

A systems design approach for investigating Australian TAFE design education

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ABSTRACT

This paper explains how a systems design approach has been used to develop a model of a design education system within the Australian Vocational Education and Training context, and with respect to the views and aspirations of design teachers. It uses empirical data to identify important model parameters (and their related constituent variables) that can be employed to describe the characteristics of the TAFE design education system. This model provides a useful tool for obtaining relevant, empirical system performance data which, in turn, can be applied to refine the model. Moreover, it may be adapted in future research to obtain the views of other important stakeholders within the context of design and perhaps other related vocational education fields. The paper begins with a literature survey and a brief outline of the research and data analysis methods employed. This is followed by system modelling, a summary and conclusions.

INTRODUCTION

This investigation of design teaching and learning practices in the Vocational Education and Training (VET) sector in Australia was completed in 2010¹. The main purpose was to develop a model of the system based on the views and aspirations of design teachers serving in the Technical and Further Education (TAFE) Institutes located in most States in Australia. The paper is primarily about the design and methods employed in this study which is based on a systems design approach and an empirical investigation used to develop a model of the education system. While there are other important groups which need consideration, including students, administrators, employers and Government officials involved in TAFE, it is widely accepted that design teachers represent a critically important group of stakeholders affecting the efficacy of the TAFE design education systems. Therefore the views and aspirations of these teachers need to be taken into consideration in the development of such a model. This is reflected in the following research questions:

- (1) Can a systems design approach be used as a possible method to model a TAFE design education system with respect to the views and aspirations of design teachers – mindful of the views of other stakeholders?
- (2) As a correlated question: what empirical data are required to inform and develop this model with respect to the views and aspirations of design teachers?

¹ Klimek, CL 2010, *A study of design education in the Australian Vocational Education and Training context*, doctoral thesis, University of Canberra

LITERATURE REVIEW

The systems design approach: This research project was initially guided by the authors' teaching and research experience at the Canberra Institute of Technology and the University of Canberra, respectively. A few explanatory remarks about what constitutes a *system* and a *systems approach* are in order: a *system* is a generic term which has many possible meanings, but in a design learning context it can be taken to mean a set of "objects" where these objects are the interconnected components of the system as a complex whole (Bonollo, 2010; Hall 1962; SESA, viewed 11.12.2008; INCOSE, viewed 11.12.2008).

In addition, the components of the system (i.e., the objects or *parameters*) usually have their own individual set of interconnected attributes or *constituent variables*. Systems can vary enormously in complexity and scale and, in many cases, often require a multidisciplinary *systems design or engineering* team to plan, analyse, design and implement the physical and operational system attributes, including the required human resources, technology (hardware and software) and standard operating procedures. But systems can also be relatively small in scale, such as a part of an education system, e.g., a TAFE design education sub-system, as is the subject of this paper – in a national VET education system. However, even though a multidisciplinary team would be normally required in a substantial development of such a system, the systems design approach can still be used to investigate and gain a better understanding of the main parameters of such an education sub-system, with specific participants, as explained later.

The TAFE design education system: Mindful of changes taking place over the last ten years, design education, as a subsystem of the TAFE system, has had to educate aspiring designers for employment in the creative industries as best as it could – given, that this is a relatively small area of the overall TAFE system. Some of the significant and well-known changes include the introduction of a national TAFE system based on competency training and assessment, the development of Training Packages, new traineeships, implementation of an Australian Quality Training Framework (AQTF) and an explicit focus on developing in students the underpinning Employability Skills that replaced the Mayer Key Competencies².

A study of design education in the VET sector (Roantree, 2000) investigated government reports and suggested that since the reforms to establish the Australian National Training Authority (ANTA) in 1992 (and since abolished in July 2005) were implemented, TAFE Institutes have continued to play a significant role in the training of designers and design assistants across a broad range of disciplines in the creative industries. These reforms included the move to a national training system after the publication of the Australian Government policy document '*Working Nation*' in 1994 (Commonwealth of Australia, 1994), which outlined the objectives of VET in the context of establishing an environment for economic growth. To ensure that a standardised and unified TAFE

² Mayer, E 1992, *Putting general education to work: the key competencies report*, Melbourne, Australian Education Council and Ministers for Vocational education Employment and Training

system functions in each state and territory, a national Australian Standards Framework (ASF) for registration and accreditation, qualifications and skills standards was introduced by ANTA in the following years. These reforms also established the leading role of industry and union organisations in determining the required training needs and standards. However, practitioners and educators in the Arts and Design communities have been less enthusiastic about these changes due to their perception that competency standards were inconsistent with the aim of striving for excellence in art and design work, and may lead to less desirable standardised performance (Arts Training Australia, 1995). It appears that more research is required to clarify the views of teacher-stakeholders.

Another area of research by Chappell (2004) has focussed on developing innovative approaches to a more student-centred learning approach, and development of online pedagogies including the design of appropriate media for course content presentations for education purposes. More specifically, there has been little empirical research reported about design education teaching and learning practices in Australian TAFE institutions.

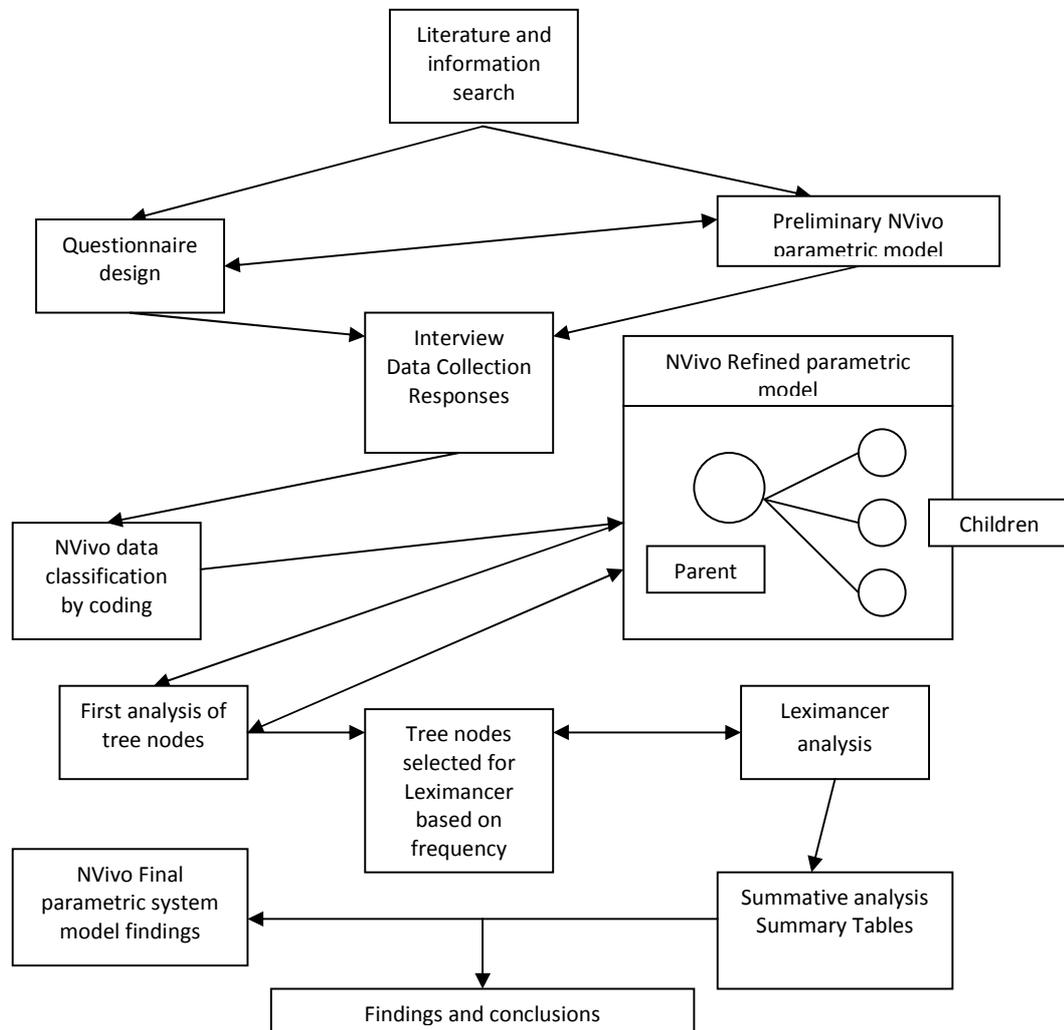
In the higher education context, understanding the nature of design thinking, design process and related underpinning theories has developed over time. Studies by Schön (1983), for example, indicate that the main teaching and learning activities in an architectural studio are consistent with *reflective practice*: a circumstance where students are thinking about what they are designing while actually engaging in the design process. Similar reflective practice circumstances occur in other design fields (Bonollo and Lewis, 1996). Middleton (2004) investigated the nature of design expertise and the transition from a novice through to a proficient and then to an expert design practice. He suggested that the kinds of research studies being employed might not be suitable for finding out about how teachers provide learning experiences to students. Moreover, the views of design teachers, as stakeholders, are not made clear. And this is an apparent gap in research data concerning the opinions, needs and aspirations of TAFE design teachers.

A report by Cartledge and Watson (2008) examined the implications of competency based training and national training packages for the teaching of design. However, the focus here was on assisting VET design educators to encourage the development of creativity across a range of business enterprises by examining training and assessment practices. Although a notable amount of consultation has occurred with the various stakeholders, further research is needed to investigate the structure and the interdependent relationships within the TAFE design education system and their impacts on design education outcomes.

RESEARCH METHODS EMPLOYED

Briefly, two levels of activity were used in this research project, namely: (1) An initial model of the noted design education system was proposed as shown in Figure 2 below. (2) A qualitative study was used to survey the design teachers participating in the study. The purpose of the latter was to obtain empirical data which could be used to further develop the initial model of the system with respect to the views of the teacher stakeholders; this qualitative study is outlined below followed by a description of the system modelling:

Figure 1: Graphic outline of the procedures adopted in the research method



Qualitative interviews – participant selection: The empirical fieldwork employed in this study involved Institutes and their staff members in every Australian state, except the Territories. This required arranging focus groups and/or individual interviews (in this case the lead author was regarded as a compatible peer given his TAFE background). A semi-structured interview method (Glanville, 1998; Hudelson, viewed 2008) was adopted. Applying the NVivo software enabled the frequency of distributions of participants’ views (in relation to the parameters and their constituent variables) to be obtained. The frequency of specific responses was used to grade the relative importance of the participant responses.

There are approximately fifty (50) publicly funded Institutes of TAFE in Australia, and altogether over 246 public and private organisations that provide aspects of design education in a range of design disciplines (NTIS, viewed 2003). In this empirical field study, thirteen TAFE Institutes, across all Australian States (but not in the Territories),

were selected using the *Art & Design Education Resource Guide 2003*, (DG International Media Pty. Ltd., 2003) annual publication as a reference. This represents approximately a quarter (25%) of all public TAFE Institutes in Australia. As indicated in Table 1, a representative sample was selected from each State by ensuring that these TAFE institutes offered a broad range of design programs.

Table 1: List of participating TAFE Institutes and interview participants

	STATE	TAFE INSTITUTES	NUMBER OF PATICIPANTS
1.	NSW	Sydney Institute of TAFE – Enmore Design Centre	9
2.	VIC	Gordon Institute of TAFE	5
3.	VIC	Swinburne University of Technology – TAFE Division	2
4.	VIC	Box Hill Institute of TAFE	8
5.	TAS	Institute of TAFE Tasmania - Launceston	2
6.	TAS	Institute of TAFE Tasmania - Hobart	2
7.	QLD	Southbank Institute of TAFE – Morningside Campus	4
8.	QLD	Sunshine Coast Institute of TAFE – Cooloola Campus	4
9.	WA	Central TAFE – Perth City Campus	2
10.	WA	Central TAFE – Leederville Campus	8
11.	SA	SA TAFE - Croydon Park	5
12.	SA	SA TAFE - Tea Tree Gully Campus	3
13.	VIC	RMIT – TAFE Division	3
TOTAL			57

Qualitative interviews – questionnaire design: The lead author conducted the interviews and used a general plan of inquiry, but not a complete set of questions that had to be asked in a particular way. From related experience, he was also familiar with the types of questions to be asked in order to obtain relevant information flexibly. Babbie (2005) found that when properly done the questions are not biased or too inquisitive, and field research interviewing can allow one to find out what is happening.

The methods employed in this investigation are more in line with the *Proximal Similarity Model* approach to generalisation as suggested by Trochim (2006). Under this model consideration is given to different contexts where generalisations may be made, and developing a presumption about which context is more or less similar to this study. For instance, there are similar TAFE Institutes which have similar design teaching practitioners working in them, which in turn are similar to those included in this study. Concepts associated with Grounded Theory and the Discourse Analytic methods were also found to be useful for analysing the empirical data. A brief review of these methods follows:

Grounded theory: According to Punch (2000), this form of research, which often begins with “*theoretical and philosophical considerations of paradigm*”, can be described as a “*pragmatic*” method. Related to this, the Grounded Theory Method (GTM) was assumed to be relevant due to the apparent scarcity of empirical data concerned with TAFE design

education in Australia. As described by Glaser and Strauss (1967) the developers of GTM, this form of research begins with a research situation. Babbie (2005) states, that through inductive studies of a situation, grounded theory seeks to develop a theory from the constant analysis of the patterns, themes and common categories, discovered in interview or observational data, which provide an explanation of the situation.

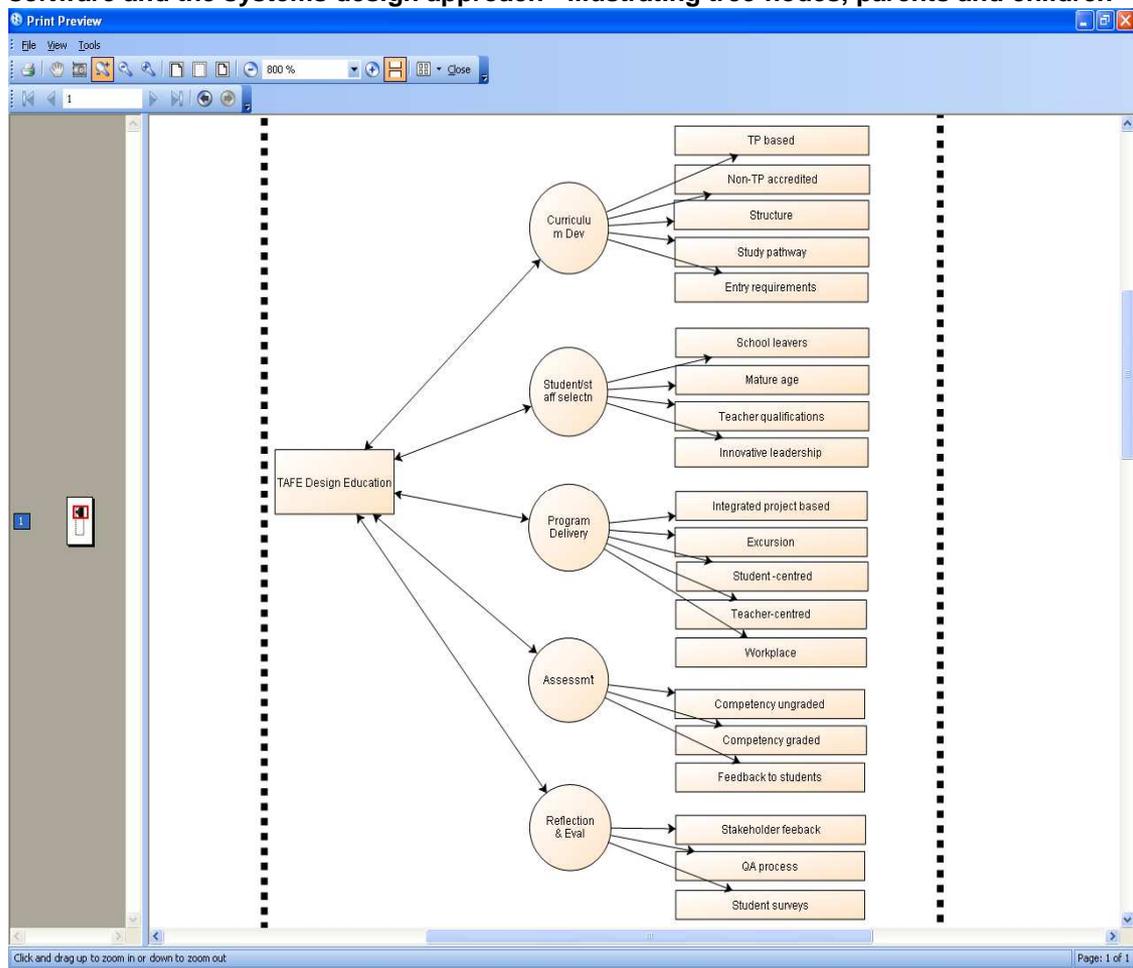
The discourse analytic method: A form of qualitative analysis that was found to be useful in this research is the discourse analytic method described by Talja (1999) who argued that participants' interpretations are much more context-dependent and variable than is usually acknowledged.

SYSTEM MODELLING

The second level of activity noted earlier began by proposing a simple model of the TAFE design education system as shown graphically in Figure 2, below. Although incomplete at this stage, this established a basis for interviewing design education teachers – using the above qualitative methods - with respect to the parameters that were perceived to characterise the system. As the research project progressed it was found, from the empirical data collected, that there were additional parameters (with constituent variables) that could be used to construct a more complete model as presented later in this paper. In view of the substantial empirical data involved, these models were developed with the aid of NVivo7 qualitative analysis software (QSR International, 2006) and Leximancer software (2009).

Referring to Figure 2 below, it will be noted this initial model has five (5) “parent nodes” representing the well-known, important *parameters: Curriculum Development; Student/Staff Selection; Program Delivery; Assessment and Reflection and Evaluation*. There are also twenty (20) “children nodes,” in NVivo terminology, representing the *constituent variables* of these parameters, and together they make up a “tree node”. This model shows, in a reasonably plausible manner, how the system design approach may proceed from *curriculum design and development* through to *reflection and evaluation* of the system as a whole in a way consistent with the usual phases of the design process (Bonollo, 2010). From Figure 2, it may be assumed that the system-produced outcomes would be obtained primarily from the interrelationships between the *parameters* and *constituent variables*, with substantial interdependence between them. In an ideal sense, these outcomes can result from efforts to achieve a satisfactory fit and balance between competing needs of stakeholders' interests, mindful of the available human and material resources, technologies and funds. To expand on this systems design approach, it follows, that a TAFE design education system may be considered as an ensemble of interconnected parameters (*objects*, with constituent variables), that together (i.e., holistically), produce educational outcomes that would not otherwise be achieved by any one of them independently.

Figure 2: Schematic diagram of proposed, initial parametric model generated using NVivo software and the systems design approach - illustrating tree-nodes, parents and children



A refined parametric model of the TAFE design education system: An important section of a more complete model of the TAFE design education system is illustrated in Tables 2 and 3 inclusive, on the following pages. It will be seen that there are now many more parameters (8 out of a total of 13 – see Figure 3 below), and constituent variables (43 out of a total of 86) involved compared to the initial theoretical model (Figure 1). By way of explanation, in addition to Tables 2 and 3, other similar tables were developed for this model of the system comprising 13 interdependent parameters and 86 constituent variables. For brevity these are not tabled here but are summarised in the conclusions section of the paper in Figure 3. A full description is given in Klimek (2010).

As will be noted in Tables 2 and 3, the parameters and their constituent variables are in alphabetical order in the main window entitled “Tree Nodes”. From the left hand side, the first column provides the names of the tree nodes and their constituent variables (indented to the right). The next two columns show the number of sources (transcripts) and individual coded references pertaining to particular variables. Note that only the constituent variables have the number of sources and references listed. The date when the tree node was created is shown in the next column to the right.

Table 2: Partial view of a refined parametric model of the TAFE Design Education System – parameters and their constituent variables shown expanded here: ASSESSMENT; ATTITUDES and CURRICULUM DESIGN

Name	Sources	References	Created	Modified
Assessment	0	0	6/11/2007 2:42 PM	25/02/2009 12:38 PM
Competency based	18	90	6/11/2007 2:44 PM	25/02/2009 12:36 PM
Feedback to students	14	47	7/11/2007 8:42 PM	25/02/2009 3:49 PM
Graded assessment	12	28	6/11/2007 2:44 PM	20/02/2009 5:10 PM
Outcome reporting	13	23	6/11/2007 2:44 PM	20/02/2009 5:10 PM
Recognition prior learning	7	17	6/11/2007 2:44 PM	6/03/2009 2:38 PM
Self and peer assessment	16	29	6/11/2007 2:44 PM	20/02/2009 5:10 PM
Attitudes	0	0	7/11/2007 11:19 AM	7/11/2007 11:19 AM
Assumptions about TAFE teach	2	2	24/02/2009 12:43 PM	24/02/2009 12:43 PM
Education	8	20	7/11/2007 12:57 PM	25/02/2009 3:12 PM
Resistance to change	9	15	7/11/2007 12:57 PM	20/02/2009 5:10 PM
Teacher's educ belief	18	98	7/11/2007 12:58 PM	25/02/2009 5:10 PM
Teaching reform	14	36	7/11/2007 12:57 PM	20/02/2009 5:10 PM
Training	18	82	7/11/2007 12:57 PM	25/02/2009 4:04 PM
University	15	35	7/11/2007 12:57 PM	25/02/2009 4:04 PM
Curriculum design	0	0	6/11/2007 2:46 PM	25/02/2009 3:58 PM
Accredited	10	14	8/11/2007 6:38 PM	25/02/2009 3:45 PM
Adult learning principles	7	9	8/11/2007 6:30 PM	25/02/2009 3:58 PM
Entry requirements	9	18	7/11/2007 5:45 PM	20/02/2009 4:30 PM
International models	3	4	7/11/2007 3:36 PM	2/02/2009 3:56 PM
Structure	12	20	7/11/2007 5:09 PM	25/02/2009 3:48 PM
Study pathways	13	36	7/11/2007 4:45 PM	24/02/2009 5:41 PM
TP based	14	47	8/11/2007 6:37 PM	25/02/2009 3:55 PM
Curriculum Determinants	0	0	7/11/2007 11:21 AM	7/11/2007 11:21 AM
Good Quotes	15	248	8/11/2007 11:57 AM	20/02/2009 5:10 PM
Graduate Attributes	0	0	6/11/2007 2:50 PM	25/02/2009 4:15 PM
Issues	0	0	7/11/2007 11:16 AM	25/02/2009 5:17 PM
Stakeholders	0	0	7/11/2007 11:15 AM	24/02/2009 4:17 PM
Student Qualities	0	0	7/11/2007 11:17 AM	24/02/2009 6:13 PM
Suggestions	17	135	8/11/2007 1:39 PM	25/02/2009 4:30 PM
Teacher Qualities	0	0	7/11/2007 11:17 AM	24/02/2009 4:15 PM
Teaching Strategies	0	0	7/11/2007 11:18 AM	24/02/2009 3:40 PM
Ways of Learning	0	0	7/11/2007 11:19 AM	24/02/2009 3:36 PM

Table 3: Partial view of a refined parametric model of the TAFE Design Education System – parameters and their constituent variables shown expanded here: CURRICULUM DETERMINANTS; GOOD QUOTES; GRADUATE ATTRIBUTES; STAKEHOLDERS and STUDENT QUALITIES

The screenshot shows the NVivo interface with a tree view on the left and a data table on the right. The table displays the following data:

Name	Sources	References	Created	Modified
Attitudes	0	0	7/11/2007 11:19 AM	7/11/2007 11:19 AM
Curriculum design	0	0	6/11/2007 2:46 PM	25/02/2009 3:58 PM
Curriculum Determinants	0	0	7/11/2007 11:21 AM	7/11/2007 11:21 AM
Articulation	11	23	7/11/2007 1:25 PM	20/02/2009 5:10 PM
Design practice	16	70	7/11/2007 1:25 PM	20/02/2009 5:10 PM
Emerging training needs	17	52	7/11/2007 1:25 PM	20/02/2009 5:10 PM
Getting a job	15	33	7/11/2007 1:25 PM	25/02/2009 4:48 PM
Industry feedback	14	38	7/11/2007 1:25 PM	25/02/2009 3:11 PM
Industry training needs	18	79	7/11/2007 1:25 PM	25/02/2009 3:06 PM
National Training Standards	10	29	7/11/2007 1:26 PM	20/02/2009 5:10 PM
Qualifications	9	31	7/11/2007 1:26 PM	25/02/2009 4:46 PM
Resources	8	22	7/11/2007 1:26 PM	20/02/2009 5:10 PM
Skill gap	14	39	7/11/2007 1:26 PM	20/02/2009 5:10 PM
Student training needs	17	65	7/11/2007 1:26 PM	25/02/2009 3:06 PM
Technical operational skilling	9	15	7/11/2007 1:26 PM	20/02/2009 5:04 PM
Technology	10	23	7/11/2007 2:51 PM	25/02/2009 4:39 PM
Good Quotes	15	248	8/11/2007 11:57 AM	20/02/2009 5:10 PM
Graduate Attributes	0	0	6/11/2007 2:50 PM	25/02/2009 4:15 PM
Design skills	11	39	6/11/2007 2:50 PM	25/02/2009 4:15 PM
Employability	18	78	6/11/2007 2:50 PM	25/02/2009 4:37 PM
Issues	0	0	7/11/2007 11:16 AM	25/02/2009 5:17 PM
Stakeholders	0	0	7/11/2007 11:15 AM	24/02/2009 4:17 PM
Industry role	13	42	7/11/2007 11:15 AM	24/02/2009 4:17 PM
Learners	4	6	7/11/2007 4:47 PM	20/02/2009 4:30 PM
Role of Government	8	11	7/11/2007 11:15 AM	20/02/2009 5:10 PM
TAFE role	14	33	7/11/2007 11:15 AM	24/02/2009 4:17 PM
Student Qualities	0	0	7/11/2007 11:17 AM	24/02/2009 6:13 PM
Mature age students	16	49	7/11/2007 1:05 PM	24/02/2009 6:13 PM
School Leavers	16	60	7/11/2007 1:05 PM	24/02/2009 6:13 PM
Selection criteria	14	33	7/11/2007 1:05 PM	20/02/2009 5:10 PM
Student selection	16	57	7/11/2007 1:05 PM	24/02/2009 5:48 PM
Suggestions	17	135	8/11/2007 1:39 PM	25/02/2009 4:30 PM
Teacher Qualities	0	0	7/11/2007 11:17 AM	24/02/2009 4:15 PM
Innovation leadership	14	46	7/11/2007 1:04 PM	24/02/2009 4:14 PM
Staff qualifications	16	51	7/11/2007 1:04 PM	24/02/2009 4:14 PM
TAFE teaching standards	10	31	7/11/2007 1:04 PM	25/02/2009 4:37 PM

SUMMARY AND CONCLUSIONS

As foreshadowed in the introduction, this paper is primarily about the design and methods employed in a study of a design education system in the Australian VET sector. A novel method of modelling a design education system has been proposed. The study is based on a systems design approach together with an empirical investigation that was used to develop a parametric model of the education system.

The literature review has indicated that although a notable amount of consultation has occurred with the various stakeholders in TAFE, further research is needed to investigate the structure and the interdependent relationships within the TAFE design education system and their impacts on design education outcomes.

It has been shown that the views and aspirations of design teachers need to be taken into consideration in the development of such a model, bearing in mind that similar studies, involving other stakeholders such as employers and students, need to be part of future research. The details of the empirical results about the views and aspirations of design teachers have been restricted in this work to informing the model developed and will be the subject of future papers (Klimek, 2010). The study addressed two research questions, namely:

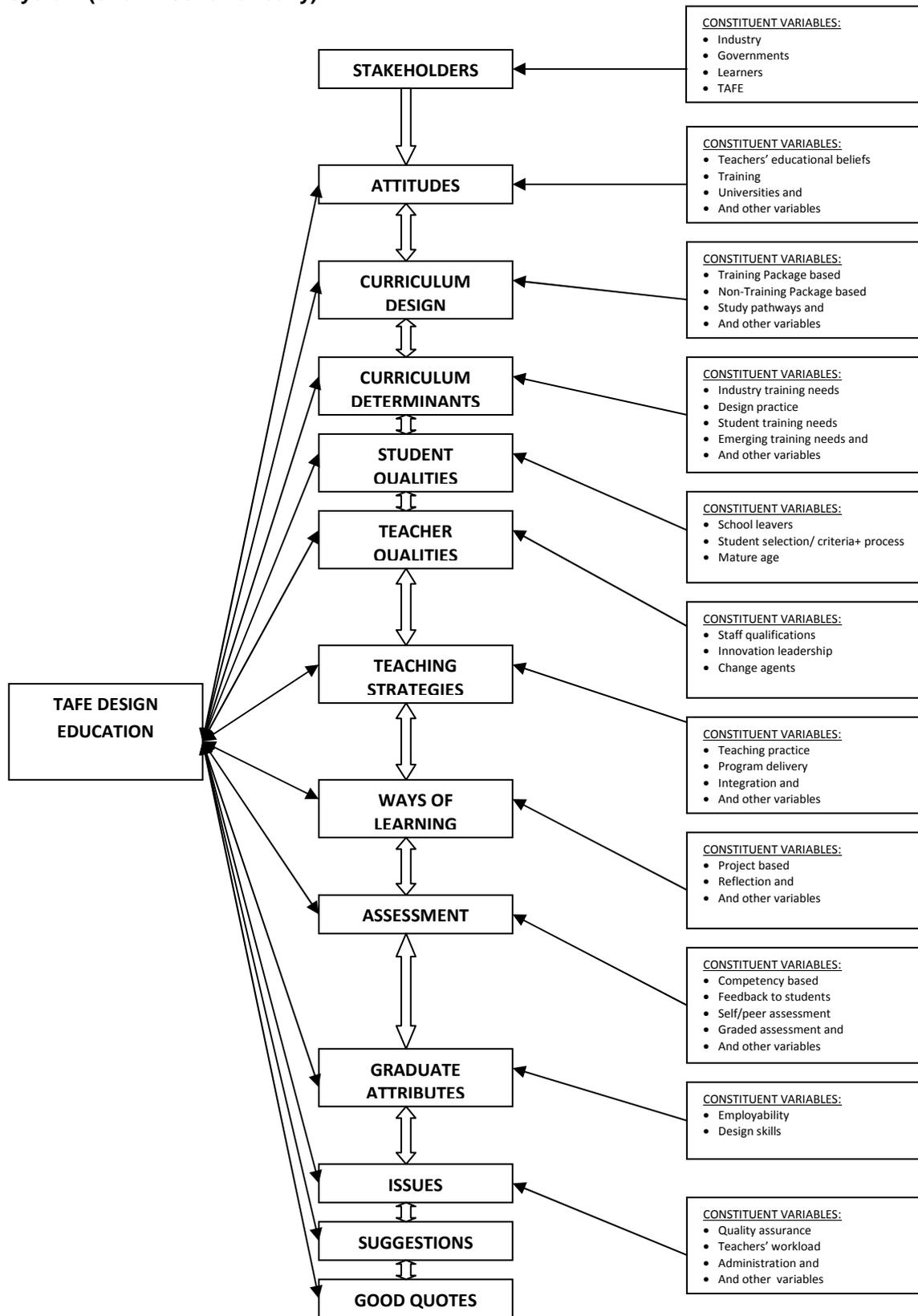
- (1) Can a systems design approach be used as a possible method to model a TAFE design education system with respect to the views and aspirations of design teachers – mindful of the views of other stakeholders?
- (2) As a correlated question: what empirical data are required in order to inform and develop this model with respect to the views and aspirations of design teachers?

It is found that the initial hypothetical system model proposed (Figure 1) was incomplete and that application of the systems design approach (in keeping with research question 1) can be used, in combination with empirical data (derived from a qualitative study of the views of design teachers as per research question 2) to develop a refined model of the TAFE design education system.

The refined model of the design education system partly illustrated in the above tables is summarised in Figure 3 below. This provides a more complete conception of the characteristics of the design education system. The parameters illustrated (*objects of the system*) include: *Stakeholders, Attitudes; Curriculum Design, Curriculum Determinants; Student and Teacher Qualities; Teaching Strategies; Ways of Learning; Assessment, Graduate Attributes*, and also include virtual parameters such as: *Good Quotes; Suggestions and Issues*.

This model reflects the utility of the systems design approach, in conjunction with an empirical investigation, for identifying parameters of importance that may not be immediately apparent from a hypothetical viewpoint. It thus represents an important research tool.

Figure 3: Summary of the refined parametric model of the TAFE design education system (shown schematically)



In conclusion, it is found that taking the systems design approach to TAFE design education requires paying particular attention to the inherent reasons for developing such an educational system. This is important in developing an accurate model of the system. Ideally, the system developers would have based their design of the system on all of the relevant clients' or stakeholders' needs. In this research project, not unexpectedly, the design teachers in the TAFE design education system are pivotal stakeholders who interact with the other stakeholders during most of the phases of design education development, delivery and evaluation processes. Knowledge about their views and aspirations is therefore important for developing an effective understanding of the TAFE design education as indicated by the many interdependent relationships among the parameters and variables in the above Figure and Tables. This approach has the potential to lead to improvements to the design education system on the basis of what these particular stakeholders perceive to be important mindful of available resources.

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