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This paper describes the development of three courses that have run for more than 30 years at Warwick Business School in the United Kingdom. The courses focus on supporting the strategy process, which consists of activities such as: setting direction and goals; creating, rehearsing, and evaluating strategic initiatives; exploring the external environment; and measuring and learning from organisational performance. We present the structure of the three courses (for undergraduate, Specialist Masters, and Executive MBA students) taught during the 2009–2010 academic year, highlighting the frameworks, methods and models, or *tools*, covered on the different courses. A key contribution of this paper is that it demonstrates how tools drawn from the operational research/management science field, but also other fields, including strategic management, can be brought together to support the strategy process. The tools are typically but not exclusively qualitative, or soft, and participative in nature. We describe how we teach five particular tools in some depth: visioning, scenario planning, SWOT/TOWS analysis, system dynamics, and the balanced scorecard. We also highlight how these tools are combined with other approaches covered in the courses. This paper ends with reflections on our experiences of teaching the courses and signposts potential future developments.

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1. Introduction

A number of authors comment on the demise of operational research/management science (OR/MS) from the business school core curriculum. Grossman (2001) notes that the reasons for its demise from MBA programme include, inter alia, the gap between the content of the OR/MS course, which is typically quantitative in nature and the requirements of MBA programmes to train general managers. In addition, Grossman (2001) points to the misalignment between the mathematical focus of the traditional OR/MS course and MBA student interests in the practise of management, which gives rise to their desire to learn practical skills. Such a quantitative focus to OR/MS courses is not restricted to the United States. However, in the United Kingdom, as Olafsson notes "Soft-OR seems to play a much bigger role..." (Olafsson 2004, p. 29). Thus core UK business school OR/MS courses in many cases span both hard and soft OR as is the case here at Warwick (Robinson et al. 2003) to remain relevant to MBA students' interests.

In this paper, we describe three courses that have evolved over a 30-year period; this paper contributes to the debate about the professional presence of OR/MS in business school programme. The courses combine both hard and soft tools, with more emphasis on the soft. We use the generic term *tool* to cover frameworks, methods, modelling approaches and techniques be they quantitative or qualitative, used in their original or modified form or combined with other tools to suit the user's needs (Stenfors et al. 2007). Henceforth we refer to tools rather than approaches, methods, models, frameworks, etc. The courses also align themselves with one of the core components of any business school syllabus; namely, strategy, something that others in the OR/MS field have also done or advocate (Markham and Palocsay 2006, Fry 2008). The focus of the courses is how tools can support the strategy process within organisations. A novel feature of the courses is that they draw on tools from the OR/MS and other fields, notably strategic management, some of which are combined for supporting the strategy process providing students with insights into the role of multimethodologies to support unstructured problems.

This paper makes three contributions. First, it demonstrates that a broad range of tools can be used to support the strategy process, thus supporting the findings of previous surveys of practitioners'

use of tools to support the strategy process (Rigby and Bilodeau 2007, Stenfors et al. 2007, O'Brien 2011). Second, it presents details and experiences concerning how such tools can actually be taught, something that is missing from the literature, particularly in the context of a course that covers multiple tools. Finally, it contributes to the debate about what constitutes the fields of soft OR and problem structuring methods (PSMs) by distinguishing between them and arguing that many of the tools used to support the strategy process, including those presented in the paper, belong to the realm of soft OR.

This paper is organised as follows. First, we introduce the context of the courses; namely, strategy and define what we mean by strategy and, in particular, a strategy process. Next, we distinguish between soft OR and PSMs, and explore the characteristics of tools from these fields. We then introduce the courses that are the subject of this paper, presenting their origins and rationale, design, assessment methods, supporting materials, and practical teaching issues. In each of these sections, we capture the development of the courses over time, and also present the version of each course, which ran during the 2009–2010 academic year. We then consider the content of each course and explain how we teach five particular tools: visioning, scenario planning, SWOT/TOWS analysis, system dynamics, and the balanced scorecard. In addition, we highlight how these tools can be combined in different ways to support the strategy process. We end this paper with some reflections on our experiences and outline some avenues for further development.
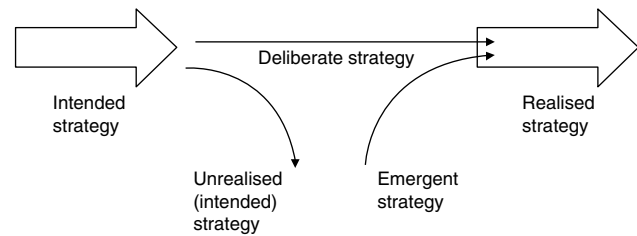
2. Strategy and the Strategy Process

Strategy is something an organisation both has and does. Mintzberg (1978) provides a definition of strategy in terms of five P's (plan, ploy, perspective, pattern, and position). However, these definitions fail to capture fully the doing or making of strategy, thus we add a sixth "p," that of process and it is the support of this that forms the focus of this paper.

Within the strategy literature, there are two archetypal views as to the nature of strategy, and therefore the process by which it is developed. Figure 1 shows how Mintzberg (1978) articulates these views and explains the relationship between them.

The intended strategy of an organisation is one which has been purposefully designed; some intended strategies will come to be *realised* and others will not. However, realised strategies do not only consist of intended ones; changes in the internal and external environments can lead to other decisions being made "along the way" and outside the formal process—these are referred to as emergent

Figure 1   Types of Strategies

Source.   Mintzberg (1978, p. 945).

strategy. Mintzberg's research also found a number of other relationships between intended, emergent, and realised strategies, including "...intended strategies that, as they get realised, change their form and become, at least, in part, emergent; emergent strategies that get formalized as deliberate ones; and intended, strategies that get over-realised." (Mintzberg 1978, p. 946) As the use of tools is necessarily intended, the focus of the courses is on intended strategy while recognising the existence of emergent strategies. However, this does not preclude the possibility that the proposed process can be used to make sense of or to rehearse the emergent strategies through the use of some of the tools covered.

The "purposeful design" (Hart and Banbury 1994) of a strategy process consists of a collection of activities, such as: setting direction, goals and objectives, formulating and evaluating options, exploring the external environment, assessing internal resources and capabilities, implementing plans, and monitoring progress against the desired direction. It is our view that the activities in this process do not necessarily have to be conducted in sequence or within a single slot of time; Johnson et al. (2006, p. 586) note that "...processes of strategy development differ over time and in different contexts." For example, a change within the external environment such as the removal or introduction of regulation may necessitate the exploration of its implications; in time this may lead to a review and revision of the organisation's direction, something that might be seen as the first activity in the process. A further example is the need to understand unexpected positive results generated from strategies that the management team had not designed purposefully.

Later in this paper, we introduce the strategy process that forms the heart of the courses described in this paper. The following section introduces our understanding of PSMs, the soft tools for supporting the strategy process.

3. Soft OR and Problem Structuring Methods

Whilst some treat the terms soft OR and PSMs as synonymous (Vidal 2004, Robinson 2007), others distin-

guish between them. Mingers (2011) proposes that the term PSM suggests that such methods can only structure problems, while soft OR methods can solve or resolve them. Under the broader heading "soft management science," Pidd (2009) also suggests that problem structuring can be thought of as a prelude to more formal modelling but is sometimes seen as an end in itself. In this paper, we adopt the view that PSMs are a subset within the broader field of soft OR. According to Mingers (2001, p. 731), soft OR methods have the following characteristics:

• "The methods are not mathematical but they are nevertheless structured and rigorous. They are based on qualitative and often diagrammatic modelling procedures. Obviously, numerical information may be included but not complex equations.

• They allow a range of distinctive views to be expressed and explored, and embrace multiple and conflicting objectives without collapsing them into a single, often financial, measure.

• They encourage active participation of stakeholders in the modelling process often through facilitated workshops of those affected by the problem. In order to encourage participation, models should be transparent to the participants . . . .

• Significant uncertainty is expected and tolerated as is a lack of reliable quantitative data.

• They aim for exploration, learning, and commitment rather than optimization."

Such soft methods have been designed to address what Rosenhead and Mingers (2001, p. 15, Table 1.4) describe as the "swamp conditions" of "wicked problems," which are situations where there are:

• multiple actors
• multiple perspectives
• incommensurable/conflicting objectives
• prominent intangibles.

Just as the above highlights the context of the swamp conditions as a supporting argument for the application of soft methods, so too it is important to articulate the context within which the strategy process sits as it bears similarities to the swamp. According to Dyson et al. (2007, p. 3) strategic decisions and issues show characteristics of:

• "Breadth of scope and therefore implications right across and beyond the organisation.

• Complexity and interrelatedness of decision making context, demanding integrated treatment.

• Disagreement about the motivation for, and the direction and nature of, development.

• Challenging the status quo, creating a politicised setting where change is contested."

Dyson et al. (2007, p. 3) state that other important characteristics of strategic decisions and issues include:

• "Enduring effects, possibly of an irreversible nature, with little or no scope for trial and error.

• Significant time lag before impact, with widening uncertainty over the time scale involved."

Because the context within which the strategy process sits shares many characteristics with the swamp conditions described above, it is appropriate to consider using tools intended for the swamp conditions to support the strategy process. The terms soft OR and PSM often bring to mind the three most commonly cited approaches; namely, the strategic options development and analysis methodology, soft systems methodology (SSM) and the strategic choice approach. Other approaches have been included within the PSM field such as: robustness analysis, drama theory, and confrontation analysis (Rosenhead and Mingers 2001). Rosenhead and Mingers (2001) also identify some "near neighbours" to PSMs, which share many if not all of the characteristics of PSMs: the viable system model, system dynamics, and decision conferencing based on decision analysis.
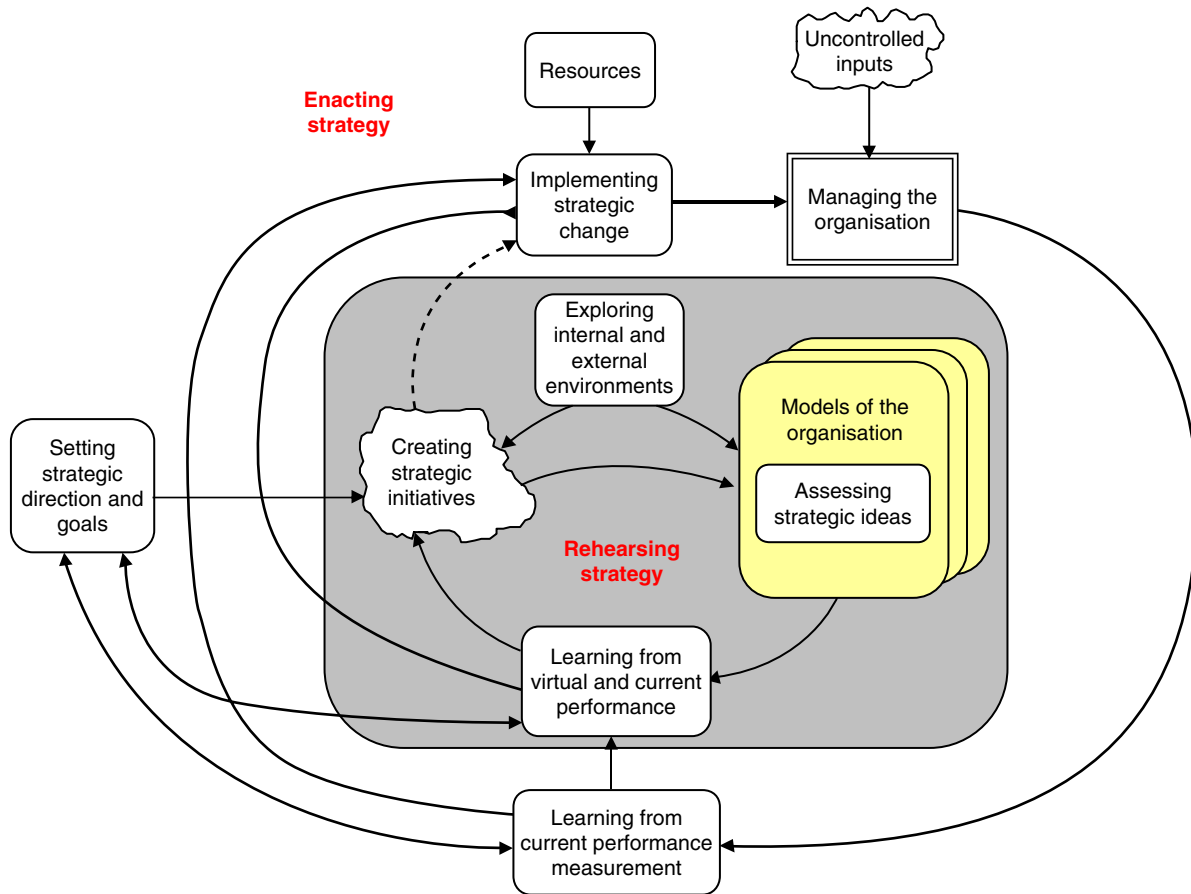
Whether an approach is strictly a PSM or belongs to the broader field of soft OR seems to be a matter for debate (Rosenhead and Mingers 2001, p. 268), as many approaches share a number of characteristics. Recent special issues of the *European Journal of Operational Research* and the *Journal of the Operational Research Society* have certainly included a much wider collection of approaches under the banners of soft OR (Vidal 2004) and PSMs, respectively (Vidal 2004, Shaw et al. 2006, Franco et al. 2007). More recently, Mingers (2011) has considered whether a broader range of tools could be considered as soft methods and argued that this depends on how each tool is actually deployed; he also comments that hard tools have the potential to be used in a soft way, for example, qualitative system dynamics. Given the intrinsic nature of strategic problems as unstructured problems (Kunc and Morecroft 2009), many of the tools applied to these types of problems fall within the realm of soft OR. Thus we argue that visioning, scenario development, and SWOT analysis provide frameworks for structuring messy situations and incorporate perceptions, and they require the analyst to facilitate the exploration of strategic problems and hence can also be classified under the soft OR banner, particularly when the details of their deployment are considered, as detailed later in this paper.

4. Course Origins and Rationale

The three courses have their origins in empirical work from the late 1970s to early 1980s that investigated the practise of strategic planning, its processes, and the tools used to support the planning process (Dyson 1978; Dyson and Foster 1980, 1982, 1983).

Figure 2   The Strategic Development Process

From O'Brien and Dyson (2007, Figure 1.7, p. 12).

This research led to the development of a model of the strategic planning process (Tomlinson and Dyson 1983) and this model has been continuously developed over the years with the latest version, used as a framework for the current courses appearing in Dyson et al. (2007) and shown in Figure 2. There was also an interest in the nature of the tools used to support the process with Tomlinson and Dyson (1983) suggesting four classes of tools: data and intelligence, models of behaviour, projections, and decision aids. The role of the analyst with respect to such tools was typically that of analytical expert who used the tools themselves to produce analyses (or models) for consumption (or use) by others. The notion of the analyst as a facilitator of soft tools in a participatory way was conspicuous by its absence. More recent surveys (Clark and Scott 1995, Rigby and Bilodeau 2007, O'Brien 2011) have explored the use of a broader collection of "tools" to support strategy and, in particular, the strategy process. The collection of tools covers both hard or quantitative tools (e.g., system dynamics, decision/risk analysis, agent-based modelling, real options, and investment appraisal) and soft or qualitative tools (e.g., cognitive mapping, robustness anal-

ysis, SSM, SWOT analysis, visioning, and scenario planning).

According to Dyson et al. (2007, p. 20); the mapping between tool and activity in the strategy process, as illustrated in Figure 3, is not one to one. Thus it is quite common to find more than one tool being used to provide insight and support to a particular activity; some tools can also be combined to support the strategy process as is illustrated later in this paper.

We have adopted a toolbox approach for supporting the strategy process. We include tools in our toolbox in a planned manner—if a tool has something to offer a particular activity in the strategy process, we include it. We also adapt and modify tools with the experience of using them in both teaching and consulting practise. However, that is not to say that we do so without reflection. For example, our approach to using and teaching scenario planning has evolved over time as we have reflected on difficulties with particular aspects of the process as encountered by both participants and facilitators of the tool. We have then tried to ameliorate the difficulties through the modification of steps within the scenario development process (O'Brien 2004).

Figure 3   The Methods/Process Matrix

Topic	Direction	Creation	Rehearsal	Evaluation	Choice
Visioning	X	X			
Stakeholder analysis	X	X			
PSMs (*)	X	X		X	X
Resource-based view		X			
SWOT analysis		X			
Five forces		X			
Product portfolio matrices		X			
PIMS		X	X	X	
System dynamics			X	X	
Agent-based models			X	X	
Scenario planning		X		X	X
Decision/risk analysis				X	X
Balanced scorecard		X	X	X	X
Financial summary measures				X	X
Real options		X		X	X

From O'Brien and Dyson (2007, Figure 1.12, p. 20).
Note. (*) PSMs include cognitive mapping, drama theory, and robustness analysis.

The rationale or purpose of each course is to introduce students to the strategy process as a system of interrelated activities, which can be supported by the use of tools applied singly or in combination, thus highlighting the usefulness of multimethodological approaches to tackle messy situations. Each course is also designed to introduce students to a range of tools that can be used to support the different activities and to develop skills in applying a small selection of them. The core activities of a strategy process are: setting direction and establishing objectives and goals, exploring the external environment particularly in the context of future uncertainty, and evaluating strategic ideas. Thus our courses have at their core a focus on three tools each of which support these activities: visioning, scenario planning, and corporate or system modelling. Over the years, we have taken the view that these three core tools deserve more contact time to allow the students to develop skills in applying them. A consequence of this decision is that there is less time available to cover other tools; these are thus introduced to students but in much less depth. Such a choice has meant that over the years, we have maintained, developed (or brought in) skills to deliver this core material, and have adopted a more flexible approach to the other noncore material, drawing on expertise as and when it is available.

5. Course Design and Delivery
The earliest course entitled Strategic Planning Systems was developed in the early 1980s for the MSc Business Management Systems, a part-time modular programme developed with and supported by a consortium of businesses; this was later replaced by the Executive MBA programme. An undergraduate version entitled *Analytical Aids to Strategic Planning*

and one for the Specialist Masters MSc Management Science and Operational Research (MSOR) entitled *Strategic Planning Models* were also introduced. In the early days of running the courses, student numbers were relatively small, with the undergraduate course typically attracting at most 30 students, and the MSOR and MBA courses attracting about 20 students each. Later in this paper, we show the 2009–2010 course enrolments.

In the early courses, the teaching was through traditional lectures with the students carrying out exercises and assessments outside the classroom. The introductory session, common to all three courses, introduced the model of the strategy process (see Figure 2) and how the chosen tools related to it. One of the earliest versions covered: corporate modelling, models of behaviour, capturing expert opinion, environmental analysis, technological forecasting, scenario development, risk analysis, gaming, profit impact of market strategy (PIMS), product portfolio matrices, SWOT analysis, and techniques for strategy evaluation, including investment appraisal. Each topic was covered in a one- or two-hour session, typically in a traditional lecture, with the emphasis being on information transfer. The exercises, largely conducted outside the classroom, included model mapping, corporate modelling, Delphi technique, and scenario development where students working in self-formed groups were tasked with developing a set of scenarios for an organisation of their choice.

Over the years, four insights have shaped the delivery of the courses. First, is the use of team teaching because it has allowed a broader base of expertise to be available to students. Since the early days, a minimum of two staff have formed the core of the teaching team, providing expertise in visioning, scenario planning, and corporate modelling/system dynamics. The

choice of noncore tools included in the syllabus has largely been influenced by the availability of expertise in particular tools. The inclusion of noncore tools has created an environment where the use of multiple tools generates insights into the value of multiple perspectives for tackling complex problems. The OR/MS teaching group runs all three courses, thus its staff make up both the core and noncore teaching teams. For staff teaching, the core topics of visioning, scenario planning, and corporate modelling/system dynamics, the combined work load across the three courses, including the marking of assessments, makes up approximately half their annual teaching load. For those teaching the noncore topics, the work load is much less. In addition to academic staff, strategy practitioners are often invited as external speakers, for one or two sessions, to describe their use of tools to support strategy within their own organisations.

Second, we have observed that students learn tools best by trying to use them. Hence we provided students with more support in developing skills in the core tools of visioning, scenario planning, and corporate modelling through system dynamics, while maintaining an introductory level of coverage of the noncore tools. The increased support has been provided by timetabling more contact time for the core tools and incorporating an element of supported group-based work within the classroom rather than non-supported work outside of it. Such a decision had an impact on how the groups could be supported. While the ideal might have been for every group to have had a dedicated expert to support and facilitate their work, the constraints of resource availability meant that one or at most two experts could be on hand to guide in-class group-based work. We encouraged students to form self-organising groups with the staff members acting as advisors on process and content issues, only stepping in to facilitate specific and self-contained issues. This arrangement has also helped students to implement the lessons obtained from other courses, which teach facilitated group decision-making approaches. An important component of this "hands-off approach" has been the use of reflective learning where students have been encouraged to reflect on the process issues they encounter, for example, as part of each course assessment. Third, to avoid overlap between student groups and cohorts, and issues related to plagiarism, tutors allocated particular companies to student groups. The implication of this was that a good collection of suitable organisations needed to be maintained to allow rotation between consecutive academic years and between courses within the same teaching year. Fourth, keeping the collection of organisations current and related to up-to-date issues, such as reported in the media, has encouraged student engagement with the course,

as it allowed them to explore the genuine uncertainties and strategic decisions facing organisations at that present moment in time.

The following section presents the versions of the courses that were delivered in the 2009–2010 academic year.

6. The Courses Taught in 2009–2010

6.1. Course Structure
Table 1 shows the structure of the three courses, which ran in the 2009–2010 academic year. The undergraduate course has always been the most heterogeneous of all three courses, as it can be taken by students both internal and external to Warwick Business School; external students typically came from the Maths, OR, Statistics, and Economics degree programme, which is based in the Statistics Department. The Specialist Masters course is taken by students on the MSc courses in Business Analytics and Consulting, and MSOR; the MBA course is taken by students from the Executive MBA, Distance Learning MBA and Masters in Public Administration programmes.

In terms of student numbers, each course has grown significantly in size; Table 1 shows the 2009–2010 class sizes along with the number of breakout groups used for each course. Such class sizes have been typical for the past 15 years for both the undergraduate and MBA courses; the Specialist Masters class size dramatically increased with the introduction of the MSc in Business Analytics and Consulting in 2008.

In 2009–2010, the undergraduate course ran over nine weeks of the autumn term. It was taught in a large, flat lecture theatre with a capacity for 100 students. This particular flat lecture theatre has movable furniture, which can be rearranged for group work; in contrast, banked lecture theatres have fixed furniture, which does not facilitate students working in breakout groups. Both lectures and group work took place in this lecture theatre; students simply rearranged the furniture to create their own space for group exercises. The Specialist Masters course ran over eight weeks in the Spring term in a tiered lecture theatre; break-out rooms were available to facilitate group work where needed, as were computer laboratories to support the practical use of system dynamics software. The Executive MBA course took place over one week (Monday–Friday) and was based in a specially designed teaching centre consisting of a tiered lecture theatre surrounded by break-out rooms for group work.

Two of the paper's authors formed the core teaching team for each of the three courses. The Specialist Masters teaching team included one other member, a professor from another organisation with expertise

Table 1   Comparing the Structure of the Three Variants for the 2009–2010 Academic Year

Variant	No. of students/ No. of syndicate groups	Timetabled contact hours	Schedule structure	Schedule duration	Assessment methods
Undergraduate	78/14	27	1 × 2 hour slot 1 × 1 hour slot per week	9 weeks	Group scenario report (40%) Individual report on system dynamics case study (60%)
Specialist Masters	53/8	24	1 × 3 hour slot per week	8 weeks	Group scenario presentation (10%) Group scenario report (30%) Individual report on system dynamics case study (60%)
Executive MBA	44/8	31	4.5 full days (9.00–21.00)	5 days	Individual report on own organisation's strategy process, scenario development, and potential tool use (100%)

in drama theory and stakeholder analysis. The Executive MBA teaching team included an OR/MS staff member with expertise in SSM plus two strategy practitioners as invited external speakers.

The different courses shared three common learning objectives:
• To introduce a framework for the strategic development process.
• To develop an understanding of the methods and models available for supporting the process.
• To develop skills in applying a selection of the methods.

A single session was used to develop the framework for the strategy process; it followed the first chapter of the course text (O'Brien and Dyson 2007). The remainder of each course was then devoted to covering a range of methods and models that could be used to support the process. Methods were cov-

Table 2   Detail of the Time (Hours) Allocated to Specific Topics Across the Three Different Courses

Topic	Undergraduate	Specialist Masters	Executive MBA
General administration	1		
Strategic development process	2	3.0	2.0
Visioning	3.0	1.5	2.0
SSM			3.5
Drama theory		3.0	
Scenario planning	6	4.5	5.5
Gaming exercise	2		
Strategy formulation (SWOT/TOWS)	1	1.5	2.0
Corporate system modelling/ mapping/system dynamics	6	4.5	7.0
Performance measurement	3	3.0	3.5
Student scenario presentations	3	3.0	2.5
External speakers (various topics)			3.0
Evening group preparation (unsupported)			4.0
Total hours	27	24	31 + 4 unsupported

ered in one of three ways: either at an introductory level, via a single exercise, or in depth. Table 2 shows the time devoted to specific topics across the three different courses. For example, the *strategic development process* session was taught in a traditional lecture format. The undergraduate "gaming exercise" consisted of a single exercise based on a cost negotiation game for the supply of water to six Swedish regions (Stahl 1983)—this session, whose key learning relates to the positioning strategies adopted by the different groups, was briefed at the start and debriefed at the end, with the bulk of the time spent playing the actual game. In contrast, scenario planning and corporate system modelling/system dynamics were taught across a number of sessions, allowing each method to be explored in detail.

Other topics have been covered from time to time, e.g., strategic choice, robustness analysis, and real options, but corporate system modelling and scenario planning/SWOT analysis have been consistent core features; the inclusion of additional topics has reflected the availability of staff expertise. The robustness principle is incorporated in the scenario planning/SWOT component.

A key issue in designing such a course, is how much time to devote to the teaching of a particular tool and how to organise the student's learning of the tool. To answer the first point, quite detailed knowledge of the tool is needed both in terms of the nature of the material generated by students and the process (i.e., how to conduct a particular step), along with how to facilitate the use of the tool if applicable. Such knowledge accumulates over time, thus the authors arrived at the timings shown in Table 1 through a process of trial and error, with typically an incremental approach being adopted. They also took care to achieve a balance between the topics to ensure that the planned material could be covered in the time available. In terms of student learning of the tool, group-based learning has always been a feature of the course, particularly for the softer tools. Unfortunately, the resources to fully facilitate group use

of the tools have not been available. Thus teaching typically follows the pattern of minilecture followed by group-based practise, partly within the class and partly between classes. In the minilecture, the steps, of a tool are broken down into manageable steps, which are explained and illustrated. During the in-class group work, the tutor circulates between groups offering advice on content and process where necessary. Student use of and reflection on the use of the tool then forms part of each course assessment, which is described in the following section.

6.2. Assessment Methods
Over the years that the courses have run, the assessment methods have evolved with the courses. At one point, the undergraduates sat an exam, writing essays on largely theoretical issues. For the most part, though, these courses have been assessed by a combination of essays reflecting and critiquing the theory and reports describing the practical application of a tool covered on the course. By 1990, two practical assessments were in use: scenario planning and corporate modelling. These two assessments, with some modification, still form the current assessment method for both the undergraduate and Specialist Masters courses. For the 1990 scenario planning assessment, students could work individually or in groups and were tasked with developing a set of scenarios for an organisation of their choice. Students then wrote an individual report describing the scenarios they had developed along with recommendations regarding the organisation's future strategy. They also had to reflect on any issues that they had encountered in using the tools and critique the value of scenario planning for supporting strategic development. Over the years, we have shifted the emphasis from student-chosen organisations to tutor-chosen organisations and students all working in groups rather than individually. For the scenario assessment, we have also moved to group reports rather than individual reports as a response to the reduction in contact hours and student credit for courses as part of various programme redesigns. In addition, groups are asked to produce a vision for their organisation and to incorporate this, along with robustness checking, into the strategy evaluation part of the scenario process, as is described later in the paper.

In 1990, corporate modelling was assessed via an in-house case study with an accompanying spreadsheet model. The assessment encouraged students to conduct a sensitivity analysis to explore the impact that changing decision variables could have on key performance indicators, as well as a scenario analysis based on possible external future events. The students were also required to produce a corporate system influence diagram or map of the key variables in the

model and to use this to explain what would happen if the organisation did nothing (i.e., a base case). The ultimate objective of the assessment was the recommendation of sensible robust future strategic options given an understanding of the underlying system structure. In the latest run of the courses, corporate modelling is undertaken through the use of system dynamics modelling. This component of the courses is assessed by an individual piece of work analysing an external (public limited company) case study involving the use of a system dynamics model, applying the concepts of the resource-based view of the firm, as suggested in Kunc and Morecroft (2009), to explore the consequences of particular strategic options.

The Executive MBA students have always had a different assessment, which allows them to apply their learning to their own organisation. It consists of a single assessment divided into three components. The first component asks them to describe and evaluate the strategic development process of their organisation. The second component requires them to develop scenarios and strategic responses for their organisation. The final component invites them to explore how other methods covered on the course might be used by their organisation to support the strategy process.

The following are four key insights from our chosen methods of assessment:

• Practise-based learning—student feedback has indicated that they prefer to learn the tools by using them.

• Group-based learning—many of the tools covered on the courses are used in group-based settings in practise. The richness and realness of student experience has been improved by group use of the tools compared to individual use.

• Reflective practise—it has been important to engage students in reflecting on their experiences in using the tools—not only does this improve their learning but helps the tutors to innovate and modify the actual tools themselves based on practical feedback of issues with tool deployment.

• Currency of materials—student engagement is improved when both in-class and assessment examples are based on genuine organisations facing real issues at that moment in time; in reality, such issues are messy and unstructured.

6.3. Supporting Materials
Initially, there was no course text although there was a reading list of books and articles. By 1990, Dyson had produced an edited collection entitled *Strategic Planning: Models and Analytical Techniques* (Dyson 1990), which included classic articles on the TOWS matrix (Weihrich 1982); product portfolio matrices (Hax and Majluf 1983a, b); cognitive mapping

(Eden 1990); scenario development (Schnaars 1987); corporate modelling (Naylor 1976); system dynamics (Hall and Menzies 1983, Morecroft 1984); risk analysis (Hertz 1979); and robustness (Rosenhead et al. 1972). A second edited collection by Dyson and O'Brien (1998) and entitled *Strategic Development: Methods and Models* appeared in 1998, including articles by: Kaplan and Norton (1992) on the balanced scorecard; Porter (1991) on the five forces model, value chain analysis, and the resource-based view; Gregory and Keeney (1994) on stakeholder values; Ormerod (1995) on soft OR; Schoemaker (1995) on scenario planning; Warren (1995) on cognitive mapping; and Trigeorgis (1993) on real options. The current text entitled *Supporting Strategy* edited by O'Brien and Dyson (2007) was written largely by the group of people who typically have had some involvement in delivering one or more of the courses over the past 5–10 years. The book includes the following tools: visioning, scenario planning, drama theory, PSMs, system dynamics, agent-based modelling, decision risk analysis, performance measurement, robustness analysis, and real options.

6.4. Teaching and Learning

The following subsections of this paper describe how we teach five tools on the courses: visioning, scenario planning, SWOT/TOWS analysis, system dynamics, and the balanced scorecard. Where relevant, we highlight how tools are combined in a multimethodological approach.

6.4.1. Visioning. A vision describes a desirable future for an organisation; it gives a sense of direction and purpose, thus providing a focal point for strategic development, both in terms of developing strategic options and reviewing performance.

Visioning appears in the early part of our courses as it provides a natural starting point for strategic development. There are two components to our teaching: identifying criteria for evaluating a vision and introducing frameworks for vision development. The criteria for assessing the quality of visions are drawn from the extant literature. Students are presented with a collection of anonymised material drawn from a set of UK retail organisations. They are invited, in groups, to discuss the criteria and rank them in order of importance. They then produce a weighted score for each organisation's material. Scores for particular organisations naturally vary across groups, thus it is helpful to follow this exercise with a discussion on what students think is most important amongst the visioning criteria. It is also fun to see whether students can correctly guess the identities of the organisations. Where the language of the vision material matches the language used in publicity and within the organisations, students often correctly identify the organisation, however, where the language is generic

(e.g., we want to be the best at X) or vague, they often get the identity wrong.

The second component of the visioning teaching is the introduction of a number of frameworks, methods, and models for vision development. Students are introduced to these frameworks and are then free to choose which of them they use to develop a vision for their allocated organisation. Lipton (1996, 2003) argues that a vision consists of three components: mission, strategy, and culture, where mission captures the core purpose of the organisation, i.e., the reason for its existence; strategy describes how the mission will be achieved, and culture captures the values that are important to the participants developing the visions. Collins and Porras (1996) provide a framework that features two key components: the core ideology consisting of core purpose and core values and the envisioned future consisting of the big hairy audacious goal (BHAG) and a vivid description of what it feels like to have achieved the vision. Articulating a BHAG is often perceived to be difficult so students are also introduced to a short visioning role-play exercise (O'Brien and Meadows 2007).

In the Executive MBA course, we have recently integrated an introduction to SSM into the visioning sessions, with a colleague with experience in this methodology leading these sessions. Here, the future identity of a business unit or organisation is articulated using a systemic modelling language. SSM provides an ideal modelling language and utilises the concept of a human activity system (HAS). Detailed system specifications can be developed using definitions statements (named *root definitions*) and activity models. This allows clear design specifications to be developed to articulate the future (desired) identity of the company (Hindle 2010). Specifically, students are given a short lecture introducing them to both rich picturing and HAS modelling.

In break-out groups, students are allocated an organisation for the visioning and scenario planning components of the course and invited to review its current vision and to create a new vision for the organisation. Students typically draw on the variety of material presented to them to create a vision for their allocated organisation. For example, they may use the Collins and Porras (1996) framework to help structure the component parts of the vision, while using some of the material from the SSM session to help them model the current organisational issues in the form of a rich picture and the HAS modelling to articulate some of the detailed content of the vision. For all student groups, the vision they develop is used again toward the end of their course as one of the criteria for evaluating the strategies that have been created from an assessment of the scenarios they have developed for their organisation. In this way,

visioning and scenario planning are combined in an additive manner (Bennett 1985), with the output of the visioning process feeding as an input to the scenario planning process.

6.4.2. Scenario Planning and SWOT/TOWS Analysis. This section describes an example of how the courses combine tools in supporting strategy. Scenarios, like visions capture images of the future; indeed visions can be considered to be normative or value-laden scenarios (Ducot and Lubben 1980). However, it is helpful to distinguish between the two—our preference is thus: a vision articulates a desirable future description of an organisation, whereas a scenario captures a possible future that an organisation may have to face. Also, scenarios typically focus on the external environment, and thus capture issues that are beyond an organisation's control. Given that we do not know how the future may unfold, scenarios are a useful tool for capturing and assessing the impact of uncertainty. Thus scenarios are typically presented as sets because a single scenario cannot capture the range of uncertainty inherent in the future. A number of approaches to

scenario planning exist (Huss and Honton 1987) spanning the quantitative and qualitative spectrum. The approach we teach at Warwick falls under the intuitive logics banner and its development over the years has been influenced by a number of authors (Linneman and Kennell 1977, Schoemaker 1995, Van der Heijden 1996) as well as our own experiences (O'Brien 2004).

At Warwick Business School, the scenario planning process is taught across six class sessions; each session lasts between one and two hours. Students are organised into break-out groups and each break-out group is allocated an organisation by the class tutor. Organisations chosen are typically well known, e.g., high street retailers and media organisations for which the tutor has checked that there is reasonable access to information via the Internet. Organisations are rotated across courses and academic years to avoid plagiarism; choice of organisations is also influenced by what is currently topical. The typical structure of a class session begins with the tutor providing a short lecturette lasting 20–30 minutes to explain and illustrate a particular stage of the process. Table 3 shows

Table 3   Detail of Sessions and Tasks Involved in Teaching Scenario Planning

Class session	Stage in scenario process	Tasks undertaken
Work conducted prior to start of module and reviewed in first session	Scene setting	Research organisation's vision, strategy, background Agree planning horizon Agree focus of the exercise
1	Generate factors	Brainstorm factors Check coverage of factors across PESTEL categories
2	Factor reduction	Reduce number of factors Define ranges of uncertainty Identify key factors (uncertainties/certainties) Map links between factors (consistency check)
3	Theme selection	Generate and select key themes Produce raw scenarios Check internal consistency Produce revised scenarios
4	Produce narratives	Write narrative for each scenario Create a name/title for each scenario
5	Assess impact of scenarios	Undertake SWOT analysis to identify opportunities and threats posed by future scenarios Assess strengths and weaknesses posed by current resources and competences
	Strategic option formulation	Undertake TOWS analysis to generate ideas for strategic options
	Evaluate ideas	Check alignment of options to strategic vision Assess robustness of options across scenarios Assess stakeholder responses to options Recommend options for further evaluation
6	Presentations	Each group presents their scenarios and strategic responses to the rest of the class

the typical structure of exercises for teaching scenario planning, which follows an evolved version of the process described by O'Brien et al. (2007). The remaining time in a session is used for students to work through the same stage in their break-out group on their allocated company. The tutor circulates amongst the groups and helps with queries concerning the content of the scenarios or the process of their development. Groups are expected to have completed the stage by the start of the next session, meeting in their own free time to complete the work if necessary. Whilst process issues are relatively easy to resolve, content issues often prove much harder because they typically concern subjective views of how the future may evolve.

Bennett (1985) notes that there are at least three ways in which tools can be combined: addition, enrichment, and integration. By taking scenario planning as the overarching method, our current process enriches it using a number of other tools. For example, the PESTEL (Political, Economic, Social, Technological, Environmental, Legal) framework (Johnson et al. 2006, pp. 65–68) is used to help brainstorm the factors, external to the organisation but which have an impact on its future. Also, influence diagrams are used to map connections between factors, which helps check the internal consistency of the individual scenarios developed. Other tools are combined in a more additive or integrative manner where the tools are used sequentially. For example, once the scenarios have been developed and each narrated, SWOT analysis is used to assess their impact on the organisation. Resources and competencies are identified from a *current* appraisal of the internal organisation and are captured as strengths and weaknesses; *future* potential Opportunities and Threats are identified within the scenarios. The output of the SWOT analysis is then fed into a TOWS analysis (Weihrich 1993) to help generate strategic options for the organisation to consider in the light of the *future external* scenarios and the *current internal* resources and competences (options may include the securing or development of resources or competences). A stakeholder analysis (Bryson et al. 2002) is then conducted to explore the stakeholder responses to both scenarios and potential strategic options. Robustness and vision alignment are both used as criteria for selecting options for further evaluation. The scenarios and the associated organisational strategic responses developed by each group are then presented to the rest of the class.

6.4.3. System Dynamics. As part of the strategic development framework, Dyson et al. (2007) suggest that initiatives should be rehearsed through the inner loop "Rehearsing strategy" in Figure 2. In this loop, strategies can be tested, modified, and refined. These tests can identify unsatisfactory performance

that leads to changes in strategic initiatives or implementation plans. System dynamics modelling and simulation, as part of the Supporting strategy courses, aim to improve students' mental models of dynamic complex systems, so that they can clearly understand the problems highlighted during the rehearsal phase of the strategic development process as the following quote illustrates:

> The modelling process engages managers in a dialogue about strategy and its likely consequences, by providing opportunities both for assessing strategic ideas and learning from virtual (or simulated) performance. ...Models and simulators compress time and space so that it becomes possible for managers to experiment and to learn what the consequences of their decisions are in the future and in distant parts of the organisation. (Kunc and Morecroft 2007, p. 158)

Our approach to the use of system dynamics within the strategy rehearsal process aims to improve management learning about dynamic complexity—a modelling for learning approach (Morecroft 2007)—and to identify the set of resources perceived by managers to be strategically relevant for firm performance (Kunc and Morecroft 2009). The model is used to *test strategies, learn about the virtual performance and challenge management theories to improve the future performance*. In this approach, modellers and users of models have to be prepared to explain the strategies in a transparent way (using graphs of key variables and showing the linkages between interventions and performance), so that other participants during the strategic development process learn from the simulations. Table 4 describes the structure of the system dynamics teaching.

The main objective of our classes is to teach students, as potential future users of models, to be able to visualise feedback processes affecting the success of strategic initiatives as well as to be able to identify the drivers of firm performance. After the explanations of feedback processes, students develop two simple models to rehearse strategies playing the role of consultants. The rehearsal process implies that students have to make the model *transparent* and *facilitate learning* rather than problem solving to provide an *optimal solution* like in hard OR. We emphasize the importance of causal relationships and graphs over time to explain behaviour and feedback processes. For the Executive MBA, we start our sessions (as we have an extra hour) with the use of a microworld or role-playing simulation game (Senge and Lannon 1990) so students can experience the issues related to dynamic complexity before we start explaining the concepts of performance under dynamic complexity.

For their system dynamics assessment, we give our undergraduate and Specialist Masters students a description of a modelling project. The objective

Table 4   Detail of Sessions and Tasks Involved in Teaching System Dynamics

Class session	Stage in system dynamics modelling class	Tasks undertaken
1	Introduction to performance of dynamic complex systems	Presentation of *archetype models*, which are simple models based on real cases that illustrate the concept of feedback loops.
2	Developing dynamic hypotheses	After explaining the archetypes, we suggest to students that any business model consists of a series of positive and negative feedback loops interacting together. This session offers students the opportunity to practise this concept through a series of examples extracted from *The Economist*.
3	Developing a system dynamics model to rehearse strategy	Students develop one model together with the lecturer. Students rehearse strategies suggested by the lecturer and their own ideas.
4	Developing a second system dynamics model to rehearse strategy	Students develop one model together with the lecturer. Students rehearse strategies suggested by the lecturer and their own ideas.

of the assessment is to test students' development of mental models of dynamic complex systems as they go through a *guided modelling* project cycle. This approach consists of the development of an imaginary consulting project where the assessment describes the steps to build a model and then certain requirements from an imaginary client related to strategy rehearsal processes. We have employed this approach because the short time allocated precludes asking students to undertake complex model building assessments and we intend students to become users rather than developers of models but with a clear understanding of the possibilities of modelling resource-based strategies.

6.4.4.   The Balanced Scorecard and Systems Thinking. To understand how long-term, nonfinancial objectives of interconnected processes, areas or functions in the organisation translate into value, Kaplan and Norton (2004) developed the idea of mapping causal relationships between strategic objectives. Kunc (2008) proposes the use of systems thinking and causal loop diagrams as tools for mapping managers' conceptualisation of the firm as a system (Mingers and White 2010) during the initial stage of developing performance management systems. By employing this approach, a mix between common and unique performance measures can be found reflecting business' reality, adequacy, and practicality (Neely et al. 2003). The interconnectedness shown in the causal loop diagram also helps managers to comprehend how their decision-making processes may affect the leading indicators. Feedback loops help managers to move from unidirectional causal relationships to bidirectional relationships, and what is more important, they help them to visualise the dynamic complexity of their business. Causal loop diagrams can uncover multiple effects over one performance measure, which usually contributes to managers' perceived lack of interrelationships between different measures. A system dynamics model, using the performance indicators agreed during model development of the causal map, can be used as a reality check

for a set of indicators developed using causal loop diagrams. For the Executive MBA and Specialist Masters courses, we teach the balanced scorecard within a single day, using two 1.5-hour sessions, as follows:

1. *Introduction to performance measurement systems.* We review the concept of performance measurement systems from financial performance to strategy maps (Kaplan and Norton 2004).

2. *Design of a strategy map.* During the second part of the day, the students work in groups on a case study used as a basis for developing a strategy map using causal loop diagrams, then identifying measures, targets, and initiatives. Each group has to present its strategy map. Different world views tend to surface during the discussion.

6.4.5.   Key Insights for Teaching and Learning. A number of the insights described in previous sections apply here. In addition, the following observations offer insights related to the teaching and learning experiences of both staff and students:

• The potential for student led learning—this is best illustrated with the visioning material taught to the Executive MBA students. The students are introduced to a number of relevant tools for vision development (e.g., visioning frameworks drawn from the strategy field, SSM). They are then free to draw on the approaches, rather than being given a singular prescriptive tool for vision development.

• Learning from the experiences of others—having students work in groups and then present and discuss their results in plenary offers many opportunities for the student body to learn from each other's experiences, both in terms of failure and success of tool use. Such varied experiences also provide opportunities for staff to reflect on tool development (O'Brien 2004). To facilitate such reflection, it is helpful for staff to maintain a collection of examples of previous students' works.

• Development of soft methods skills—having students work in groups structuring corporate data and discussing different strategic options offers a practical route to develop their skills in structuring messy

problems where disagreements and multiple views exist.

• Exploring tool combination—Several of the tools described above offer opportunities for combining tools from different fields, for example: SSM and strategy-based visioning frameworks; scenario planning and SWOT/TOWS analysis; balanced scorecard and systems thinking. In addition, we also have used a combination of tools to explore strategies in the fishing industry and reflect on multimethodological approaches (Bryant et al. 2007). The students find that such tools can complement each other in a natural way, perhaps partly because of the focus on supporting the strategy process.

7. Reflections and Future Developments

In reflecting on our experiences of teaching these courses, we first highlight the contributions that this paper makes. Next, we identify issues we are currently grappling with. Finally, we end with considerations for future developments.

One of the key contributions of this paper is to demonstrate that a broad toolkit can be used to support the strategy process. In particular, the toolkit we have adopted spans the OR/MS and strategy/management fields, something that is lacking in the extant literature. Within the literature, there is some debate concerning the nature of the development of a toolkit: eclecticism versus paradigmatic compatibility (Brocklesby 1995, 1996; Ormerod 1996). In practise, when considering whether a tool has the potential to support a particular activity within the strategy process, our approach is somewhat eclectic, particularly as the possibility of combining it with other tools may not be immediately apparent. However, the opportunity to repeatedly use the tool with different groups of students, lends itself to a reflective mode of operation, particularly when considering, for example, why some groups work well with particular tools where others appear to struggle. When considering the possibility of combining tools, we have adopted an explicitly reflective approach by applying multiple tools to the same case study (Bryant et al. 2007), to explore the different insights offered by each tool.

A second contribution of this paper is the documentation of details and experiences in the teaching of specific tools from the toolkit to a diversified student body. Key insights include: currency of course materials; continuous improvement with respect to tool development; group-based learning experiences; the role of the tutor; and the centrality of modelling. Each of these is now considered.

A factor that has helped maintain the popularity of our courses is the currency of the material we use. For our group work, we specifically choose organisations with which students will have had direct experience or at least are familiar. Such a strategy has encouraged student engagement with the material, particularly if their organisation has hit the headlines whilst the course is running or is facing some topical issues. For example, in teaching our undergraduate course in October 2001, students developing scenarios had to engage with the challenges of looking to the future of the changing world we all faced after the events of 9/11. During the past few academic years, students working on UK-based organisations have had to consider the outcome and impact of a UK general election.

We have endeavoured to adopt an attitude of continuous improvement with respect to tool development over the years, meaning we have accumulated a wealth of experience in deploying and combining tools from across the fields in novel and pragmatic ways. Such a practise is quite necessary with practically focused courses; different student groups and years bring different backgrounds and experiences to each course, thus they present different needs, for example, some may struggle with the conceptual understanding of how to undertake a particular aspect of using a tool. To address these different needs, we have had to modify and adapt the detailed deployment of tools within their overarching structured frameworks. For example, our current teaching of scenario planning is quite different in detail compared with that taught in 1990; it is even slightly different from the most recently published version (O'Brien and Meadows 2007).

A key feature of our current courses is the emphasis on the learning of new and practical skills, particularly through group-based exercises. It is our experience that reflective experiential learning provides an appropriate learning environment for developing skills in participative-based tools. As Mingers and Gill (1997) note, there is a steep learning curve involved in applying tools, especially for the first time, and having opportunities to practise using the tool along with an experienced guide available to coach you through the process is particularly helpful. It is also important that students reflect on their experiences so that they can improve their future use of the tool. The implication of adopting this approach is that a balance has to be achieved between teaching the detail of a tool and providing opportunities to practise it and reflect on its use. For reflection, we have found that student assessment works well as it provides opportunities to reflect on their own experiences in the light of extant literature. For learning about a tool, we have found that the use of short lecturettes accompanied by group-based sessions works well. However, such an

approach requires a tutor experienced in the deployment of the tool and in supporting issues of both content and process. One of the limitations of group-based work relates to group facilitation. Constraints on staff resources means that we have been unable to provide individual group facilitation, rather we have had to rely on the groups facilitating themselves with the tutor adopting the role of advisor. This has the added benefit of the students developing their softer skills, for example, in facilitating themselves.

A third contribution of this paper concerns the debate about which tools constitute the soft OR and PSM fields. In this paper, we present what some would consider to be an unusual set of tools some of which we argue should be included in the soft OR field. They are unusual in that their origins are not solely the OR/MS domain; some also originate within the management/strategy domain but have been modified and adapted from the perspective of OR/MS practitioner academics. However, it should be noted that the popular soft OR/PSM tools of cognitive mapping and SSM also have their origins elsewhere. Each of the tools described in the previous section was deployed in a participative way with involvement from those with potentially different views; the process followed was in many ways more important than the final product as it contributed to individual and group learning and insight. The analytical component of each tool drew on a varying mixture of perception and hard data. We also note that each of the approaches described above has involved some form of model development/use at its core: the visioning taught to MBA students included HAS modelling; scenario planning developed alternative models describing future uncertainty in the external environment; system dynamics was used in a qualitative mode as it was used to develop qualitative models of organisational strategy rehearsal in the form of causal loop diagrams as an aid to learning; and the balanced scorecard and systems thinking material used influence diagrams and causal maps to map managerial cognition in the development of performance measurement systems. We therefore believe that we have demonstrated that these approaches should be included in the soft OR field. We do, however, accept that our argument may rest on the way that we have deployed the tools. Whether any of the approaches could also be considered as a PSM is a matter for further exploration.

The courses have been and continue to be successful; for each course, enrolments have increased over time and tutors generally receive positive student feedback scores for their contributions. However, the courses are not without their issues. Comparing the early incarnations of the courses with the more recent offerings, we are struck by the reduction in coverage of tools. As this paper demonstrates, over the years, we have taken the view that it is important to cover a few tools in depth, thus developing particular skills. In our current review of the courses, we wonder whether we have got the balance right because we are aware of the important material we do not cover because of lack of time. We are considering reintroducing one or two sessions that cover a range of tools, or an assessment that focuses on the range of tools available but not necessarily covered on the courses. Another possibility may lie in developing technology that offers many opportunities for considering different delivery modes, as we currently make rather little use of technology in the actual delivery of the courses.

A further possible future for our courses is to consider an integrated multimethodology course involving different tools integrated or in parallel. For example, for next year's courses, we are already planning that students will work with the same organisation. First, they will evaluate the organisation's vision, then represent this vision using a balanced scorecard to explore causal relationships between concepts. They will then develop a set of scenarios of the organisation's future external environment, using SWOT/TOWS analysis to generate possible strategic options. Finally, they will develop a system dynamics model to rehearse and revise the strategic options in the light of the scenarios.

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