality assessment (PCFC, 1990b, p. 13). In discussing quality assessment and the use of Performance Indicators, Barneston and Cutright comment, "the use of common PIs assumes institutions… are comparable. This may pressure institutions to generate common outcomes…. Which may or may not be appropriate" (Barneston and Cutright, 2000, p. 286). In discussing Government

services in general, Mintzberg expresses the general frustration over the use of indicators and metrics; “Things have to be measured, to be sure, especially costs. But how many of the real benefits…lend themselves to such measurement” (Mintzberg, 1996, p79).

One of the stronger criticisms comes from Barnett who asserts, “higher education is a developmental process of increasing intellectual maturity…given this view…it is difficult to see how PIs can be of any help” (Barnett, 1989, p. 38). He comments on the fact that academic research appears to lend itself to the use of Performance Indicators but that teaching and learning does not; his reasoning for this borrows from Popper’s three-world model (Popper, 1976 pp. 180-182, Pratt et al, 1994). Popper makes the distinction between “thoughts in the sense of contents or statements in themselves and thoughts in the sense of thought processes belong to entirely different worlds” (Popper, 1976, p. 181). Research is a product of the human mind and is in the domain of world III; the products of research and the outcomes of teaching and learning (assessments, essays etc.) can be measured and subjected to performance indicators. However teaching and learning as actual processes, fall into the realm of subjective experience and inhabit world II. It is difficult to see how we could “peer into a student’s mind to see what changes, if any have taken place” (Barnett, 1989, pp. 29-31).

Acceptability is an acknowledged problem; “no-one has yet devised even a single PI that commands wide support amongst the academic community” (Johnes and Taylor, 1990, p. 185). However, the main problem with the use of Performance Indicators in quality assessment is probably highlighted by Cave et al and provides a useful justification for the proposed line of research. Their view is that the development of valid performance indicators depends on agreement on the goals of higher education and that these have become increasingly contentious and political. Government has tried to move away from the academic definition of the goals to their own market and employer led definitions of the aims of higher education (Cave et al, 1997 pp. 104-105).

6. League tables

A set of PIs can be combined and presented in the form of "league tables". The compiler selects a range of PIs and weights them to produce a single value. Institutions are then ranked according to this value. This process has been even more controversial than “straight” PIs.

There are general concerns over league tables and there is debate over the validity of the formulation of individual indicators. For example, in the past the government's (then current) formulation ‘employability’ was hotly contested by vice- chancellors and education secretary David Blunkett (THES, 1999). Some of the other factors that are used in the preparation of league tables are more controversial and have, in many cases, been ill-thought through. Examples include the staff-student ratio (SSR) and the number of first class honours degrees awarded. A low SSR could be considered a positive aspect (more face to face contact between students and staff) or negative (inefficient use of resources). A university awarding a high number of "firsts" may be a highly effective teaching institution or may be thought to have lower than average standards. Perhaps the most controversial element concerns the entry qualifications and the retention of the students. Institutions with a mission to widen access to higher

education take on students with non-standard entry qualifications. The majority of these students are successful but they are a "high risk" group in that a number will not be able to cope with a full programme. Such institutions are penalised in league tables on both counts because in the absence of genuine measures of added value in education, their success in adherence to their mission cannot be properly reflected.

There has been considerable debate over the form and method of the teaching quality assessments and the recently formed Quality Assurance Agency (QAA) has developed a new system to be introduced during the next year. The current system has produced anomalies even within the same school in an institution due to the differences in the makeup of the visiting panels. There have also been suggestions that the panels assessing teaching quality can be unduly influenced by a high research rating that the department or school may have attracted. In this way it could be that the result of the RAE can have an indirect impact on the teaching quality assessment which, as we have seen above could affect recruitment and funding.

In the authors' view, performance measures have been evolved for HE that provide some indication of strengths and weaknesses and provide a further basis for investigation, discussion and action.

The collation of a range of indicators on a regular basis is still not standard practice, many being only collated in response to outside pressure (especially from the Funding Council), so they do not form the valuable aid to routine decision-making that they could do.

The reasons for this may lie in a suspicion of the appropriateness of such 'managerial' practice by some staff combined with the inability of many information systems to generate them automatically, (especially those measures which require data collected from more than one source or functional area).

The indicators in current use were formulated in an attempt to answer perceived managerial issues given the information available or obtainable. In the authors' opinion, many are excessively concerned with resource utilisation without reference to the quantity and quality of the output so obtained. When a greater understanding of the current, basic, measures is achieved, more complex, but more meaningful, measures should be explored, for instance, the ' Value added ' to student attainment measured against the resource inputs utilised to achieve it.

Like other PIs, league tables have been highly controversial in the UK. THES (1999a), in its "leader' (Opinion): "What counts cannot always be tabulated", commented: "League tables are loved and hated- with reason. A spur to improvement, they are necessarily uncomfortable. They are also unfair, open to manipulation and do not measure vital aspects of university education such as inspiration, friendship and intellectual challenge."

In the authors' opinion a prime cause is that league tables impose a single view of the mission of a university. The choice of performance indicators and their weighting inevitably contains a judgement on what the "correct" mission of a university is. This is compounded when the data from different sources is aggregated into a single table as the weighting used also contains a bias. The THES (1999a) comments: "We would like to develop more tables so the diversity of universities shows more clearly.

Instead, we are likely to be driven back to fewer as the half-dozen indicators being developed at the government's behest come to dominate all others." These issues are illustrated when the restructuring plan for the troubled Thames Valley University [UK] was published. The THES (1999a) again comments: "That plan is for a pared-down university concentrated around four faculties geared to getting students jobs -in health, the media, tourism and services. Teaching is to have high priority, research low. While this may please Mr Blunkett [former UK education secretary], others will dismiss it as "mere training" hardly suited to a 'university'."

7. Current SD Contributions to Higher Education

One of the fundamental problems with PIs as a management tool is that they are normally measuring inputs or outputs to the organisation and ignore the actual things that management can directly influence. Dennis Sherwood (2002) expresses this in terms of the "levers" that management can direct and the "outcomes" that they are trying to influence. "No lever is connected to any outcome directly; likewise, no outcome is connected to any lever directly. Rather, levers and outcomes are connected indirectly, as regards both logic and time." He develops the theme as follows (ibid): "Why managing a business is difficult: As a manager, the *only* thing you can do is to operate on the levers – to decide their target settings and take corresponding actions to bring the actual settings into line. As a manager, the *only* thing you want is a complete set of favourable outcomes, continuously. However, no lever is directly connected to any outcome, either in terms of logic or time. So the only thing you can actually do in practice is to pull the levers toward the target settings you believe in, close your eyes, and hope that the outcomes will come out right. There's nothing else you can do. That's why managing a business is difficult." We would suggest that this is at least as applicable in a University context.

Bolland & Fowler (2000) suggest that a systemic approach to public sector management issues is required because, "…a fundamental framework based on systems theory should underpin management initiatives such as performance improvement, using the terminology and tools of "systems thinking". This potentially provides clarity of process, structure and method which can help to focus perceptions with respect to issues such as the polarity of causality (distinguishing cause from effect, the dynamics of policy formulation, appropriate implementation of controls and the promotion of understanding with respect to the overall complexity of the organisational situation generally.

Furthermore (ibid), "Public sector management occurs within a complex system involving several nominally independent stakeholders, coupled with informational and resource flows and behaviour that is characterised by inertia and multiple feedback loops. It is therefore apparent that the generic principles of systems thinking and system dynamics potentially provide a useful framework within which the issues of performance measurement, performance indicators and improvement initiatives should be considered…"

To summarise the current SD contributions to Higher Education Kennedy (2002) presented an extended taxonomy of SD investigations in higher education management. The completed investigations were classified into eight specific areas of

concern (Corporate Governance, Planning, Resourcing & Budgeting, Teaching Quality, Teaching Practice, Microworlds, Enrolment Demand, External forces/ legislation and Human Resource Management Dilemmas) and five hierarchical levels (National, Regional/ State, University/ Institute, Faculty and School/ Department).

Relatively little work has been done in the field of quality, Kennedy (1998a, 1998b), has examined some issues and described a prototype model. This has now been superseded by the further work of the group in developing the Holon Framework (below). In the closely related fields of higher education planning effectiveness (Barlas and Diker, 1996, 2000) and planning, resourcing & budgeting Galbraith (1982, 1989, 1998a, 1998a, 1998a); Galbraith and Carss (1989) have done some work.

We briefly summarise below the most relevant SD work to Higher Education policy. Kennedy (2002) contains a fuller description.

Kennedy (1998a, 1998b)
The information management and modelling research group (IMMaGe) have developed an initial SD model to examine quality management issues facing the school of Computing, Information Systems and Mathematics (SCISM) at South Bank University. Interviews were conducted with academic members of staff to guide the construction of the model. This investigation is considered to be the first part of a long-term project.

Key Findings
• The identification of sectors, *e.g.* Administration, Staff Performance, Department Effectiveness, Funding, Research and Funding, needed to be considered for a future quality management model.
• The identification of metrics (or performance indicators) needed to be collected for further SD investigations.

Barlas and Diker (1996, 2000)
The main objective of Barlas and Diker's (1996, 2000) research was to construct an interactive dynamic simulation model, on which a range of problems concerning the academic aspects of a university management system can be analysed and certain policies for overcoming these problems can be tested in a "Microworld" format. More specifically, the model focuses on long-term, strategic university problems that are dynamic and persistent in nature, such as growing student-faculty ratios, poor teaching quality, and low research productivity. The model generates numerous performance measures about the three fundamental activities of a university, namely, teaching, research and professional projects. The interactive decision variables of UNIGAME are: New Graduate Students, New Under-graduate Students, Graduate Faculty Hiring Decision, Under-graduate Faculty Hiring Decision, Share on Official Projects income per Faculty Member and Weekly Release Time per Graduate Faculty Member.

The purpose of the simulation model is to investigate the difficulties of keeping the delicate balance that must exist between education, research and service and what measures can be taken to alleviate the potential problem. The validity of the model is tested using 1983-1997 Bogaziçi University data. In the "participatory" (gaming) version of the model (which starts in 1993), certain decisions are made by a "player"

interactively during the simulation. The different decision making units of the universities can potentially use the model, especially in strategic planning.

Key Findings

- Simulation experiments with graduate (versus under-graduate study) orientation shows that graduate study can have considerable positive effect on research output, provided that it is coordinated with other related decisions such as instruction-hour requirements, research recognition and rewards etc.
- If, in order to obtain improved teaching quality, we keep class sizes too low, under the condition of high student enrolments this may mean multiple sections (or too many electives). This, in turn would mean increased teaching loads, which may cause serious problems in maintaining the faculty body, because of decreasing faculty supply and increasing number of faculty quit rates.
- The simulation model demonstrated the systemic nature of university management in the sense that a single decision in isolation may yield counter-intuitive results, if not coordinated with a number of other related decisions.

Galbraith (1982, 1989, 1998a, 1998a, 1998a) (Galbraith and Carss, 1989)

Peter Galbraith in an extended series of papers (Galbraith (1982, 1989, 1998a, 1998a, 1998a) (Galbraith and Carss, 1989) has investigated the impact of managerial policy on HE institutional performance, with particular emphasis on time delays between policy change and the results being evident.

Galbraith (1998a, 1998b) has identified many positive and negative loops in Queensland University. An example of a positive loop is the process by which an increase in enrolments provides additional resources, which supports an increase in academic staff, which provides for the enrolment of more students, which produce additional resources and so on. An example of a negative loop is the process by which an increase in staff increases the salary bill, which reduces resources available to employ staff, which reduces the rate at which new staff can be appointed, which leads to a reduction in staff etc. In both of these two loops, delays of the order of years are involved before the loops are closed. The structure of complex systems ensures that they are inherently difficult to manage. As Forrester (1994) confirms:

"A problem is perceived, an action proposed, a result is expected but the result does not often occur. Symptom, action, and solution are not isolated in a linear cause-to-effect relationship, but exist in a nest of interlocking structures."

Galbraith argues that recent pressure on the administration of Australian universities is due to government interventions, which has created tensions between the achievement of academic and fiscal goals. He has constructed a SD model to simulate competition between different schools that belong to a faculty that has limited funds. A wide range of employed and postulated policies are investigated. He demonstrates cyclic behaviour is endemic within the current climate despite the intention of managers to achieve stability. Finally, the results of the policy analysis are embedded within a wider discussion of the climate of institutional management, in which the concepts of "corporation" and "ecology" are employed as contrasting metaphors.

Key Findings

• Behavioural outcomes for a university, as for any complex system, are determined primarily by the combination of multiple interacting feedback loops that are a consequence of structural arrangements. The delays and non-linearities in the loops mean that behaviour cannot be predicted easily.
• Strategic plans serve a variety of purposes. For example, within teaching and learning contexts plans to improve teaching methods and to make assessment procedures more accountable are demonstrably worthwhile. Their impacts on university practices are direct, and the image of the institution indirect as public perceptions of changes in quality accrue over time.

• The production of separate plans for faculties, departments and schools means that pursuit of individual targets can in fact undermine the attainment of general institutional goals. If every unit succeeds with an ideal of achieving student growth in a situation where total funding is limited then some units must loose. Galbraith sees this as a version of the 'tragedy of the commons' because there exists a 'commons' or a limited resource shared amongst a group of competing units and the units dictate their own actions in order to maximise their own gains from the common resource. The common resource becomes less productive per individual demand as units work harder for less and less.

• It is argued that the culture of institutional administration, to the extent that it limits its vision to a corporate identify, lags a metaphor behind the world at large. While the world at large, including corporate interests, is moving its thinking beyond self-interested practices, to consider issues such as global warming, the replenishment of forests, and the protection of endangered species, institutional management remains locked in a competitive corporate prison. As Senge (1990) reminds us "*Few large corporations live even half as long as a person*".

The SD models developed demonstrate the utility of SD in the HE management domain but do not (to date) exploit the full potential in the QA area.

8. The Holon Planning and Costing Methodology

The SD models developed so far have not concentrated on the issue of quality management and audit. From our summary and comments above it is clear that the SD approach has the capacity to play a valuable part in the development of better practice in the area by highlighting the linkages between the "levers" that management can direct and the "outcomes" that result from these policies.

Furthermore as Bolland & Fowler (2000) point out: "Public sector management occurs within a complex system involving several nominally independent stakeholders, coupled with informational and resource flows and behaviour that is characterised by inertia and multiple feedback loops. It is therefore apparent that the generic principles of systems thinking and system dynamics potentially provide a useful framework within which the issues of performance measurement, performance indicators and improvement initiatives should be considered…"

The complexity of Public sector management, system and stakeholders means that it is often difficult to "frame" the study and effectively involve all the stakeholders. As Bell *et al* (2000) point out, although Galbraith (above) demonstrates the usefulness of the SD technique for HE planning through highlighting its explanatory strengths, he

did not work with any key decision-makers at Queensland University. This is a significant limitation of his research, because the findings, though interesting, so far have had little impact on the planning of the university. We contend it is important to work with stakeholders in order to identify the relevant problems, determine the influence and feedback structures and calibrate the model. Moreover, model ownership must be achieved through passing verification and validation tests to the satisfaction of the stakeholders.

In an attempt to produce a tool to "frame" the study and effectively involve all the stakeholders the IMMaGe Group at South Bank University (Bell et al, 1999, Warwick et al, 2000a, Bell et al, 2000,) have defined an approach to higher education planning and control known as the Holon Planning and Costing Framework. The framework stems from some research into the limitations of existing methodologies for software process improvement (Bell et al, 1999, sections 5.1-5.3). The approach is rooted in soft systems methodology as described by Checkland (Checkland, 1981) but acknowledges the limitations of this methodology resulting from its lack of any metrication upon which to measure progress towards the declared goal. By proposing a combination of the soft systems approach with the Goal/Question/Metrication (GQM) ideas of Basili and Rombach (Basili and Rombach, 1988) these shortcomings are reduced.

The original Holon Methodology (Warwick et al, 2000a, pp. 3-5) consists of four main stages. The first, Framing, is the identification and briefing of the stakeholders in the system under study, the definition of the problem situation and the main environment and framing Holons. Holons are representations of the social situation encapsulating the problem. The second stage is Enquiry, which is the identification of the problem(s) as perceived by the stakeholders. It involves the drawing out, through fact-finding techniques, the stakeholders' understanding and definition of the problems to be solved. The solution to these problems can be categorised as essential or desirable.

The third stage is Metrication, which involves the application of the GQM methodology to the identified problems in order to assign metrics and define their collection. The metrics and the suitability of the method of their collection are validated by the stakeholders as part of this stage. The final stage of the process is Action and involves the use of templates to collect the metrics and store them for use by the organisation to inform analysis of past performance or to guide decisions on alternative courses of action.

The Holon Methodology was originally developed as a "post-mortem" tool to assist in identifying some of the problems associated with completed software development projects. The aim was to give development teams and their sponsors a better understanding of the process with a view to software process improvement. It was subsequently adapted to address some of the problems associated with Higher Education planning, prompted by the publication of the Dearing report (National Committee of Inquiry into Higher Education, 1997) and its expressions of a vision for higher education (Bell et al, 2000, p. 3).

The revised methodology, "the Holon Planning and Costing Framework", supplements the framing and enquiry stages with a subsequent Vision stage. Here, the main problems that afflict the achievement of a vision of a desired future state are

identified and prioritised as part of the interaction with the stakeholders. The problems are listed and transformed into identified goals and metrics are then developed to enable the assessment of the problem and the subsequent performance of the organisation in addressing its solution. Data is collected against these metrics and this enables the moulding of performance indicators through which progress towards the achievement of the goals of the improved system can be assessed.

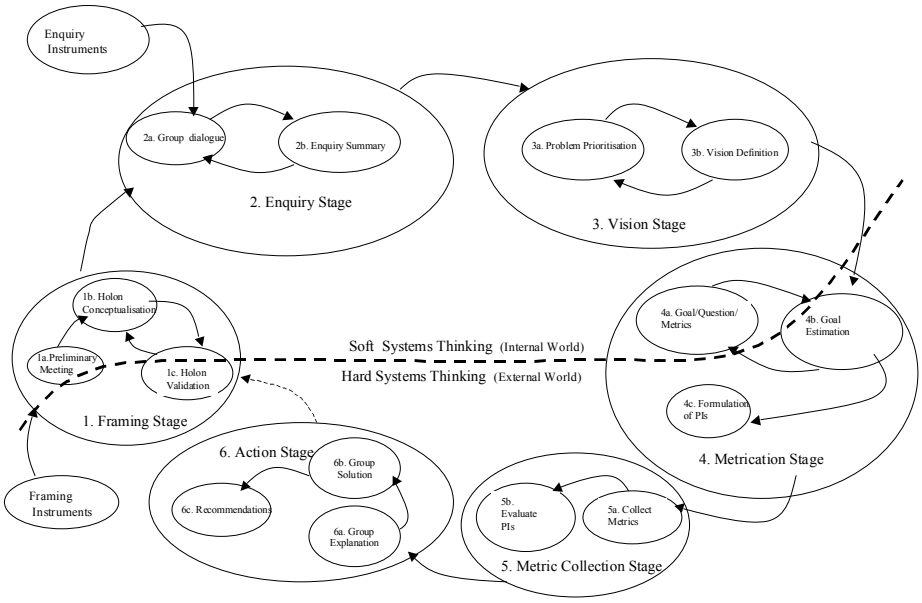

Figure 1.0: The Holon Framework (Bell et al, 2001).

In Bell et al (2001), the team distinguish their contributions to Higher Education Process Improvement and to Higher Education Process Control. They state "Process improvement research in HE is underpinned by the view that all issues of teaching and research quality revolve around improving the process. Additionally, it aims to enhance quantitative understanding through numerical representation of identified problems in order to improve change management decision-making. Process improvement focuses on 'characterising', *e.g.* establishing and enhancing metric baselines, and 'improving', *e.g.* removing process "bottlenecks", and is underwritten by representational measurement theory."

On Higher Education Process Control (ibid) they state: "Process control research in HE is informed by the notion that a systemic approach is needed to achieve quality teaching and research targets, and monitor the processes which impact on these, specifically in course delivery, resource management, *etc*. Our research is based around the academic year, *e.g.* semester one, semester two, and clearing, and involves: identifying academic milestones; deriving strategies to enable those milestones to be met; establishing a metrics collection and collation programme; monitoring differences between actual and estimated milestones; and explaining

differences through the use of algorithmic models to feed back into the strategies. We believe both HEPI and HEPC are inextricably linked through the use of metrics (see figure 2.0)."

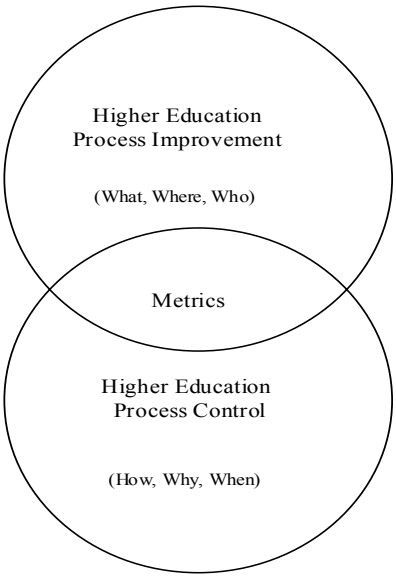

Figure 2.0: Highlighting the Link between Higher Education Process Improvement and Control (Bell et al, 2001).

The revised methodology was applied in a study of an academic department at South Bank University in order to help the department define and develop its strategy. In doing this, the investigators used the methodology to help the stakeholders understand the systems and processes affecting the operation of the department and how these will be affected by the changes necessary in achieving the vision of the desired future. The research was timed to coincide with a formal review of the department and its strategic plans that was being carried out by the university, as part of a rolling programme of review. The review was undertaken by academics from other parts of the university, together with subject experts from outside the university and, in some senses, mirrored aspects of the system of subject review undertaken by QAA and HEFCE. (Warwick et al, 2000b)

The application of the Holon Costing and Planning Framework led to the identification of many issues that were common to both the internal stakeholders and the review panel members. Indeed, the review did not raise any issues that had not emerged from the study. However, the study raised a number of issues that were not identified by the review panel (Warwick et al, 2000b, pp. 9-18) and its further application led to the identification of metrics that could be developed into Performance Indicators for use in helping the department achieve its vision.

One of the Holons identified was termed "Quality Management" (Warwick et al, 2000b, p. 18), but since the focus of the research study was on strategic planning and

resource utilisation, detailed investigation of this aspect did not take place. However, there was sufficient evidence in the study and in the background research to suggest that the methodology could be adapted further to address the area of quality review and audit. The team intend to address this aspect in the future.

9. Conclusions

This paper has described the pressures on the UK Higher Education sector and has charted the evolution of quality management and audit it the UK. We have shown the way that these forces have encouraged the use of Performance Indicators (PIs) and other metrics. We have discussed issues surrounding the use of PIs and shown that, in the vast majority of cases, discussion of performance indicators is restricted to the assessment of the efficiency and effectiveness of institutional management. In a few cases (such as staff student ratios) a link with teaching and learning is suggested but as yet no detailed research on this has been found. A few authors such as Cave et al (1997, p. 111) have drawn tenuous links between performance indicators and their possible use in teaching quality assessment, but others comment that PIs are not applicable to teaching quality assessment (Barneston and Cutright, 2000, pp. 281-286). This issue needs further investigation because links between performance indicators and "product" or "service" quality are often a significant feature of other industries. It may be that education is so specialised that this is more difficult or that the appropriate tools have not (until now) been available.

Apart from the difficulties referred to above PIs also have significant limitations as a management tool. As PIs as are normally measuring inputs or outputs to the organisations they do not directly consider the policies that the management can adopt. These are called 'levers' by Sherwood (2002) [see 7 above]. As we describe [7 above] SD models are an excellent way of exploring the links between 'levers' and 'outcomes'.

We have shown that while SD models may form a valuable component in a quality management and audit system in many instances it would benefit from a tool to enable it to better "frame" the study and effectively involve all the stakeholders. We have suggested that the Holon planning and costing framework is a suitable vehicle for this purpose and would benefit from further research. It can also generate useful data to calibrate the model and indicate useful PIs to collect in the future. One of the studies by the researchers at South Bank University compared an exercise on their own School using the methodology to analyse and review the strategic plans of the School. While this research was being undertaken, the university was conducting its own review of the School as part of its internal monitoring procedures. One of the main conclusions was that the Holon methodology identified all the issues that the review did and many more besides. Consequently, the methodology can provide a framework within which future studies of quality assurance in higher education can be set and will represent a useful enhancement to SD in this domain.

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