



**Improving systemic success factors in a university to achieve more effective and efficient operations: Using the PrOH modelling methodology**

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Manuscripts

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3 **Improving systemic success factors in a university to achieve more**  
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5 **effective and efficient operations: Using the PrOH modelling**  
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7 **methodology**  
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13 **ABSTRACT**  
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17 **Purpose**  
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19 The aim of this research is to improve the efficacy of professional support services and  
20 teaching processes within a leading UK university so that they align better to changing  
21 academic requirements and external market forces, and to do this using a novel systems  
22 thinking methodology. A case study is given from a school in a leading UK University.  
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31 **Methodology**  
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33 The case uses a novel process modelling methodology known as the Process Orientated  
34 Holonic (PrOH) modelling methodology. Abducted rationalisation is used to reflect upon  
35 the 4V's theoretical concept of operational characteristics (volume, variety, variation over  
36 time, and visibility). The paper also briefly describes the unique systems thinking  
37 principles behind the methodology and its use of abductive rationalisation.  
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47 **Findings**  
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49 The methodology and models show that it is advantageous to simultaneously review  
50 strategic processes *and* operational processes because this enables roles, processes, and  
51 tasks to be more purposefully redefined and more closely meet endogenous  
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3 organisational requirements and exogenous market forces.  
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### 7 **Originality**

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9 This work will interest organisational analysts wishing to use a novel approach to  
10 improve strategy and operational processes in higher education and universities. The  
11 practical implications of the study are discussed using the 4V's theoretical concept:  
12 volume of throughput, variety of offerings, variation over time, and visibility of processes  
13 to students. The international context and implications are outlined.  
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### 23 **KEYWORDS**

24 Holistic thinking; action research; 4V's operational characteristics; higher education;  
25 operations strategy; language teaching.  
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# **Improving systemic success factors in a university: Using the PrOH modelling methodology**

## **INTRODUCTION**

The ethos and culture of higher education institutions in the United Kingdom and many other countries has undergone rapid change over the past 20 years (Sporn, 1996). In this period, higher education has been forced to respond to new government agendas such as the massification of teaching (Edwards, 1998; Gumport, 2000) and the general arrival of more ‘managerial’ professionalism in the higher education arena (Santiago et al., 2006). Academic leaders and frontline staff have had to respond to these developments and manage considerable organisational changes (Jones and Lewis, 1991; Miller, 1995; Trowler, 1998; Pedro, 2009). These changes include creating new visions for higher education and crafting the right culture for new structures and practices to occur (Gumport, 2000; Dill, 1999). These changes are driven by changing economic, financial, and market pressures (Browne, 2010; Kondakci and Van den Broeck, 2009). Leaders in higher education therefore have to pursue the ‘modern imperatives’ of higher education while still preserving the valuable kernels of traditional academic ‘accumulated heritages’ of the past (Kerr, 1987). Such changes have moved current higher education organisations away from being philanthropically focused institutions primarily driven by social and cultural gains towards more commercially focused competitive organisations that are managed as professional businesses.

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3 One area that has seen particularly dramatic change in the United Kingdom over the last  
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5 decade is the delivery of modern foreign languages (Gumport 2000; Kondakci and van  
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7 den Broeck, 2009). For more than a decade, the number of students wishing to study  
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9 modern foreign languages at the degree level in the United Kingdom has been declining.  
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11 For example, a government-commissioned report (Footitt, 2005) on the supply of  
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13 language skills in the United Kingdom discovered a 15% drop in language-degree  
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15 undergraduates between 1998 and 2002. This situation has been compounded by the fact  
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17 that fewer UK students are spending part of their degree in non-English speaking  
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19 countries. A House of Lords Report discovered that the number of UK students taking  
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21 part in the Erasmus programme fell from a peak of 12,000 in 1994–1995 to 7,539 in  
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23 2002–2003 (House of Lords European Committee, 2005). The decline in popularity of  
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25 UK students wanting to study in non-Anglophone countries was also shown in a study  
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27 commissioned by the Higher Education Funding Council for England (HEFCE, 2004).  
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29 Based on responses of staff at 80 universities and 1,200 students, it was also discovered  
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31 that although the United Kingdom had a high rate of international student mobility,  
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33 students opted to study in the USA, Canada, Australia and New Zealand, rather than in  
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35 non-Anglophone countries.  
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44 These trends are strategically and operationally worrying for universities providing  
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46 professional language education services in an increasingly globally competitive sector  
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48 that is constantly changing and has seemingly shrinking UK government budgets (Milson  
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50 et al, 1983). For the last decade, it has been a challenge to recruit foreign language  
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52 students. Therefore, it is now important for foreign language providers to be increasingly  
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54 competitive in recruiting new international students (McClea and Yen, 2005), to deliver  
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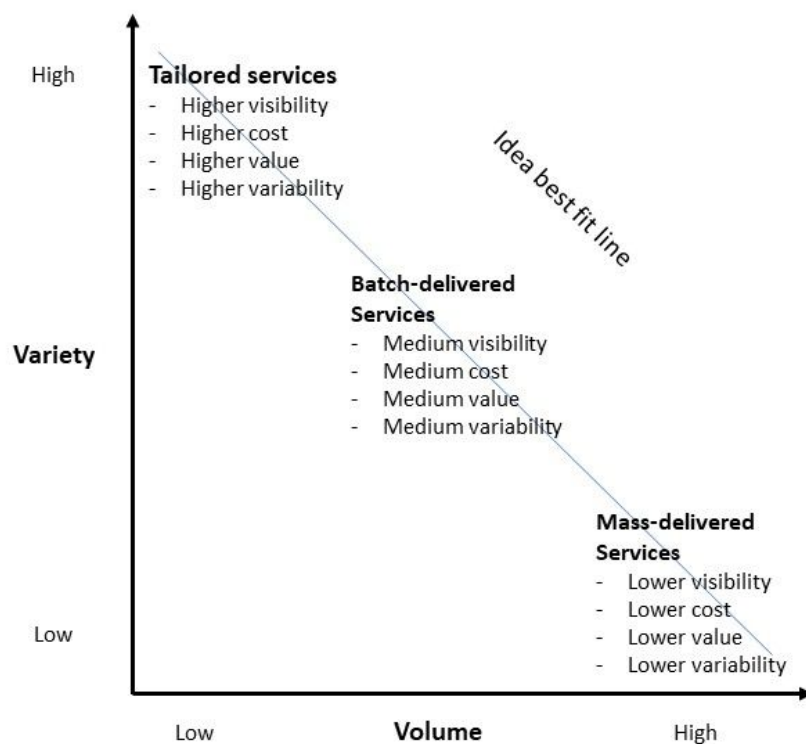
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2 commercially desirable courses, to attract research funding, and to deliver language  
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4 services via efficient and efficacious operational processes (Ahmed et al., 2007; Martz et  
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6 al., 2001). This research is based on the premise that such challenges can be met using  
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8 practices more akin to those used in the private professional service sector (Johnes et al.,  
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10 2017) than in the higher education sector. One way to begin to achieve this is to model  
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12 operations and processes and reflect on practices found using known theoretical concepts.  
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14 The theoretical concept used in this case is the 4V's (volume, variety, variation and  
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16 visibility) of operations strategy and management (Hayes and Wheelwright 1979a,  
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18 1979b; Paton et al., 2011, p.10-11; and Slack et al., 2004, pp 20-26).  
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26 The aim of this research is to improve the efficacy of professional and teaching processes  
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28 within a leading UK university and to better align these to academic requirements and  
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30 external market forces, and to do this using a novel systems thinking methodology. A  
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32 case study is conducted using the Process Orientated Holonic (PrOH) modelling  
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34 methodology. Abducted rationalisation is used with the process models and case study to  
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36 reflect on the theoretical concept of the 4V's of operational challenges.  
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42 Similar studies in other professional service sectors (e.g. accountancy, and architectural  
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44 firms) have called for techniques that allow emergent behaviours to surface (Bolisano,  
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46 Scarco and Giuman, 2016). In this study, the specific type of soft systems methodology  
47  
48 (SSM) used is known as PrOH modelling. It was chosen because of its ability to facilitate  
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50 discourse on emergent (and hidden) properties of strategic and operational systems and  
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52 decision-making about those systems.  
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## REFERENCE FRAMEWORK

Hayes and Wheelwright's (1979a, 1979b) volume and variety conceptual framework and Silvestro et al.'s (1992) adaptations for services are used in this study as a framework to rationalise and explain findings from a theoretical perspective, via abductive logic (Lawson, 1998), and to explain shifts in operational delivery via a conceptual framework. This simple, fundamental, and commonly accepted conceptual framework is core to most operational deliveries and is shown in a generic form in Figure 1.



**Figure 1: Volume and Variety Theoretical Concept of Service Delivery**

(Adapted from Hayes and Wheelwright, 1979a, 1979b; Silvestro et al., 1992).

The service delivery in focus in this study is that of higher education language education.

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3 At the onset of this study, delivery of language training in the 'Case Study School'  
4 (known hereafter as 'CSS') was considered to be at the top left of this conceptual  
5 framework. Professional service management states that this is only suitable for highly  
6 premium priced services because they can be costly and complex to deliver. Therefore,  
7 this was not an appropriate position for CSS's language services because they are value-  
8 priced and not premium-priced services. With prices unlikely to be increasable because  
9 of competition, CSS had to become more operationally efficient and efficacious and  
10 move more toward the centre or even to the bottom right of the framework where the  
11 volumes of customers (e.g. students) are higher and the variety of offerings are lower.  
12 Figure 1 shows a diagonal line of best fit for service characteristics from top left to  
13 bottom right, and any services not near this line of best fit are potentially not being  
14 delivered correctly. For instance, services in the top right-hand corner are likely to be loss  
15 leading and inefficient, and those in the bottom left hand corner are unlikely to reach  
16 sustainable economies of scale.  
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### 34 35 36 37 **CASE STUDY: A UNIVERSITY SCHOOL IN FLUX** 38 39 40

41 This paper presents a case study that focuses on the academic management of a school of  
42 languages and social science. Other such cases (e.g. Clayton, 1993; Doherty, 1993;  
43 Newton, 2002; Hodgkinson and Brown, 2003) have been published that have proven to  
44 be useful for sharing common experiences about the management of higher education  
45 services. The current case study adds to this useful bank of higher education case studies.  
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47 The CSS in this study is a part of a leading UK university in the UK Midlands, which  
48 delivers a variety of language and social science courses at all levels from short  
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2 vocational courses to research courses. The majority of students in the school are  
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5 undergraduates.  
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9 Because of a year-on-year decline in student numbers, the CSS had been instructed by the  
10 executive of the university to increase the volume of students and improve the quality of  
11 educational service provision. A low-volume delivery scenario using inefficient and  
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16 unpurposive processes could no longer prevail.  
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21 Many changes occurred from 2012 to 2014 to try to combat the decline in student  
22 numbers. One major change had been to use the ‘bridging’ strategy to restructure the CSS  
23 and merge it with another department from another school where student numbers are  
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26 more buoyant (Gumport, 2000). For instance, the CSS took in the social science and  
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29 politics groups from another school to increase its volume of students and its ability to  
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32 deliver a greater variety of course offerings.  
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37 Another change was to restructure the taught programmes. This was achieved in the CSS  
38 at the undergraduate level by introducing politics and international relations as discrete  
39 programmes in the school – this was in addition to them being a part of various European  
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42 studies degrees and to offering new subjects based around the study of English. The  
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45 intention was to create an increase in the number of applicants, possibly more than could  
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48 be accommodated through a ‘buffering’ strategy, so the strongest applicants could be  
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51 picked (Gumport, 2000). Other new programmes were also offered at the Master’s level,  
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54 and the number of PhD students was increased in a similar way. The newly reconfigured  
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57 CSS was then renamed to reflect the widened portfolio of offerings that had a newly  
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2 increased social science focus. Together, these activities contributed towards the  
3  
4 improved 'collectivism' (Ziman, 1996) and 'professionalism' of the CSS, giving them a  
5  
6 stronger core and critical mass of language and social study courses to draw upon. These  
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8 changes were pitched at the middle, or tactical, level of university management that is at  
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10 the school's dean and senior management team level (as per Santiago et al., 2006). The  
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12 main initial purpose of these changes was to increase the volume of students.  
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19 These changes and expansion occurred over a relatively short period of two years (2012–  
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21 2014), and the increased numbers placed more burden on the incumbent professional  
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23 administrative staff, systems, and processes. It also placed a burden on the academic  
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25 staff, who undertook an increasing number of administration-related duties and non-  
26  
27 academic duties. During the academic year 2015–16, it became obvious that the increase  
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29 in student numbers had outgrown existing administrative professional structures,  
30  
31 practices, and processes, and that additional staff was needed. Reactive responses had  
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33 seen rapid curricula development, resulting in almost double the number of  
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35 undergraduate and postgraduate programmes being offered by the CSS and in the overall  
36  
37 number of students rising. Therefore, despite increasing numbers of students, the variety  
38  
39 and complexity of offerings had also stayed high, which was not ideal because costs and  
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41 delivery remained a challenge. As a result, human resources in the CSS were over-  
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43 stretched. For instance, although the core administrative team comprised several  
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45 professional non-academic managers, there was no one person responsible for the whole  
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47 team's performance. Changes had been made in the CSS as a result of the bridging and  
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49 buffering strategies, and additional tasks had been incrementally added to the roles of  
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51 both professional clerical and academic staff, which led to much frustration because job  
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2 roles and responsibilities were not clearly defined. As Higson and Filby (2005, pp.2-3)  
3 stated, it is often a waste of time and resources to take up excellent teachers' and  
4 researchers' time with administrative activities such as recruitment, fundraising, and even  
5 student support. The CSS responded to this ambiguity of roles by recruiting new non-  
6 academic specialist professional staff, who had the necessary formal qualifications and  
7 experience for the tasks they needed to undertake, which was not always the case for  
8 academic staff in equivalent roles. These changes increased the commerciality and  
9 professionalism of the CSS. Higson and Filby also point out that the days of the 'amateur  
10 administrator', that is academics working as administrators, were coming to an end  
11 because this was often an ineffective and costly way of resourcing such activities (Miller  
12 and Higson, 1996, 1999; Higson and Miller, 1997).  
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30 Along with increasing the numbers and skill base of administrative staff, the  
31 administrative systems, structures, and processes of the whole school were reviewed with  
32 a view to meeting new organisational and student (i.e. customer) needs. In a sense, the  
33 CSS became the victim of its own success, with more students and course offerings than  
34 it could deliver with its current administrative processes, people, and skill base. In  
35 response to these new challenges, a working party was established in late 2015 consisting  
36 of key members of staff from the CSS, an action research team (with methodological  
37 expertise), and the university's central human resource department.  
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51 Action research using the Process Orientated Holonic ProOH modelling methodology was  
52 conducted to surface political agendas, address formal lines of authority, consult (and  
53 sometimes abate) influential figures in the school, and develop plans for change. For  
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2 instance, a particularly sensitive issue was the misalignment between academic  
3 requirements' delivery and administrative support provision – an ongoing cause of  
4 dissatisfaction and friction among staff – that had begun to negatively affect the quality  
5 of education because of the increasing volume of students. Because the university and  
6 CSS are committed to providing an excellent working environment for staff and a  
7 stimulating learning experience for students, these operational conditions had become  
8 unacceptable. Remedial action was taken during this project, the findings of which were  
9 delivered in early 2016. After much consultation, the findings were implemented.  
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23 This action research project took place during the 2015–16 academic year. It is not the  
24 purpose of this project to try and test different types of process modelling approaches but  
25 to select one suitable method and make changes to practice; the reasons for choosing  
26 PrOH modelling methodology are given in the following section on methodology. The  
27 changes recommended in this project started to come into effect during the 2017–18  
28 academic year.  
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### 39 **METHODOLOGY: PROCESS ORIENTATED HOLONIC (PrOH) MODELLING**

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44 Systems approaches have been widely used before to investigate quantitative and  
45 qualitative systemic issues in higher education management (Jantsch, 1972; Sterman,  
46 2000; Strauss and Borenstein, 2015). The Process Orientated Holonic (PrOH) modelling  
47 methodology views organisations as complex adaptive systems and has been developed  
48 over the last decade through various action research projects. Early versions of the  
49 methodology focused on managing information about new product design, concurrent  
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2 engineering, computing service provision, export processes, systems engineering, and  
3 project management. PrOH modelling is best used to help remove unnecessary process  
4 complexity between different functional groups and formulate overall organisational  
5 strategies. It is also well suited to investigating processes that are difficult to define  
6 because of low throughput volumes and high variation that provide few repeated learning  
7 opportunities – such as a change management project in an higher education environment  
8 – just as in this case study.  
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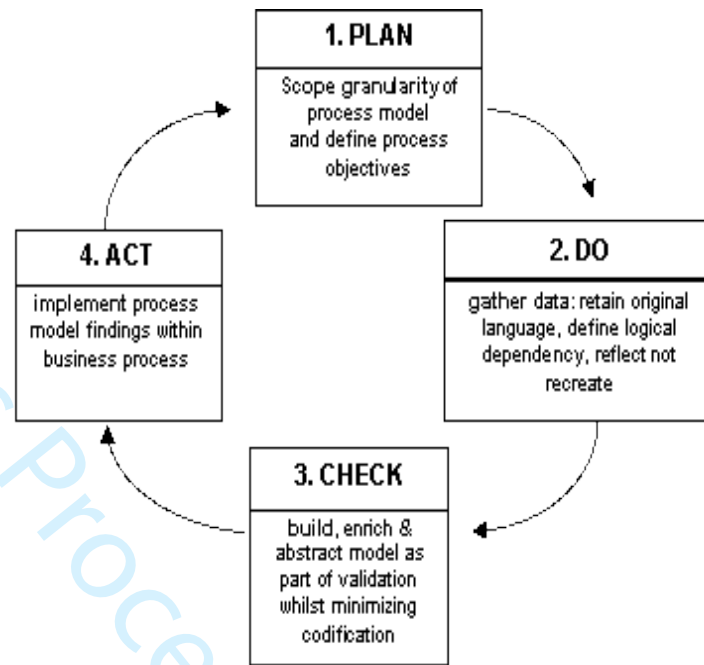
21 Like PrOH modelling, there are other systems approaches that are also aimed at tackling  
22 the ambiguity and complexities of processes in human activity systems by describing  
23 chains of causal activities and changes to them. However, these approaches tend to focus  
24 on general business problems rather than process and strategic change. To give some  
25 examples:  
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- 32 • Strategic Choice focuses on managing uncertainty in interconnected decision  
33 problems and has been described as ‘planning under pressure’ (Friend and  
34 Hickling, 1987).
- 35 • Soft Systems Methodology (SSM) (Checkland and Scholes, 1990; Bell et al.,  
36 2009) deals with general problems (not just business ones), especially when there  
37 are conflicting viewpoints.
- 38 • The Viable Systems Model (VSM; Beer, 1985) deals with management problems  
39 in organisations.
- 40 • Journey Making (Eden and Ackermann, 1998) deals with designing and building  
41 a shared commitment to a strategic action plan among key stakeholders.  
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55 PrOH modelling has several similarities with these other approaches, such as the naming  
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3 of the model/system to give a model a unique recognisable identity, as in both SSM and  
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5 VSM, and the use of 'normal' everyday language to describe systems under observation  
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7 rather than the use of esoteric coding. The use of everyday language in PrOH modelling  
8  
9 is shared with SSM and Journey Making among others. PrOH modelling, like SSM and  
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11 Journey Making, makes extensive use of validation as an essential means for building  
12  
13 consensus among stakeholders in a human activity system.  
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18 The principal difference between PrOH and other systems approaches is that PrOH looks  
19  
20 specifically at *process* modelling and change. It also explicitly uses *abstraction* and  
21  
22 *enrichment* of holistic systems thinking rather than the *aggregation* and *reduction* used in  
23  
24 more traditional reductionist thinking. This distinguishes PrOH modelling from other  
25  
26 process modelling methodologies and makes it particularly useful for this action research  
27  
28 project. Clegg (2006, 2007) and Clegg and Shaw (2008) described how PrOH models are  
29  
30 constructed and discussed their philosophical background. Other recent examples of  
31  
32 PrOH's use are demonstrated in Clegg et al. (2018), Clegg et al. (2019), Kalaitzi et al.  
33  
34 (2019). The PrOH modelling methodology is outlined in Figure 2.  
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**Figure 2: The Process Orientated Holonic (PrOH) Modelling Methodology**

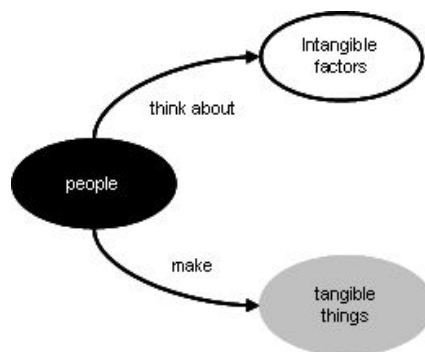
The PrOH modelling methodology in Figure 2 is structured around Deming's (1986) Plan-Do-Check-Act cycle. For PrOH modelling, this involves

- Scoping the granularity of the model (e.g. Plan)
- Gathering data (e.g. Do)
- Building, enriching, and abstracting the model (e.g. Check)
- Implementing changes (e.g. Act)

These stages were used during the CSS case study to construct a holarchy (i.e. a set of holistic models) of three models. During Methodological Stage 1 (in Figure 2), the model was scoped. During data collection (Methodological Stage 2), process data and associated issues were collected and holons (individual models) were built. The logical structure between the entities and the input-transformation-output information (Juran, 1987) were

1  
2 initially collected in a tabular format and then converted into a graphical PrOH model.  
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5 The graphical model was then presented to an audience to facilitate group-based  
6  
7 understanding, validation, and agreement building (in Methodological Stage 3).  
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9 Methodological Stage 4 was used to make changes to ‘real-world’ CSS processes. This  
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11 paper does not discuss the construction of these models in detail but does provide  
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13 guidelines to read them so that readers are able see how they have been instrumental in  
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15 catalysing changes in the CSS.  
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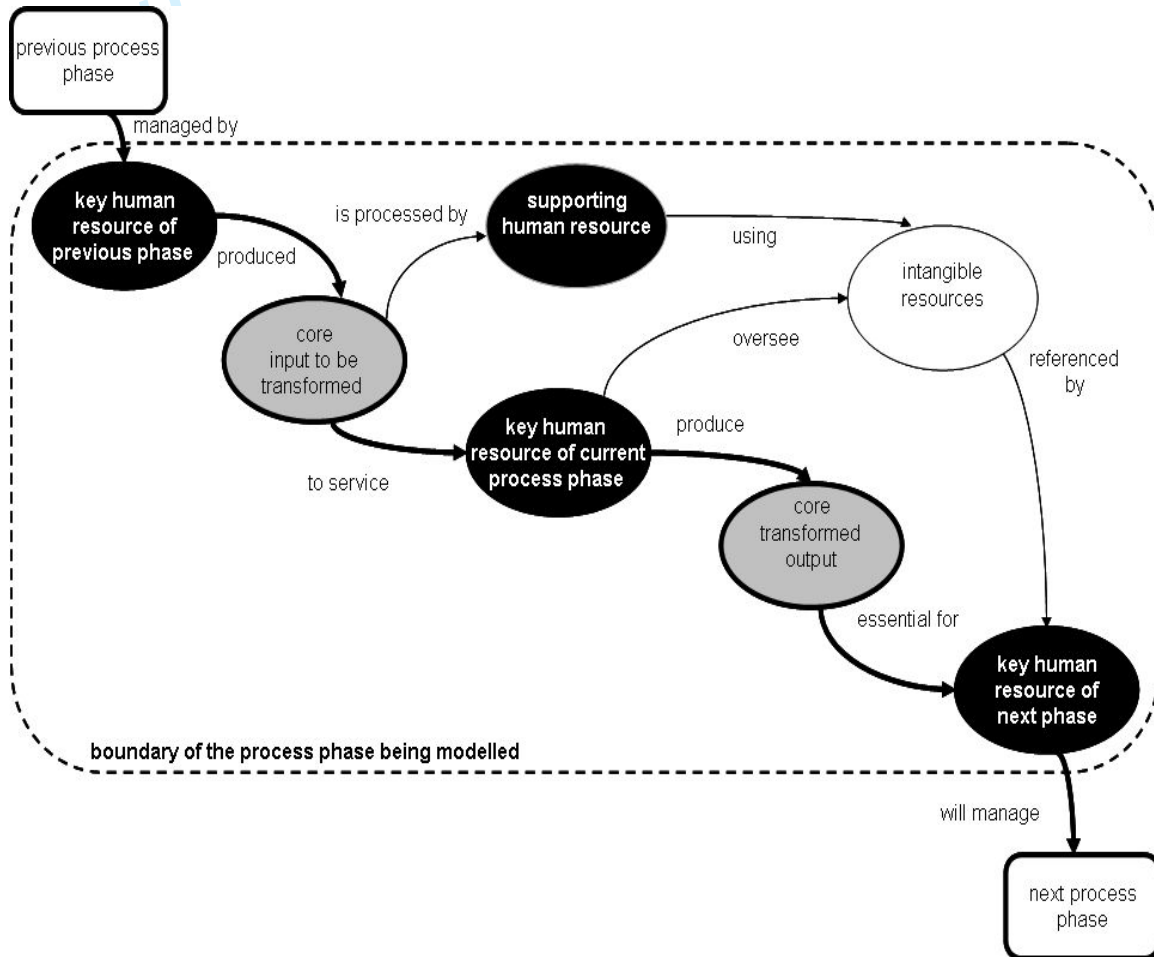
21 PrOH models are made up of bubbles and arrows in a modified form of a semantic  
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23 network. Verb phrases go on the arrows and noun phrases go in the bubbles, and together,  
24  
25 they make up sentences about the process they are describing. Unlike in traditional  
26  
27 semantic networks, there are three kinds of bubbles (in this paper, black bubbles  
28  
29 represent people, white bubbles represent intangible factors, and grey bubbles represent  
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31 tangible artefacts in the process – in actual action research, full colour versions are used).  
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33 The models are always constructed with alternate people and non-people bubbles. This  
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35 simple nomenclature is shown in Figure 3. For ease of reading, sentences start and finish  
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37 at the people bubbles.  
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54 **Figure 3: Bubbles and Arrows Make Up Descriptive Sentences**  
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The PrOH modelling methodology offers a template to ensure that sound philosophical systems thinking fundamentals are built into each and every model. This template is shown in Figure 4. It depicts an individual process model – known in systems thinking terms as a *holon* (Flood and Jackson, 1991).



**Figure 4: Template for a Single PrOH Model**

In addition to building on systems thinking constructs, the PrOH model template includes the rigours of input-transformation-output type process analyses (Juran, 1987), and the application and interpretation of this template is the basis of every PrOH model. This

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2  
3 template can be thought of as serving a similar purpose to Checkland's SSM 'root  
4 definition' and 'conceptual model' (Checkland and Scholes, 1990) because it helps to  
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7 define the essential parts of each individual process model. However, there are three  
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9 significant differences. First, the SSM conceptual model is of an ideal system, whereas  
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11 the PrOH model is of the actual dynamics of a system under observation. Second, in  
12  
13 SSM, there are multiple root definitions and conceptual models, where each is associated  
14  
15 with a different *Weltanschauung* (worldview); PrOH has only one model of each system  
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17 representing a consensual view. Third, SSM conceptual models are free format, whereas  
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19 the PrOH model template mentions both the necessary components and discusses how to  
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21 construct the model (as in Figures 3 and 4).  
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28 The PrOH modelling methodology can produce process models that contain a great deal  
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30 of information on a single page (such as people, artefacts, and activities and their  
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32 dynamic relationships), which is an advantage over other alternatives. SSM conceptual  
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34 models, for example, include only activities. While data flow and flow chart type  
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36 diagrams often spread over many pages to convey the same amount of information.  
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38 However, the density of information in a PrOH model can make the cerebral digestion of  
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40 the information overwhelming, potentially far in excess of Miller's 'magical'  $7\pm 2$  items  
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42 (Miller, 1956). Therefore, the presentation of PrOH models is best made using an  
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44 approach known as 'storyboarding'. Storyboarding is used in the film industry to depict  
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46 sequential scenes or episodes in a film, or used as a form of knowledge representation in  
47  
48 computer systems design (Sakurai et al., 2009). Storyboarding in PrOH modelling is  
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50 similarly used to show one scene of a process (system under observation) at a time  
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52 (starting with the basic core process statement derived from the template) along with the  
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2 associated critical success factors (Rockart, 1979). Other parts or scenes are then added  
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4 one at a time to build up a whole picture. Simultaneously, previous parts can be faded out  
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6 so that they are less prominent but still act as a reminder for an audience of stakeholders;  
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8 Blair et al. (2007) describes storyboarding in modelling in more detail. Storyboarding is  
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10 used in this case to present the systemic success factors in the CSS.  
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16 Often, a single model is not enough to adequately describe the systemic success factors of  
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18 a whole system, so a set of models that connect serially (describing the whole length of a  
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20 process) and at different pitches of abstraction and enrichment (describing different  
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22 systemic success factors at strategic, tactical, and operational levels) are required (Ulluru,  
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24 2002). Other systems approaches such as SSM and VSM (Beer, 1985) similarly use the  
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26 concept of 'systems within systems'. However, the set of models produced by the ProOH  
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28 model is known as a *holarchy* (Jackson, 1984) rather than a hierarchy because it  
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30 explicitly uses abstraction and enrichment rather than aggregation and reductionism to  
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32 produce the models; this approach is unique to ProOH modelling and can be read about in  
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34 detail in Clegg (2006; 2007). This paper focuses on the system under observation (CSS  
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36 case study) rather than the axioms of the ProOH modelling methodology.  
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44 Data were collected by interviewing 21 key stakeholders in the CSS. Interviewees were  
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46 selected so that multiple tenable viewpoints could be collected and formulated into a  
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48 model conforming to ProOH rules and guidelines that was a defensible representation of  
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50 CSS' systemic success factors. Each interview lasted between one and two hours. The  
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52 interviews were noted down as annotated flow diagrams and or rich pictures (the latter  
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54 concept originated in SSM). Each interview was validated and signed off on by the  
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2 interviewee at the end of the interview as an accurate representation of his or her  
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4 knowledge. These interviews served as raw data for the PrOH models.  
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9 After being converted into a form compatible with the PrOH model template (to ensure  
10 holistic thinking had been applied to the processes), the final PrOH models were  
11 presented back to a wider forum of people representing the whole of the CSS in an open  
12 ‘town-hall’-type meeting. This was to gain further validation and buy-in from other  
13 people who were directly involved in implementing changes and those who would be  
14 affected by the changes. Validation sessions such as these are a common and essential  
15 step in approaches such as SSM or Journey Making, but the use of wider group-based  
16 validation is less common and is always done with PrOH modelling because it helps to  
17 consolidate the multiple tenable viewpoints among those potentially affected by any  
18 resulting changes. The storyboarding potential of the PrOH modelling methodology has  
19 been developed especially for this large-scale validation, which gives it some advantages  
20 over and above other systems modelling approaches. Because this exercise was part of an  
21 official consultative exercise involving the university’s human resource department, it  
22 was necessary that these wide-scale buy-in activities occurred to equalise knowledge so  
23 the exercise was seen as fair. Because this wide-scale validation is a part of PrOH  
24 modelling, it was one of the reasons for using this approach.  
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48 Clark and Newman (1997) and Thorne and Cuthbert (1996) highlighted the value of  
49 using such methods in higher education organisations. This case study demonstrates how  
50 the PrOH modelling methodology, which can assimilate the complexities and nuances of  
51 changes in higher education organisations, is both appropriate and timely.  
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## RESULTS: HOLISTIC MODELS FOR CHANGE

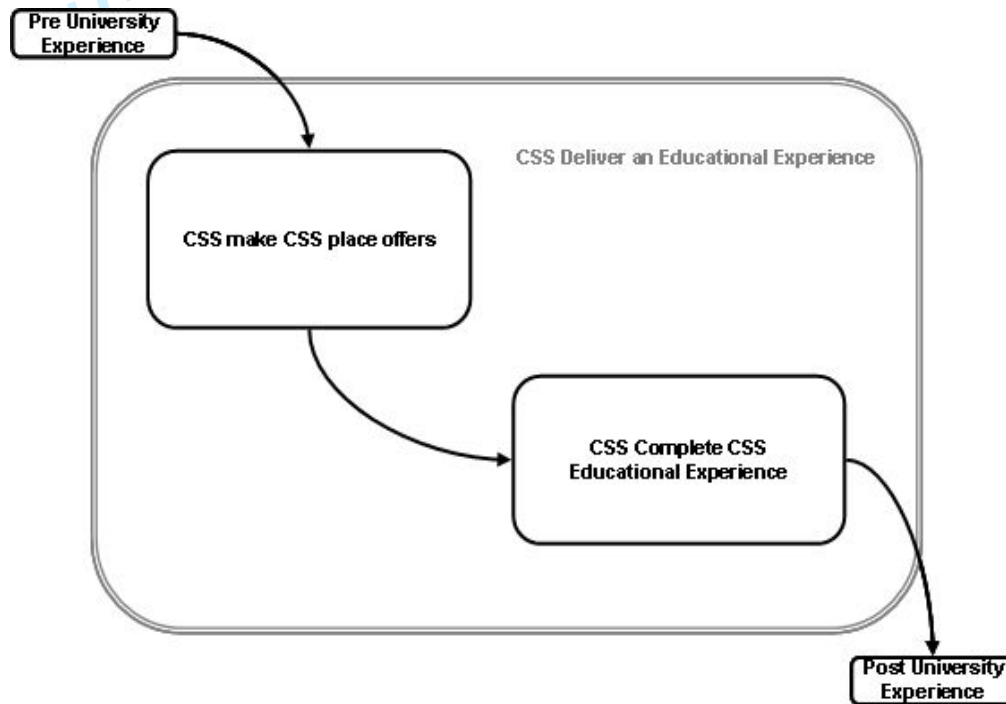
This case study involved a holarchical set of models consisting of one tactically pitched model representing the views of the CSS dean and senior management team (called ‘CSS Deliver an Educational Experience’). It shows the overall customer-facing process starting by taking newcomers to the university as an input and producing educated students as an output. This model, pitched at the dean and senior management team level, was further enriched by producing two lower-level, or lower-pitched, operational models called

- ‘CSS make CSS Place Offers’ – Describing activities that occur before and during recruitment
- ‘CSS Complete CSS Educational Experience’ – Describing activities occurring after the students have been recruited and are in attendance.

A meta or strategic model linking the CSS to other schools (e.g. the business school or the science and engineering school) and the overall university strategy could also have been produced through abstraction if required.

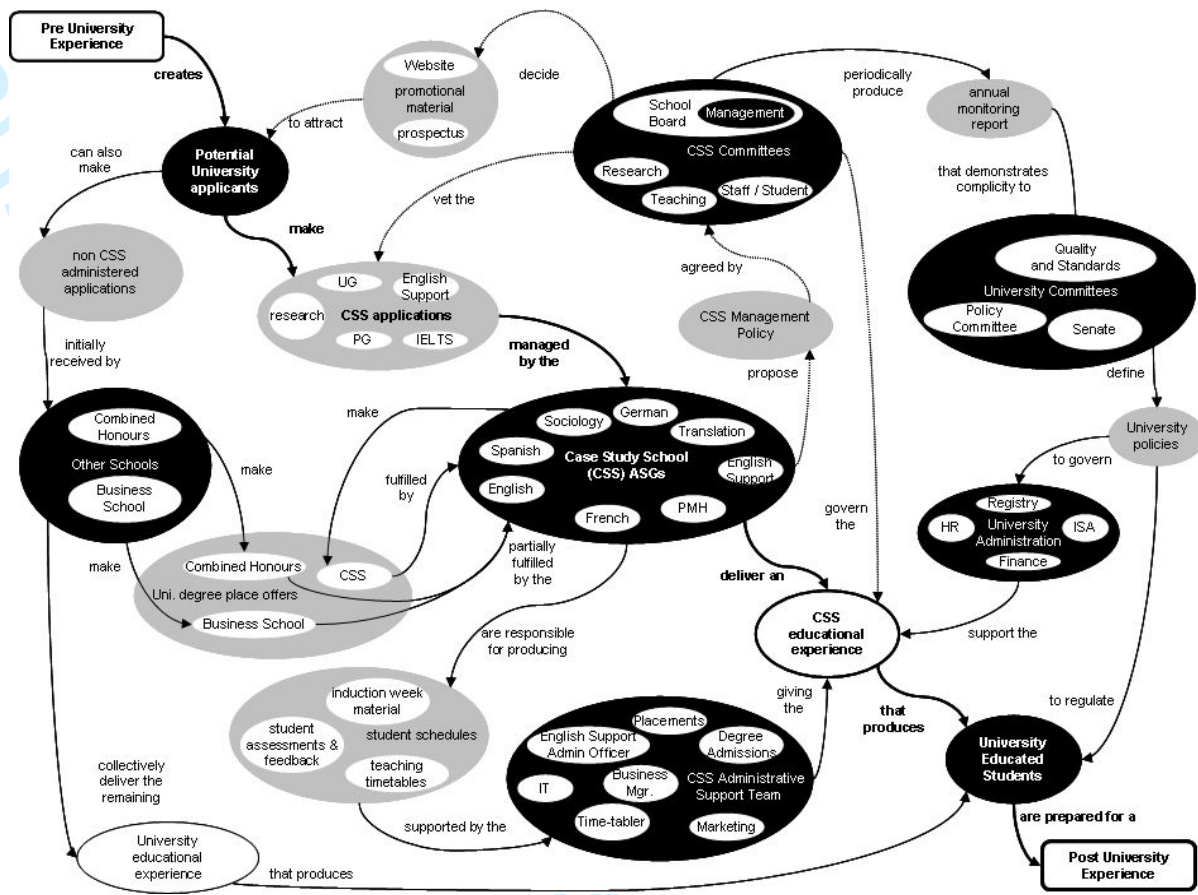
Although hierarchical structures are important for regulating academic work in the ‘real world’, hierarchical modelling of systems under observation tends to be dogmatic, mechanistic, and sometimes uninspiring. In contrast, ProOH modelling creates holarchies; in this actin research project three models create a holarchy (a tactical system that contains two operational sub-systems) as depicted in Figure 5. This allows differently pitched levels of management thinking to be produced simultaneously so that both

tactical and operational views can be considered together, which Nyhagen and Baschung (2013) deemed necessary. Because PrOH modelling does this holarchically rather than hierarchically, it is possible to claim that PrOH models are able to inspire more innovative thinking and gain greater buy-in from stakeholders.



**Figure 5: Structure of the CSS PrOH Model Holarchy**

The high-level PrOH model of ‘CSS Deliver an Educational Experience’ is shown in Figure 6; it gives a tactically pitched overview of CSS processes and how they link to other strategically pitched university-wide processes. It should be noted that all models were storyboarded. The storyboard for the tactically pitched systems model in Figure 6 is, for reasons of brevity, not shown in this paper, but the storyboards for both lower-pitched operational sub-systems models are presented in detail.



**Figure 6: Top-Level Process Overview of the CSS**

Some systemic success factors associated with the tactical-level view in Figure 6 are

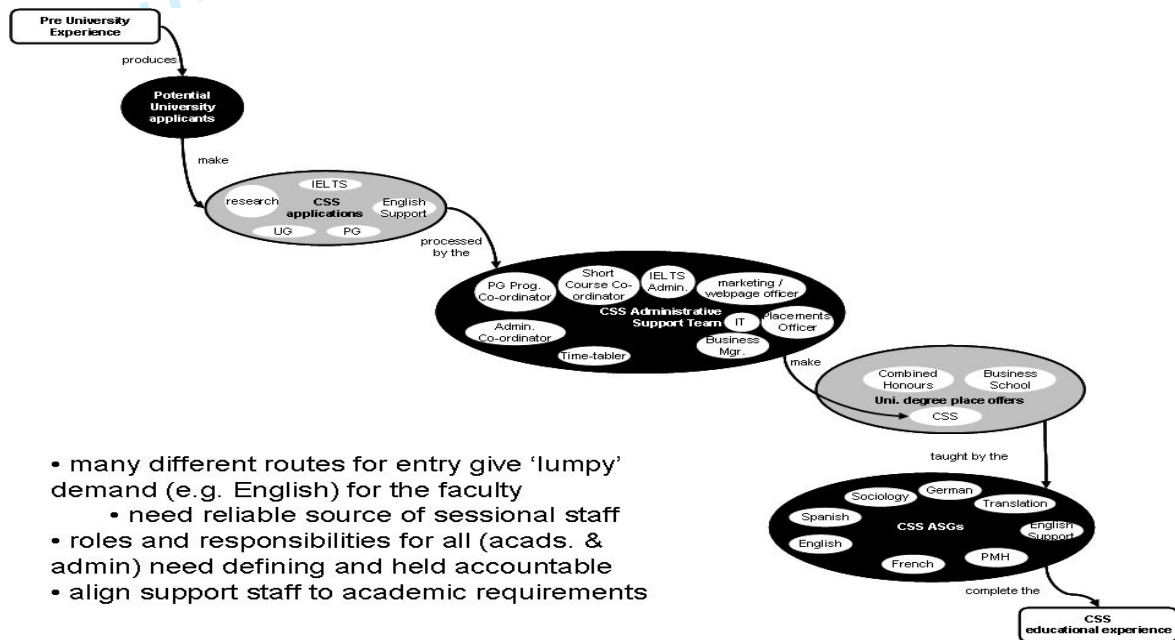
- Each academic subject group (ASG) in the CSS creates an administrative workload that needs to be better aligned to support staff provision and achieve a clearer demarcation of roles.
- Education provision needs to be increasingly thought of as product/service delivery.
- Applications for the CSS come from many routes other than just the CSS. An overall university experience needs to be presented for integrated courses, and the interfaces with these other parts of the university need to be improved.

- Annual planning horizons should be declared and used by all, increasing the use of partial, provisional, and firmed-up versions of timetables where possible. These need to be driven by a university-wide calendar.
- CSS policy and procedures must be available to all staff and students.
- Decision-making should be devolved to the lowest possible level of staff that has the authority for decision-making responsibilities, including budgetary devolution where appropriate.
- External promotion and marketing of the CSS must set the right expectations for potential students.
- IT systems are fragmented, and better compatibility and integration are required to speed up data exchanges.
- Functional divisions within ASGs must be removed to achieve more collective strategizing.
- Support for faculty-wide research programmes must be improved.
- The quality and standards of staff performance (via student, peer, and line-manager feedback) must be measured against volume (load levels) and responsibilities (actions).

There are eleven systemic success factors in this list alone (without including the other elements from Figure 6). This is in excess of Miller's  $7\pm 2$  (Miller, 1956) simultaneously manageable factors, so an enriched context pitched at a lower level is required. Lower-pitched operational models were therefore constructed using PrOH modelling's enrichment steps. Each of these operational models was 'storyboarded' to effectively present to and discuss systemic success factors with a school-wide audience. Figures 7a to 7e each show a scene from the storyboard about 'CSS Making CSS Place Offers'.

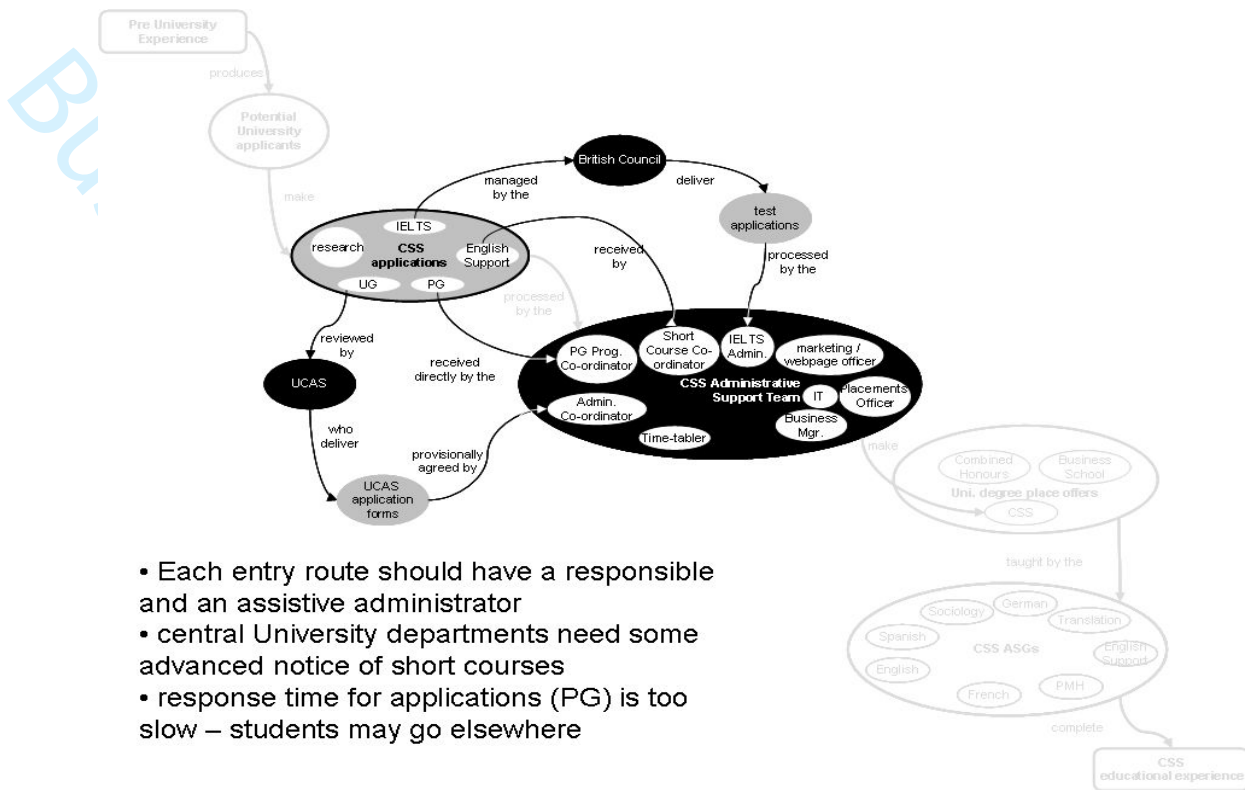


Figure 7a shows the core process statement, and bullet points for each scene explain the systemic success factors. Each scene contains between  $7 \pm 2$  systemic factors, which according to Miller (1956), is a manageable sum for meaningful debate by a group of stakeholders.



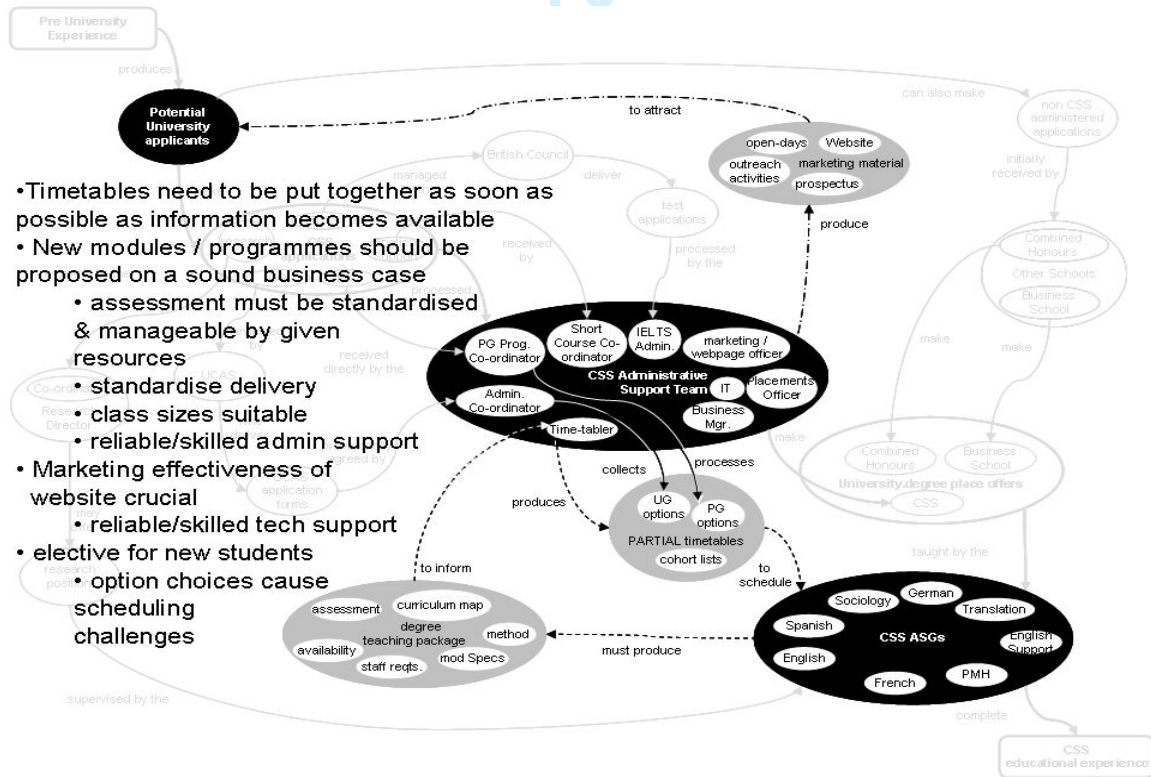
**Figure 7a: CSS Make CSS Place Offers – Core Process Statement – Scene 1**

It should be noted that 'bubbles' that have already been shown in a storyboard are faded out to give context to new parts of the model, and it is not necessary to read these again in the foreground of the new scene. This was a useful storyboarding technique and a key feature of PrOH modelling.



- Each entry route should have a responsible and an assistive administrator
- central University departments need some advanced notice of short courses
- response time for applications (PG) is too slow – students may go elsewhere

Figure 7b: CSS Make CSS Place Offers – Scene 2



- Timetables need to be put together as soon as possible as information becomes available
- New modules / programmes should be proposed on a sound business case
  - assessment must be standardised & manageable by given resources
  - standardise delivery
  - class sizes suitable
  - reliable/skilled admin support
- Marketing effectiveness of website crucial
  - reliable/skilled tech support
- elective for new students
  - option choices cause scheduling challenges

Figure 7c: CSS Make CSS Place Offers – Scene 3

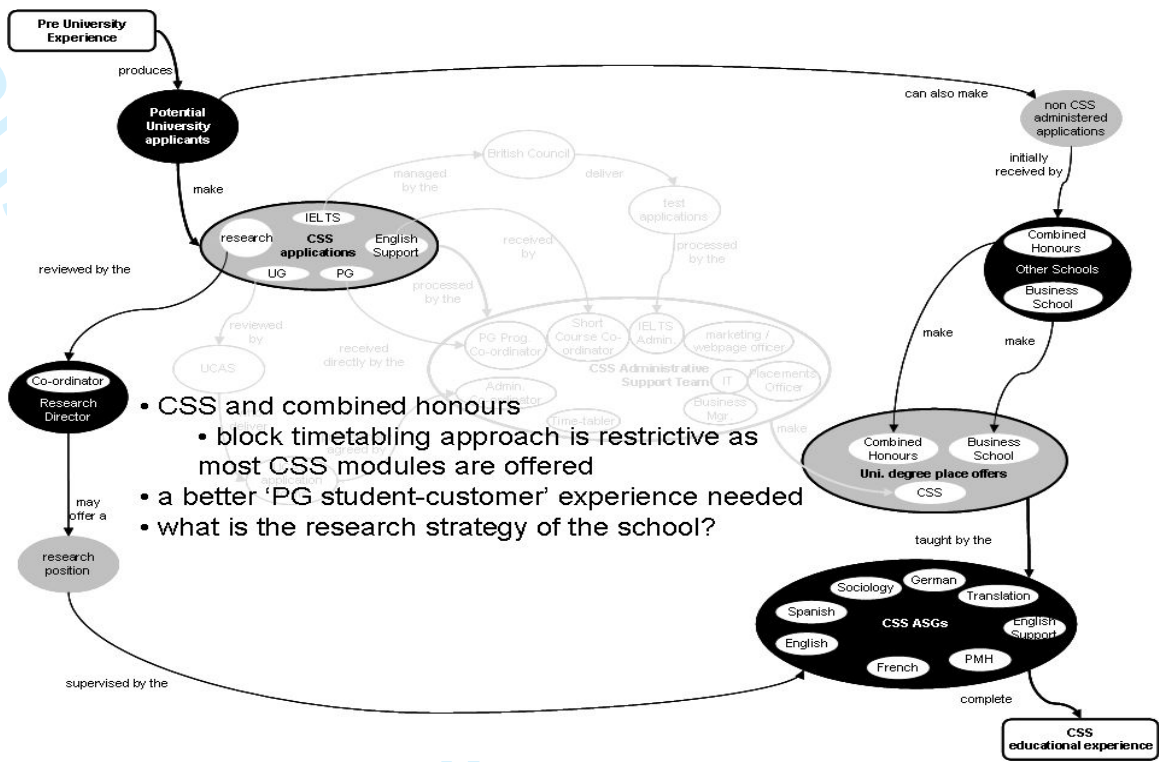


Figure 7d: CSS make CSS Place Offers - Scene 4

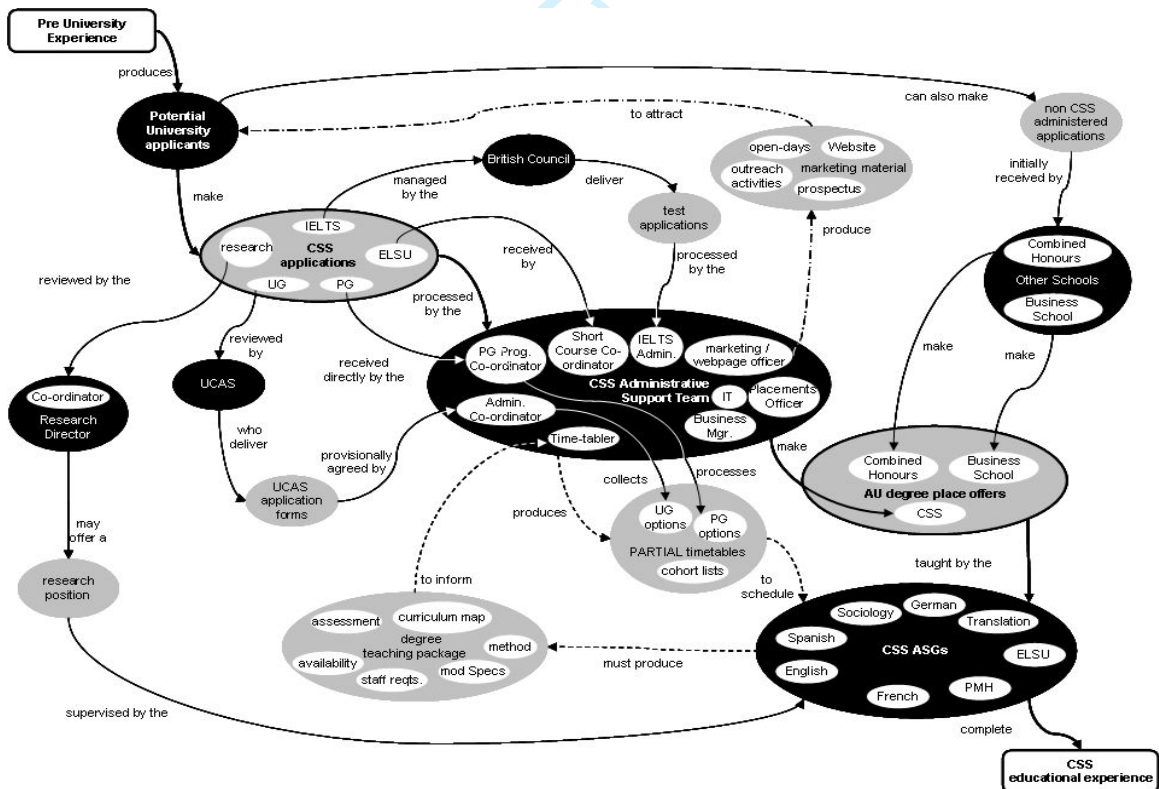
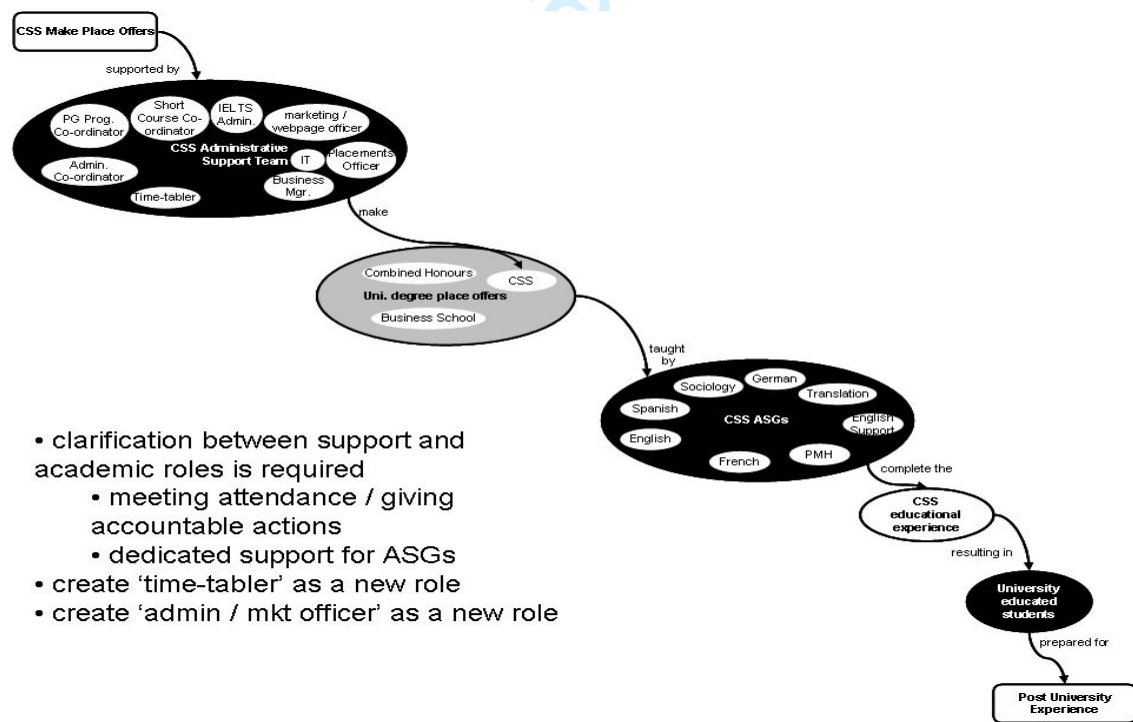


Figure 7e: CSS make CSS Place Offers – Complete Model – Scene 5

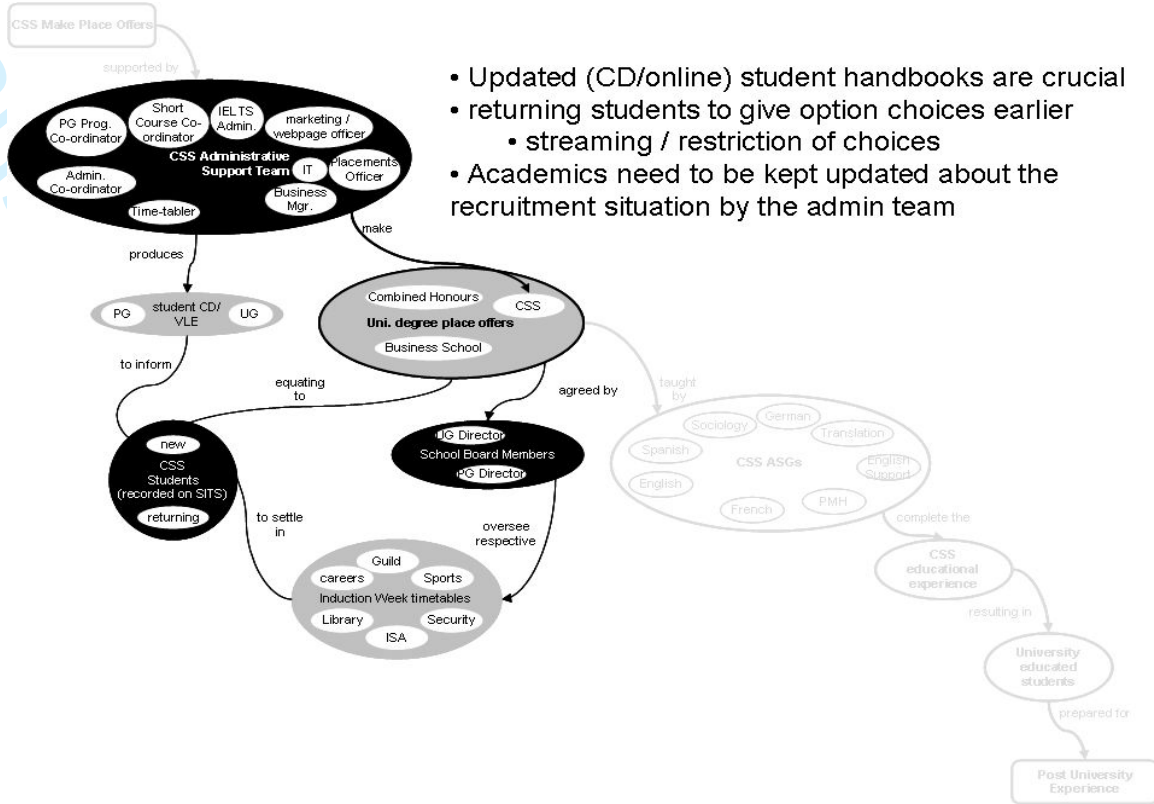
The issues in Figures 7a to 7e are strategically important because they affect the *recruitment* of new students to the university. Some changes had already been made, but further changes were still required, such as improvements to the delivery of programmes and extracurricular activities and support. Planned change, rather than reactive and uncoordinated change, had to be made (Tsoukas and Chia, 2002).

Figures 8a to 8f depict scenes from the ‘CSS Complete the CSS Educational Experience’ PrOH model. The issues in these models are equally important because once students are recruited into the university, the educational service experience they receive determines their retention and progression. If their perceived quality levels do not match the expectations set by the CSS marketing materials, then dissatisfaction is likely to detrimentally affect the university’s reputation and affect further recruitment.



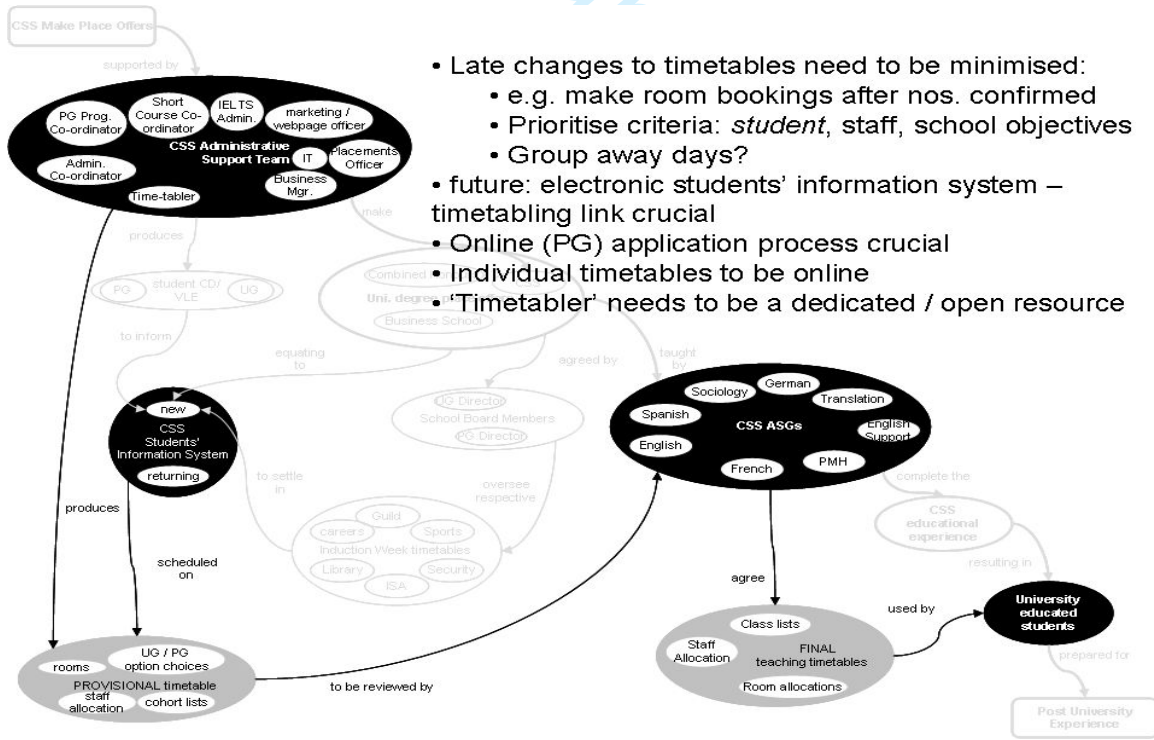
**Figure 8a: CSS Complete the CSS Educational Experience – Core Process**

**Statement – Scene 1**



- Updated (CD/online) student handbooks are crucial
- returning students to give option choices earlier
  - streaming / restriction of choices
- Academics need to be kept updated about the recruitment situation by the admin team

Figure 8b: CSS Complete the CSS Educational Experience – Scene 2



- Late changes to timetables need to be minimised:
  - e.g. make room bookings after nos. confirmed
  - Prioritise criteria: *student*, staff, school objectives
  - Group away days?
- future: electronic students' information system – timetabling link crucial
- Online (PG) application process crucial
- Individual timetables to be online
- 'Timetabler' needs to be a dedicated / open resource

Figure 8c: CSS Complete the CSS Educational Experience – Scene 3

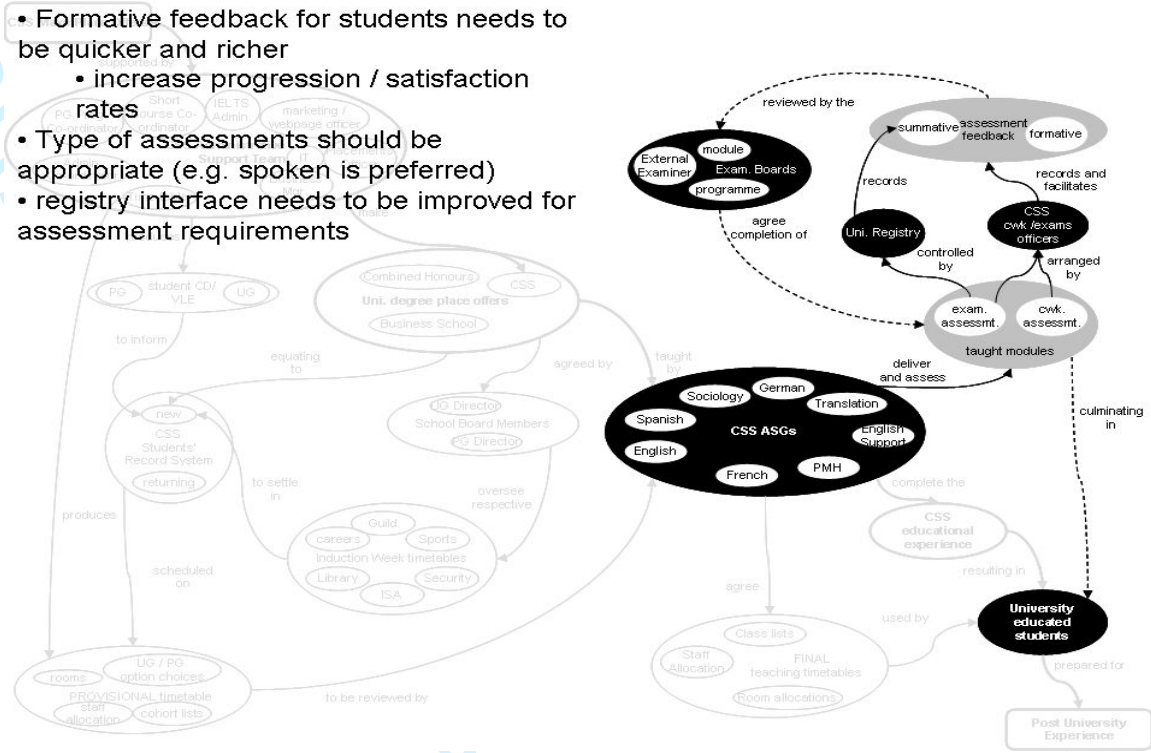


Figure 8d: CSS Complete the CSS Educational Experience – Scene 4

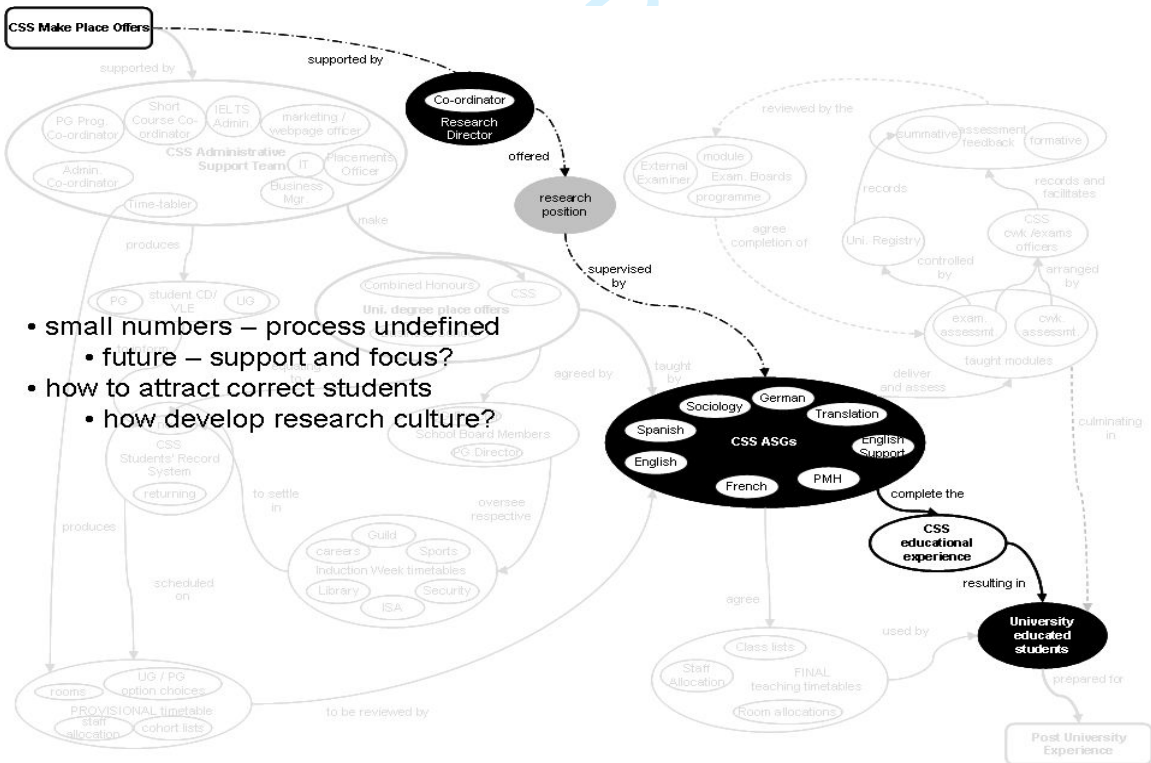
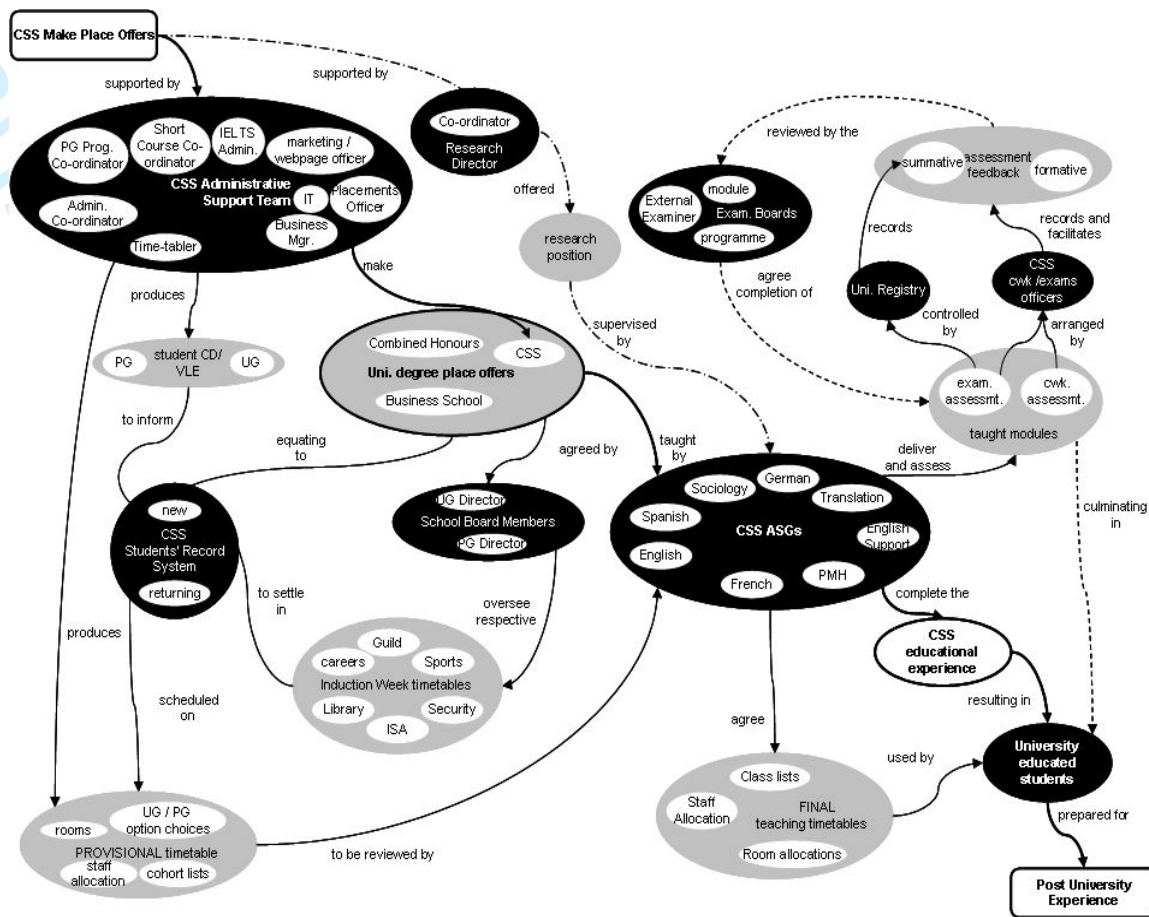


Figure 8e: CSS Complete the CSS Educational Experience – Scene 5



**Figure 8f: CSS Complete the CSS Educational Experience – Complete Model –**

**Scene 6**

The above storyboards were presented to an open ‘town hall’ forum of people within the school and to representatives of other critically related departments. After this open consultation, some recommendations were made; they are detailed below.

**DISCUSSION OF PRACTICAL IMPROVEMENTS USING THE 4V’s THEORETICAL FRAMEWORK**

Because new departments and new academics joined the CSS, and because the number of

1  
2 students increased, an overall increase of throughput was placed on the school's  
3 incumbent administrative processes during 2012–14. These processes reached a critical  
4 breaking point because they lacked efficacy and efficiency and were under- and  
5 inappropriately resourced. This action research project highlighted many of the systemic  
6 success factors (as shown in Figures 6, 7a-7e, and 8a-8f above) and recommended some  
7 corrective actions. These are discussed below using the 4Vs (Variety, Variation over  
8 Time, Volume, and Visibility) theoretical conceptual model discussed at the beginning of  
9 this paper. The 4V's theoretical concept provides a useful and relevant typology of  
10 operations management characteristics (Slack et al., 2004, pp.20-25).  
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### 25 **Variety – of Educational Services Delivered**

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30 The scenario depicted by Figure 6 illustrates overly complex administrative processes  
31 within the CSS and their unclear relationship to other schools and departments in the  
32 University. The CSS offered undergraduate programmes in eight different subject areas a  
33 figure that was set to grow further (see Figure 7a). The CSS also offered two suites of  
34 interrelated postgraduate programmes in Teaching English to Speakers of Other  
35 Languages (TESOL) and Applied Linguistics, plus five other programmes in TESOL,  
36 Translation, and International Relations. It also offered a doctoral research programme.  
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48 The nature of language subjects is unlike some other subject areas such as law or  
49 business studies because economies of scale cannot be achieved by allowing students in  
50 similar programmes to share common modules (especially in their first two years). This is  
51 because, in comparison to students of other subjects, language students require more time  
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3 for formative feedback for effective written, listening, and verbal development (see  
4 Figure 8d). As a result, steps were taken to give students more opportunities for formative  
5 feedback in shorter lead times to possibly increase their progression and satisfaction rates  
6 (as per McCall, 2007).  
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14 Prior to the CSS taking in departments from another school, it was believed that the  
15 administrative processes would be scalable and able to accommodate an increasing  
16 number of students. This, however, proved not to be the case, because it became evident  
17 that each different entry route required different dedicated administrative support  
18 positions (see Figure 7b). As a result, additional clerical posts had to be created to  
19 support each ASG.  
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30 The CSS had aimed to increase recruitment by offering a variety of programmes by  
31 customising courses for ever smaller cohorts of students. This was probably due to  
32 excessive 'cloisterism' prevailing over rational, planned, and productive 'collegialism'  
33 (Harvey, 1994). Such activities had hitherto been unmonitored, resulting in a total of  
34 forty-seven different programme routes being offered in the academic year 2014–15,  
35 nineteen of them hosting fewer than three students (see Figure 7d). The vast array of  
36 programme routes being offered to first-year undergraduates was the main contributing  
37 factor for this over-provision of variety. This *modus operandi* was fast creeping towards  
38 an unplanned mass customisation or personalisation of the university experience. If this  
39 unplanned-for turn of events had become compounded by the introduction of even more  
40 totally new programmes, an unsustainable burden would have been placed on the already  
41 overstressed and overstretched resources of CSS. Out of necessity, recommendations to  
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2 rationalise these choices into fewer *degree streams* (containing a bunched module choice)  
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4 meant that demand could be met more easily without sacrificing the quality of academic  
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6 content. Henceforth, it was decided that further programme and or module combinations  
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8 had to be proposed on a sound business rationale rather than on personal requests of  
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10 students or on academic tendencies to cloister.  
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### 16 **Variation – of Delivery Requirements over an Academic Year**

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21 Systemic success factors were also related to student and staff timetabling and the  
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23 management of resource demand variability over the academic year (e.g. enrolling  
24  
25 students, managing the induction week, and scheduling examinations). To complicate  
26  
27 matters, the university allocated dedicated timetabling slots for undergraduate students  
28  
29 taking CSS subjects in combination with another school's timetable (see Figure 7c). This  
30  
31 greatly reduced sequencing and scheduling possibilities for the CSS. Negotiations on this  
32  
33 subject with the university's central planning department resulted in more slots being  
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35 granted, which gave CSS greater scheduling flexibility.  
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41 The CSS also houses the university's English Language Support Unit (Figure 7a –  
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43 'English Support'), which runs many short courses and workshops to support non-  
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45 English speaking students and requires timetabling independently from the term-based  
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47 university-wide timetabling system. These typically run during summer recess and  
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49 require large allocations of staff resources for short durations. The solution for this in the  
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51 past had been to rely on sessional (temporary) staff. The relationship of permanent  
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53 members of staff with these temporary, and critical human resources, was poor and had to  
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2 improve because these sessional staff felt excluded from other school activities and the  
3 culture of CSS. Thus, more inclusive and engaging practices needed to be adopted.  
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9 Likewise, assessment procedures had become inefficient (see Figure 8d), and it was clear  
10 that not enough consideration was being given to the load variation over the CSS's  
11 academic year. As a result, resources again became overstretched during critical periods.  
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13 The resulting recommendation was to clearly identify a dedicated person and role  
14 responsible for timetable scheduling and to have another supporting person fully trained  
15 and able to cover critical peak-capacity periods.  
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### 25 **Volume – of Teaching Delivered**

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30 It was an ongoing aim of the CSS to increase the volume of enrolled students while  
31 maintaining student quality and a financially sustainable school. Successful admissions  
32 and marketing were crucial to achieving this and were therefore another systemic success  
33 factor that had to be improved (c.f. Figure 7d). Because the CSS website was the main  
34 marketing tool for recruitment and increasing the volume of students, its design (i.e. look,  
35 copy, and interaction) had to primarily appeal to potential postgraduate and research  
36 degree entrants as well as secondarily appeal to high volumes of undergraduate students.  
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38 This was because the average postgraduate student was generally more transient,  
39 international, demanding and had a greater choice of alternative courses to choose from  
40 in comparison to the average undergraduate student. Therefore, it was decided that  
41 another new senior role should be created that would be dedicated to online marketing,  
42 social media, web authoring, and the administration of admissions, with the intention of  
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2 increasing the professionalism of information provision, and student on-boarding  
3 processing capabilities in the CSS. Therefore, a major redesign of the CSS website was  
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5 embarked upon. These changes were aimed at increasing student volumes in a planned  
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7 way in consultation with the deliverers of professional academic support services so that  
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9 enough teaching capacity was available to be able to deliver quality services to greater  
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11 numbers of students while being financially sustainable.  
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18 These dramatic recent changes to teaching in the CSS meant that research activities in  
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20 general and the formulation of an associated planned research strategy in particular had  
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22 taken something of a back seat (see Figure 8e). It was also therefore recommended that  
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24 additional administrative and financial resources be provided to boost the research culture  
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26 of the school.  
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### 32 **Visibility – of Decisions and Progression**

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37 Another systemic success factor was the considerable overlap between the  
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39 responsibilities and duties of the CSS executive officer and business manager roles in the  
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41 CSS. Both posts were at the same grade, but neither person had overall responsibility for  
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43 administration (and administrative staff), or overall strategic planning for the CSS as a  
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45 whole. As Figure 8a shows, this research highlighted that both roles should be  
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47 amalgamated into one, thereby providing clearer administrative leadership with a better  
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49 understanding of all the school's high-level requirements relating to teaching and a more  
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51 visible line of reporting for administrative staff. By creating this new role (a 'school  
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53 administrative officer'), the improvement team believed that responsibilities for  
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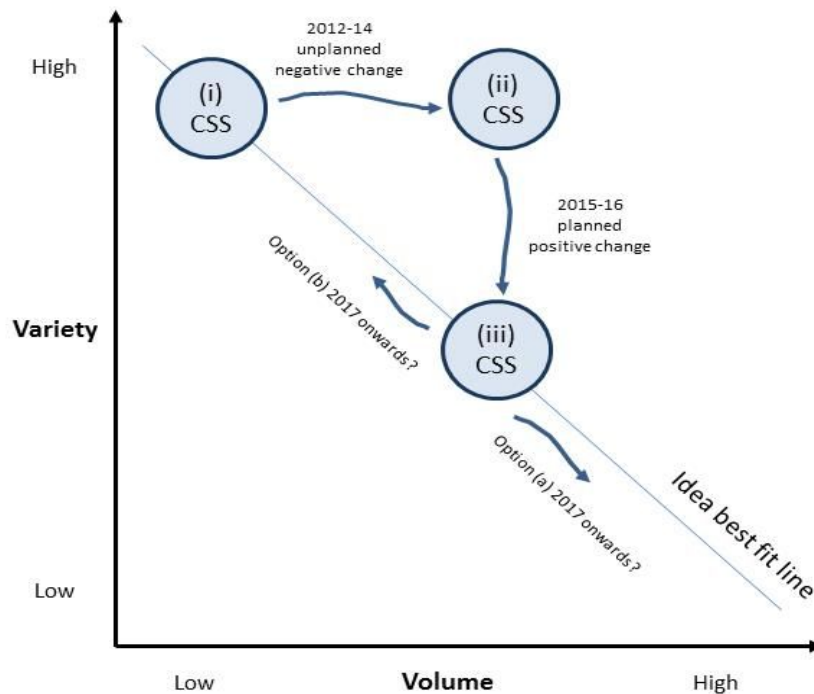
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2 administrators will be clarified, and increased visibility of information via the better use  
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4 of existing online information and communication technologies (ICTs), particularly those  
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6 for student progression and staff timetabling, can be achieved.  
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11 Job descriptions of all other administrative staff were reviewed, redefined, and  
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13 professionalised to ensure that core support processes associated with critical events in  
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15 the CSS administration were serviced efficiently and effectively. For example, supporting  
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17 research students and room bookings had been the responsibility of one post, whereas  
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19 supporting research staff and quality assurance had been that of another. Both research-  
20  
21 related tasks were brought together into a single role and staffed by multiple people using  
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23 the same databases. Additionally, responsibility for room bookings was moved to a  
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25 timetabling role, and a new quality assurance role was created as a new dedicated  
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27 position. These changes all improved the visibility of decision-making in the school.  
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34 Figures 8b and 8c highlight the increasing importance of online ICT in academia today,  
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36 including the many processes associated with timetabling, students' data, examination  
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38 and course information. However, despite the CSS' internal use of ICT, the ICT link  
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40 between it and other university departments still needed further improvement. Initial  
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42 recommendations to improve the link between the CSS and university registry were also  
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44 made to improve the efficiency of enrolment and assessments. For instance, the  
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46 timetabling would now be released in partial and provisional states to allow enough time  
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48 for consideration by staff.  
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55 Broadly, this case shows that higher education organisations need to plan more  
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2 strategically and be as good at data and knowledge processing as they are at student  
3 processing. The 4V's model was used to explain changes that have occurred in CSS in  
4 processing. The 4V's model was used to explain changes that have occurred in CSS in  
5 the duration of this action research. The following changes were observable: (i)  
6 Unplanned student volumes initially increased from 2012 to 2014 and led to too much  
7 organisational complexity and cost. (ii) Corrective actions took place during 2015–16,  
8 reducing cost and complexity in educational service delivery and in CSS's organisation.  
9 (iii) Future directions lie in a conscious decision to go with either (a) high volume and  
10 lower variety value-based strategy associated with relatively low visibility and smoothed  
11 variation or (b) a higher variety and lower volume premium-priced strategy with greater  
12 visibility and unsmoothed variation. Going for both options ('a' and 'b') is not considered  
13 possible by the 4V's concept. The 4V's concept also advises against high volumes and  
14 high variety because it leads to overly complex and high costs, and it advises against low  
15 volumes and low variety because it is unlikely that sustained delivery is possible. Figure  
16 9 shows these transitional paths, where between 2012 and 2014, delivery had started to  
17 move away from the best fit line and then return towards it as a result of planned changes  
18 made in 2015–2016.



**Figure 9: Changes Made in the CSS in the Context of the 4V's Theoretical Service**

**Delivery Concept. A Summary of Phases and Time Lapses**

**SUMMARY**

This CSS case study demonstrated the usefulness of the PrOH modelling methodology as a method of enquiry and systems analysis. The 4V's typology of operations management was useful, as a theoretical concept, in this professional service environment in the public sector. Previously, these had mostly been used in the private sector for engineering and manufacturing activities. This study also showed how PrOH modelling can be used in abductive rationalisation against conceptual frameworks, such as the 4V's model, This stimulated new thinking about roles and tasks in processes (Rytmeister, 2009) and how they can be merged through *abstracted* thinking or rethought through *enriched* understanding.

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5 Together, collective decision-making and action-taking moved CSS towards a 'collective  
6  
7 consciousness' that enabled frontline staff and the management team to view themselves  
8  
9 differently (as per Hodgkinson and Brown, 2003). The key to doing this was effective  
10  
11 individual and group learning 'in' action, reflection 'on' action, and reflection 'for'  
12  
13 action, as embodied in PrOH modelling and other leading systems intervention  
14  
15 approaches (e.g. Revan, 1982; Kolb, 1984; Senge, 1990). In this case, the top-down  
16  
17 'tactical' modelling view was more formal, overt, and management led, whereas the  
18  
19 bottom-up view was more latent and heartfelt. Bringing both views together increased the  
20  
21 novelty of action taking, the credibility and confidence of all staff, and the relevance of  
22  
23 actions taken to exogenous market forces and political changes. For frontline staff, this  
24  
25 diminished scepticism and suspicion of the senior management team's motives, and for  
26  
27 the senior management team, it improved the overall collegiality of the school. This  
28  
29 meant that changes were more readily accepted and easier to implement.  
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37 PrOH modelling was used in this case to clarify the positive and negative effects of  
38  
39 change processes and facilitate transitional recommendations for improvements. PrOH  
40  
41 modelling's holistic properties were particularly useful to show where new roles should  
42  
43 be created (e.g. new marketing and admissions roles); show where specific tasks and  
44  
45 roles would be better off consolidated (e.g. research and quality activities and executive  
46  
47 officer and business manager roles); help with improving continuous flow (e.g. more  
48  
49 connectivity between online ICT); suggest more suitable division or fragmentation of  
50  
51 roles (e.g. dedicated administrators for each ASG, better use of sessional staff, and a  
52  
53 dedicated role for managing assessments); and show where to add further resources to the  
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2 process (e.g. to help level loads and deal with lumpy demand patterns). These systemic  
3  
4 insights were made possible by simultaneously considering the tactically pitched CSS  
5  
6 model and the lower-pitched operational models – provided collectively by the set of  
7  
8 three holarchical PrOH models – which catalysed change recommendations from detailed  
9  
10 examination of operational practices and the creation of new strategic School-level  
11  
12 visions. We observed in this case that simultaneous views were necessary and useful to  
13  
14 model and that they could be successfully modelled using the PrOH modelling  
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16 methodology.  
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23 Because this case study led to a significant redefinition of roles and tasks, we can see that  
24  
25 the perceived misalignment between academic requirements and administrative support  
26  
27 was substantiated and remedied. Additionally, by collectively redefining the school's  
28  
29 systemic success factors, it was possible to fundamentally change reporting structures,  
30  
31 power, and authority and enhance the culture of the CSS. This was achieved by using a  
32  
33 holistically composed multi-pitched set of systems thinking models produced using the  
34  
35 PrOH modelling methodology.  
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42 In summary, this holistic thinking

- 43  
44 • Raised awareness of systemic school-level issues and reduced inertia to create  
45  
46 change at the strategic, tactical, and operational levels
- 47  
48 • Freed up academics from administrative duties so that they could devote more time  
49  
50 to teaching and research activities while simultaneously reducing bureaucracy
- 51  
52 • Provided clarification of core processes, roles, and responsibilities so that a  
53  
54 customer-facing process focus was adopted and reporting structures were  
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3           unequivocal

- 4  
5           • Made sure that the support structure met the new academic requirements  
6  
7           • Ensured that critical events in the academic year were fully resourced along with a  
8  
9           contingency to deal with any unforeseen circumstances  
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11  
12           • Increased professionalism and collectivism for teaching and professional staff,  
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14           allowing discretionary behaviour to flourish.  
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19       These recommendations started to come into effect during the 2017–18 academic year  
20  
21       and will help to accomplish further transitions in CSS as the United Kingdom’s new  
22  
23       Teaching Excellence Framework (HEFCE, 2017) begins to have increasing effect. It is  
24  
25       believed that this novel systems approach can be used in other universities across the  
26  
27       world to help reduce waste and define and redefine roles, responsibilities, and processes.  
28  
29       The processes focused on in this study (e.g. student recruitment and student education)  
30  
31       are likely to be vital to any higher education organisation. This is extremely relevant in  
32  
33       light of the current economic, regulatory, internationalisation and other technical changes  
34  
35       happening in higher education (Browne, 2010), particularly in subjects such as modern  
36  
37       languages that need high staff-to-student ratios and are less scalable than other subjects.  
38  
39       Changes as seen in this case study are a careful balancing act to ensure changes in market  
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41       conditions can be met without a loss in moral legitimacy, core purposes, and values of the  
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43       school.  
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51       In early 2017, the head of the CSS stated that this exercise had ‘... really helped us to  
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53       understand our processes, clarify our core mission and know what our peripheral  
54  
55       activities were. It showed us how we could build on our strengths to deliver courses  
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2 efficiently, effectively, and most importantly with financial sustainability; which in light  
3  
4 of recent budgetary cuts and regulatory changes, by the UK Government, is our primary  
5  
6 concern. What was particularly interesting is that by using the “4 V’s framework” as a  
7  
8 theoretical framework we found that those in strategic positions were less directly  
9  
10 affected by “V-changes” than those who were in operational positions – who had the least  
11  
12 authority and least time to respond to them and change them ...’. This is a phenomenon  
13  
14 that the author refers to as the *4V’s latent whipping effect*: ‘... Therefore we should  
15  
16 always take a holistic view of our school at every level and at every stage of our delivery;  
17  
18 and by doing so we will be in a stronger position to tackle upcoming challenges. We  
19  
20 would use these techniques again in the future to reassess our constantly changing  
21  
22 situation’. The changes made will hopefully make the delivery of modern foreign  
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24 languages more resilient, efficient, and effective and increase the percentage of native  
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26 English-speaking students working in non-Anglophonic countries.  
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35 This action research activity was considered by those involved to have a positive and  
36  
37 instrumental effect on instigating change. It was probably successful partly because it  
38  
39 took the view that ‘...the future of [a] university is contingent on how well internal  
40  
41 adaption processes to external changes are implemented...’ (Sporn, 1995, p.72). This  
42  
43 research was limited because it was based on only one UK university. It cannot claim  
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45 beyond doubt that these changes were solely and deterministically brought about by the  
46  
47 PrOH modelling exercise.  
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53 More work can be done to further enrich and define tasks and roles as new systemic  
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55 success factors become apparent. More highly pitched abstractions can also be used to set  
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1  
2 the CSS tactical model and systemic success factors into a strategic university-wide  
3 model (e.g. for the formation of multi-school colleges). The PrOH modelling  
4 methodology can also be used in other types of organisations to instigate change.  
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17 management of the case study university, who provided critical support to this study.  
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