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REFLECTION AND ANALYSIS IN DESIGN STUDENT BLOGS

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1. Introduction

Web logs ("blogs") constitute a new technology for design students to maintain an online journal of their work and for design educators to assess and monitor the student's thinking-through-writing. This article raises the question whether stylistic differences in the ways that the design students write about designing and their designed works may indicate differences in the way that the students are orientated to design praxis. Just as ways of sketching have been shown to reflect approaches to designing, this paper raises the question whether this finding would hold true for ways of writing about designing. The aim of this article is to describe how to apply the theory of systemic-functional linguistics to design students' texts as the basis for exposing the way that students describe designing and the way that they orientate themselves to design praxis. Through the analysis of the students' blogs, we propose that particular grammatical forms may also characterize styles of designing. By making use of formal, functional grammatical analysis, the research exposes specific grammatical forms employed by the students to account for design practice and the designed work in text. As a consequence, the research makes two tentative claims. First, the research reveals the existence of two specific styles, *analytical* and *reflective*, for expressing the realities of designing. The differences in styles of expression of ostensibly the same 'content' (designing) indicate differences in approach (style) to designing. Second, the style of blogging and what the style indicates about how the student is oriented toward designing signals the student's preferred style of feedback. This article proposes that knowing the style of writing about design enables design educators a means to attune themselves to how design students become oriented toward design and their individual style of designing.

1.1 Background

Web logs or "blogs" have quickly become a popular medium for maintaining online design journals. In design education, blogs are being deployed to support reflection on the design process (MacColl et al., 2005). Some educational research suggests that frequent blogging contributes to social construction of knowledge (Du & Wagner, 2005). What is most intriguing about the blog for design educators is that it allows them to access the emerging attitudes and thinking processes behind a student's design work and to assess *learning about designing*. For researchers, blogs can give access to long-term attitudes and thinking process which are problematic to ascertain through laboratory studies of designers.

The motivation behind this article is to gain insight into how the textual structures behind a blog may also parallel styles of designing. Much as research in scrutinizing sketches has revealed how the content of the sketches themselves can assist researchers in interpreting what designers were thinking and doing while generating the sketch, this article pays attention to the claim of a establishing a relation between the different ways in which designers write about designing and their designed work through text and their style of designing. This research postulates that individual styles of designing

may correspond to differences in the semantic and grammatical forms of describing design. A similar finding was made in a study by the psychologists Pennebeker and King (1999) who found that they could reliably predict psychological health from patients' writing *style*.

Influenced by the seminal work in functional linguistics in the Department of Linguistics at the University of Sydney by Michael Halliday (2004), advances in verbal protocol analysis to study designing by the Key Centre of Design Computing and Cognition (e.g., (Purcell, Gero, Edwards, & McNeill, 1996)), and our own prior empirical and theoretical work on language use in design (e.g. (Dong, 2005)), we have become increasingly interested in the linguistic behaviour of designers and the relationship of their linguistic behaviour to their style of designing.

Our interest is on what actions language performs during design and the relationship between the designers' linguistic behaviour and the production of representations of the design process and designed work. As such, we chose the analysis technique of systemic-functional linguistics (SFL). SFL theory is concerned with the system of grammar within a genre of text and how the grammar produces meaning and relates experiences in the text. The text itself is considered to be strongly associated with a social situational context within which the text is produced. Within each specific genre, SFL theory holds that the system of grammar of a language constrains the choices available to a speaker to generate meaning. SFL specifies a lexico-grammatical framework which constrains the features available to speakers. The constraints imposed by the structure of a grammar yield the potential to analyse how the structural consequences of that choice relate to how the speaker utilized language as a tool for representing knowledge or for making meaning (Halliday & Matthiessen, 1999).

Functional linguistics offers several key benefits towards the study of human behaviour in design through the text that the designers produce. First, practitioners of functional linguistics claim that because functional linguistics prescribes a rigorous and objective set of rules to ascertain the appropriate process label (what the clause is 'doing') and the grammatical parse, the need for multiple coders, as is usually required by verbal protocol analysis, is diminished except for outlier complex clauses. Further studies are ongoing to ascertain the inter-coder reliability issues regarding the labelling of ambiguous clauses.

Second, because functional grammatical analysis separates language into the semantic meta-functions and the functional roles of grammar (the processes that realize the meta-functions), it becomes possible to define rigorously and objectively the grammatical and semantic forms of language used in a specific socio-situational context. That is, we expect the grammar of rap music to differ sharply from the grammar of design texts (or even rap to describe designing). This makes it possible to write computational systemic-functional linguistic parsers that tag the text into part of speech, separate sentences into clause boundaries, and then tag the clauses according to the appropriate process. While the research in computational SFL parsers is ongoing, the key preliminary tasks are to catalogue the grammatical and semantic forms corresponding to the processes in a specific genre of text and to formulate the network of choices.

In our research, the structural and functional characteristics of language are hypothesized to correspond to the way in which designers describe and represent designing and the designed work *and* their concomitant style of designing. A style of designing is defined as describing a designer's preferred way of relating to the design process and the designed work. Specifically, we wish to uncover the linguistic grammatical forms that may correspond to a style of designing. One of the primary systems of grammatical choice involved in the way that people express experiential meaning, that is, in the way that people express reality in text (Eggins, 2004) is the system of TRANSITIVITY. (Consistent with the notational standards of SFL, systems of grammar are denoted using all capital letters.) Thus, the system of TRANSITIVITY can be construed as the set of grammatical choices that designers use to express the realities of their design process and the designed work. Our research begins with an analysis of design students' writing styles as a pilot to test our hypothesis and as a baseline for future comparisons with professional designers. In this paper, we analyse the grammar of describing the design process and designed work in design student blogs based on the TRANSITIVITY system.

1.2 Conceptual journey

Because SFL analysis is intended for the analysis of a broad range of texts, in order to relate the analysis technique to uncovering style of designing, we propose a way to relate the functional grammatical analysis to describing designing – what we term the designer's 'conceptual journey'. The diagrammatic representation of a conceptual journey is depicted in Figure 1 based on the Pahl & Beitz design process (1999).

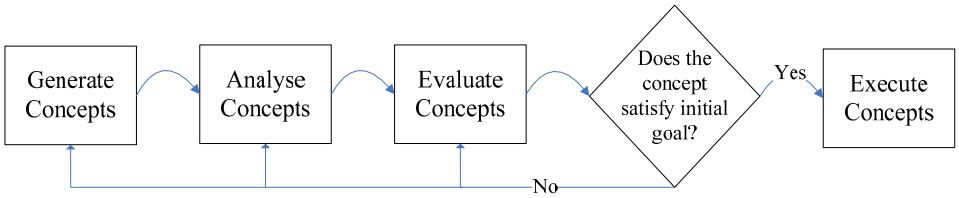

Figure 1. Conceptual Journey diagram

Although the engineering-based Pahl & Beitz design process diagram was intended to describe the different phases of the process of design over time, this conceptual journey diagram is not concerned with time or work load allocation to each of the phases. The diagram is instead intended to categorize the main types of activities commonly associated with designing. The diagram of the 'conceptual journey' will assist us in mapping the process types in the TRANSITIVITY system to design activities, providing the crucial link between designing and the description of designing in text.

1.2.1 Phases of a conceptual journey

Before proceeding to apply the linguistic analysis, we must characterize each phase to motivate the formulation of the grammatical forms designers could use to relate designing through text.

- Generate Concepts. This phase of the conceptual journey relates to the processes related to the construction of representations of concepts/ideas. The designer may conceive of diverse, potential design concepts (by brainstorming for example) yet not worry if the generated concepts meet the criteria of the design brief. The designer describes the attributes of the concept – its form, what it does, etc.
- Analyse Concepts. This phase of the conceptual journey relates to tangible actions done to scrutinise the essential details of the concepts (posited from the generate phase) as the basis for evaluations. This may be achieved by breaking down the concepts into components or essential features and then applying specific analytical tools such as finite element modelling or simulation.
- Evaluate Concepts. This phase of the conceptual journey is similar to the second phase but instead of specifically materializing aspects of a concept, this stage ascertains the value of the design concepts. In this phase the concepts are examined and judged.
- Execute Concepts. This phase of the conceptual journey relates to the production of the embodiment of the design concept. This stage is characterized by actions to actualize the concept.

2. The TRANSITIVITY system and describing the conceptual journey

Given the description of the conceptual journey, the next step in the functional linguistic analysis is to ascertain the network of choices that constrain the way the designer can produce meaning about each stage and activity in the conceptual journey. In order to make the distinctions, we need to investigate grammatical forms of clauses and how the grammatical forms enable the designer to express the realities about designing through text. The distinctions permit both text categorization, i.e., "Is the designer writing about concept generation?", and analysis of grammatical style, i.e., "How does the designer describe concept generation?"

Expressing the realities about designing would be, according to Halliday (2004), part of the ideational meta-function of language. In order to understand how grammar is implicated in the realization of the

ideational meta-function of language, functional linguistics theory classifies clauses as processes in the TRANSITIVITY system. Of the process types in the TRANSITIVITY system, material ('doing'), mental ('thinking'), behaviourial ('behaving'), relational ('being'), and existential ('existing') have the most relevance to expressing the realities of design.

Doing processes are referred to as **material** processes and are concerned with tangible actions. Thinking processes are referred to as **mental** processes, and are concerned with consciousness - perception, cognition, reaction and intention. Behaving is referred to as **behavioural** processes; they deal with physiological and psychological behaviour. In functional linguistics theory, only conscious beings can behave. Clearly, designed objects may also have behaviours, but functional linguistics would classify those behaviours as attributes and thus a part of the relational process. Being processes are referred to as **relational** processes and are concerned with relationships of possession, identity and description. A related process to **relational** is **existential** which represents reality by only positing the existence of a phenomenon. For a complete description of the TRANSITIVITY system, we refer the reader to Eggins (2004, pp. 206-253).

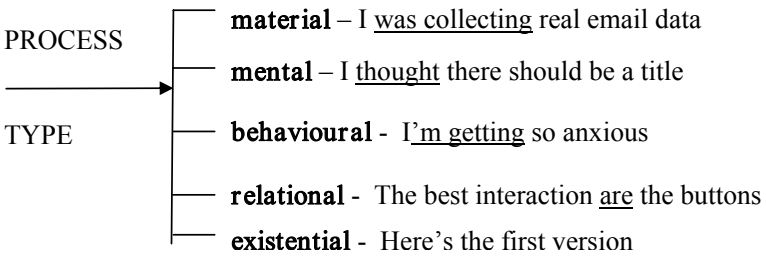

Figure 2. The process types in the conceptual journey

The TRANSITIVITY system does not take into account the Evaluate stage of the conceptual journey diagram. Evaluation is part of the APPRAISAL (Martin, 2000) system, which is the subject of a separate research project to the study of the language of appraisal in design text.

The diagram in Figure 2 demonstrates the process types and representative sentences (taken from the student blogs as described in Section 3) that relate to each of the process types. Table 1 to Table 5 show the sentences partitioned into functional annotations focusing on functional roles of the terms in the clauses. This segmentation of text into clauses is the first step in SFL analysis; a clause typically consists of a verb phrase (process) and its non-clausal arguments (participants). The value of the process label and the participants in the verb clause change depending on which process material, mental, relational, etc. is being defined. Both the 'process' label and the participants indicate what kind of functional process a clause will denote, although often the verb is sufficient. For example, in Table 1 the 'process' label is the word 'collecting.' As the word 'collecting' is an action word, the sentence is considered to construe a material process. In Table 2 the 'process' label is the word 'thought' which is a word in the process of perceiving, thinking or feeling; thus the sentence is a mental process. 'I'm getting' (Table 3) is a colloquial expression for a behaviour and is thus considered an behavioural process. In Table 4 the 'process' label is the word 'are', identifying the sentence as a relational process. The example of Table 5 illustrates an existential process statement.

Table 1. Material (action)

I	was collecting	real email data
Actor	Process	Goal

Table 2. Mental (conscience processing)

I	thought	there should be a title
Sensor	Process	Phenomenon

Table 3. Behavioural (behaving)

I	'm getting	so anxious
Behaver	Process	Circumstance: Manner

Table 4. Relational (identifying)

The best website interaction	are	the buttons
Carrier	Process	Attribute

Table 5. Existential (existence of)

Here	's	the first version
Value	Process	Existent

Now that we have identified the grammatical attributes of the sentences, we can relate these processes to the corresponding phases of the conceptual journey diagram. Figure 3 shows this integration.

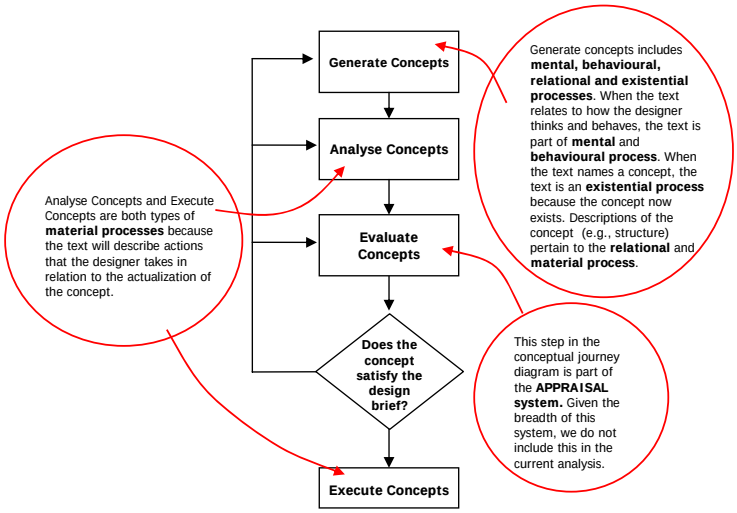

Figure 3. Identifying the TRANSITIVITY processes in the conceptual journey

3. Results

3.1 Analysis of Blogs

Using the rules for the process tags described in Figure 3, we conducted a functional grammatical analysis of a set of design students' blogs. The computing students designed a computational data visualization system for real-time stock market data. In the blogs, the first year students were to describe their design process and the designed work. The pedagogical aim of blogging was to evaluate how the students orientate themselves to designing rather than to assess whether the students' design process or if the students even followed a design process. Generally, the students wrote entries into their blogs at least twice per week because they were assessed for participation in blogging as a community-building forum.

To illustrate what the analysis entailed and what information can be derived from a functional linguistic analysis, a short excerpt from two blogs is included below, identified as Blog 1 and Blog 2. To conduct an analysis of the TRANSITIVITY processes, the analyst highlights the verbs according to process type. Here, the material process is highlighted with green, the mental with yellow, the behaviour with purple, the relational with blue, and the existential with red. The choice of colours is arbitrary. From this, the grammatical forms can then be assessed and catalogued.

The excerpt from Blog 1 shows two relational processes and three material processes. The student writes that 'they' (the e-mails which constitute the data that is being visualized) appear in 'one column' and that they way that the visualization behaves is that the e-mails 'came' in sequentially and then stack vertically. It is interesting to note that the Actors and the corresponding Attributes all refer to objects constituting the product. In most other entries, the student is seldom the Actor in the clause.

> They are all in one column and they came in one after the other vertically. They are aligned according to the day they arrive, so all these emails arrived the same day and practically the same hour.

In this next excerpt from Blog 2, there are no material processes. That is, the student does not describe any functions or behaviours relating to the design concept. Instead, most of the entries relate to relational and material processes. Also, note that the Actor in the clauses is the designer herself, indicated by the use of the personal pronoun 'I'.

> So that is what i want to persue. the flower one. i have some basic ideas for screen layout

In this excerpt, the student names the existence of an idea (design concept) cued by the use of the word *that*. The demonstrative pronoun *that* has no representational meaning other than to posit the existence of something (the concept), and, as required in English grammar, to provide a subject for the sentence. Then, having named the concept, she proceeds to define the identity of her concept in subjective terms as her personal 'want'. Then, she indicates the existence of 'basic ideas' but in terms of an attribute, 'basic ideas,' that are possessed by her, the Carrier 'I'.

3.2 The Analytical and Reflective Blogger

In completing the analysis for four blogs (several hundred lines of text), one can recognize that all process types occur to varying degrees of frequency and that the students-as-designers wrote about all phases of their conceptual journey. One important stylistic difference occured. As already alluded by the results of the verb clause analyses above, the student of Blog 1 chooses her product or assignment itself as the Actor (or in this example the Carrier) in most of her blog entries. Blog 1 is an example of the *analytical blogger* who is characterized by descriptions of design that are directed more toward technical analysis of the object/product or task rather than toward her subjective feelings toward the object/product or task. In the example above, the student retains a third person view or an objective view on his/her project. She chooses to extract herself from the blog comments and wants to concentrate on the technical aspects of the designed work. Table 6 shows an example of the Relational process from an analytical blogger. Here the student identifies 'best website interaction' as the Actor/Carrier, applying the attribute 'buttons' by the process 'are' in this relational process.

Table 6. Relational process from Analytical Blogger

The best website interaction	are	the buttons
Carrier	Relational Process	Attribute

By placing the object/product in the Actor/Carrier position, the student could be characterised as *analytical* about her work. This characterization does not necessarily correlate to the measure of time and attention the designer spends on problem analysis. Unlike Nigel Cross's view that analytical "expert designers appear to be 'ill-defined problem solvers" (Cross, 1999), the notion of analytical in this research is not associated with expertise. Here, analytical is characterised by the grammatical form of placing the designed work (object) as the subject or object for relaying experience about designing. Note in this next excerpt the strong focus on the (student's) critique of the designed work.

> The first visualisations had so many flaws and useless elements, and were in many cases rather 'disjointed' in that there was no inter-relation between elements in the design or what they represented. the second prototype was somewhat better, but nonetheless still possessed numerous flaws, and confusing elements. My final version seems ok to me

In contrast, the designer of Blog 2 places himself as the role of the Actor, making him a blogger that could be characterised as a *reflective blogger*. This characterisation has similarities to Schon's description of the reflective practitioner, where actions are scrutinised by the designer who in turn

reacts to the new state of their own making and is known as the "reflective conversation with the situation". This means that the attributes that the designer uses to describe the design process are directed at subjective, inward-examining experiences about designing. Looking at Blog 2, the student maintains a first person view, a subjective view which reflects his feelings toward the work. The designer reflects on his transition through the project and also reflects on how he felt during particular milestones of the project. There is also evidence of technical reflection on the object/project itself. Table 7 shows an example of a technical reflection (as a mental process) about the object. Here the student identifies himself, 'I' as the Actor, applying the mental process 'thought' to the attribute/phenomenon "there should be a title". Note the grammatical difference between 'I thought there should be a title.' (reflective stance) and 'There is a title.' (analytical stance).

Table 7. Mental Process from Reflective Blogger

I	thought	there should be a title
Sensor	Mental Process	Phenomenon

Reflective bloggers are also characterized by a style of writing about designing that emphasizes subjective stances toward design and the designed work over active descriptions about designing and the designed object. As this next excerpt shows, the blog serves as a memory of designing rather than a record or linguistic representation of the designed work.

> Like I said, I have all these thoughts running in my head.. and I know exactly what i want and need to do.. but it kinda gave me a headache trying to think about the whole thing in my head.

There also appears to be a relation between analytical/reflective bloggers and the type of feedback they elicit. Research on blogs used in educational settings has stressed that "weblogs enhance the traditional learning log, which facilitates cognitive constructivism, with collaborative elements, which facilitates social constructivism" (Du & Wagner, 2005). This element of 'social constructivism' is also supported in a study of a design class at Queensland University of Technology which had similar setting to the class studied in this paper (MacColl et al., 2005). Our analysis further suggests that the style of feedback may affect the social constructivism in that level of social constructivism increases when the style of blog feedback matches the style of the entry. In this class, the student giving feedback appeared to 'know' how to respond to the student making the entry such that analytical blog entries received analytical responses whereas reflective entries received reflective responses. Table 8 and Table 9 show an example of analytical entry which received an analytical feedback.

Table 8. Extract from Analytical Blogger

The best website interaction	are	the buttons
Carrier	Process	Attribute

Table 9. Extract from Analytical Blogger Feedback

The rollovers	are	better interaction
Carrier	Process	Attribute

Contrasting the above example is the following reflective blog entry and reflective feedback:

> So - In my opinion, this is an idea for a visualization that MIGHT work. But now, I have no time to implement it. I want to cry. heh

> I guess what you needed to have done was thought about this new one earlier, either thinking very long and hard, before beginning its implementation, or giving yourself enough time to test it. Personally I sit and think about it alot.

4. Conclusions

This paper applied the formal method of systemic-functional linguistics in order to learn how the words and grammar that design students use to express their work can contribute to both empirical

understanding of the design process and expose individual differences in style of designing. The TRANSITIVITY system in functional linguistics offered a rigorous and objective way to annotate design text against what a designer is thinking (mental), doing (material), and naming (relational) and how the designer is behaving (behavioural). This paper demonstrated an analysis of blogs which highlighted stylistic differences between *analytical* and *reflective* bloggers in the way that design students describe designing on the conjecture that the stylistic differences may also correspond to differences in style of design. Whereas analytical bloggers focused on the designed work, reflective bloggers focused more on process and themselves. One could say that the analytical bloggers relayed experiences about designing through observations of the transformation of the designed work whereas reflective bloggers relayed knowledge about designing from observations of what the designer has undergone. Seeing these differences as ways that students form 'images' of designing can inform teachers how to coach design students through the individual student's design process.
Unfortunately, ethics rules prevent us from corroborating these findings by interviewing the students. Given the encouraging results of this work, we plan a larger study to study the correlation between linguistic style and style of designing. It is our intent to progress towards a computational system to analyse design text more thoroughly than we have been able to do before with latent semantic analysis (Dong, 2005) and lexical chain analysis (Dong, 2006).

Acknowledgements

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References

Cross, N. (1999). Natural intelligence in design. Design Studies, 20(1), 25-39.

Dong, A. (2005). The latent semantic approach to studying design team communication. Design Studies, 26(5), 445-461.

Dong, A. (2006). Concept formation as knowledge accumulation: a computational linguistics study. Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 20(1), 35-53.

Du, H. S., & Wagner, C. (2005). Learning with Weblogs: An Empirical Investigation. Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS'05), (pp. 7b), Hawaii, USA.

Eggins, S. (2004). An Introduction to Systemic Functional Linguistics (2 ed.). London: Continuum International Publishing Group.

Halliday, M. A. K. (2004). An introduction to functional grammar (3 ed.). London: Arnold.

Halliday, M. A. K., & Matthiessen, C. M. I. M. (1999). Construing experience through meaning: a language-based approach to cognition. London: Cassell.

MacColl, I., Morrison, A., Muhlberger, R., Simpson, M., Viller, S., & Wyeld, T. (2005). Reflections on reflection: Blogging in undergraduate design studios, Blogtalk Downunder (pp. http://incsub.org/blogtalk/?page_id=69). Sydney, Australia.

Martin, J. R. (2000). Beyond Exchange: APPRAISAL Systems in English. In S. Hunston & G. Thompson (Eds.), Evaluation in Text: Authorial Stance and the Construction of Discourse (pp. 142-175). Oxford: Oxford University Press.

Pahl , G., & Beitz , W. (1999). Engineering design: A Systematic Approach (K. Wallace, Trans.). Berlin: Springer.

Pennebaker, J. W., & King, L. A. (1999). Linguistic Styles: Language Use as an Individual Difference. Journal of Personality and Social Psychology, 77(6), 1296-1312.

Purcell, T., Gero, J., Edwards, H., & McNeill, T. (1996). The Data in Design Protocols: The Issue of Data Coding, Data Analysis in the Development of Models of the Design Process. In N. Cross & H. Christiaans & K. Dorst (Eds.), Analysing Design Activity (pp. 225-252). Chichester: John Wiley & Sons Ltd.

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