

## Chapter 4

### **RESULTS AND DISCUSSION**

This study sought to contribute to a better understanding of sketching in the design process. Students design process sketches were collected and compared to their final products to determine the effects of the quantity and quality of sketches. This information will add to and support the descriptions of the case studies still to be discussed.

#### **Process**

Sketch journals and projects were collected from all the students enrolled in Design Fundamentals I. There were 43 students enrolled, 42 were female and 1 was male. The average age was 19.2. Twenty-two students were academic freshmen, 18 students were sophomores and three were juniors. All of the students are first year interior design students. There were no prerequisites for the course.

The students were assigned the project (Project 12) and were given class time to work on their design process. The expectation was that students would also invest out of class time in the project as well. While the students were in class, their process was discussed with attending faculty. Faculty asked students probing questions about their conceptual development and guided students in making design decisions.

At the termination of the project, final products were photographed and sketch journals were photocopied for use in this study. Due to either the lack of sketch data or the lack of a photograph, three projects were dropped from

evaluation for this study. Therefore, the expert judges evaluated 40 journals and then 40 final products for this study. The following information is the result of those evaluations.

### **Hypothesis Testing**

Two statistical relationships were evaluated. The first relationship was the extent to which the quantity, creativity and efficacy of the sketches predicted the creativeness of the final product. The second relationship that was evaluated was the extent to which the quantity, creativity and efficacy of the sketches predicted the functional properties of the final product. The hypothesis, stated earlier, was supported in the analysis of the data.

$H_1$ : There is a relationship between the quantity, creativity, and efficacy of process and the quality of the final design product.

All sketches that appeared in the journal during the time of project development were counted even if the sketch seemed more like a doodle and was not directly related to the sketches around it. Additionally, if the random markings of the pencil or pen did not indicate a word, they were counted as a sketch.

The sketch creativity rating was based on the novel expression of the sketch. A sketch was considered more creative if it was unique and innovative and less creative if they were representational of common objects or symbols. Sketch efficacy was a rating of the sketch's ability to communicate. If the sketch was messy and did not communicate well it had a lower score and if a sketch

was clear (even though it may be stylized) and communicated the details of thought, it was given a higher score. Scoring sheets are located in Appendix B.

The data were entered into SPSS version 10.0 and a Pearson Product Moment Correlation was evaluated to see if there was a significant relationship between the variables. The following table, Table I, shows the results of that test. It was observed that there was a significant positive correlation between the three sketch ratings, creativity rating, the efficacy rating and the quantity of the sketches and the creativeness of the final product. Additionally there was a positive significant correlation between the three sketch ratings and the function of the final product.

**Table I**

**Pearson Product Moment Correlation – Sketch Attributes to Project Attributes**

		Quantity of Sketches	Efficacy of Sketches	Creativity of Sketches
Pearson Correlation	Project Creativity	.405	.585	.713
	Project Function	.398	.621	.509
	Quantity of Sketches	-----	.500	.450
	Efficacy of Sketches	.500	-----	.710
	Creativity of Sketches	.450	.710	-----

**Note.** All relationships were significant at  $p < .05$  (N = 40).

It is interesting to note that the sketch's quality measures; creativity and efficacy are more correlated with project attributes than quantity of sketches. The inference here is that the better quality the process the better the final product.

Although, it is important to note that quantity of sketches is also significantly correlated with the final product's attributes of creativeness and function.

Another set of relationships that are brought to light in this correlation are that quantity of sketches is significantly positively correlated with sketch efficacy and sketch creativity. This intuitively makes sense. The student who is comfortable with drawing and is able to draw in an effective manner might be more apt to create more sketches in the pursuit of a design solution.

After looking at the correlations, a multiple regression was performed with the data. The multiple regression indicated that sketch creativity explained 51% (R square = .509, standard error of the estimate = 1.0767) of the variance of the project creativity variable by itself. The Analysis of variance table below illustrates the significant relationship of the predictors to the dependent variable.

**Table II**

**Analysis of Variance – Variance of Project Creativeness Described By Sketch Creativity Rating**

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	93.577	1	93.577	80.720	.000
Residual	90.423	78	1.159		
Total	184.000	79			

**Note.** Relationship of project creativeness and sketch creativeness was significant at  $p < .05$  (N=40).

The high intercorrelation of the sketch attribute variables led the researcher to examine a hierarchical regression to better understand the relationship of sketch efficacy and quantity of sketches to the dependent variable,

project creativeness. The hierarchical regression allowed the researcher to account for the creativity of sketches measure first and to see what residuals were explained by the other independent variables, sketch efficacy and quantity of sketches.

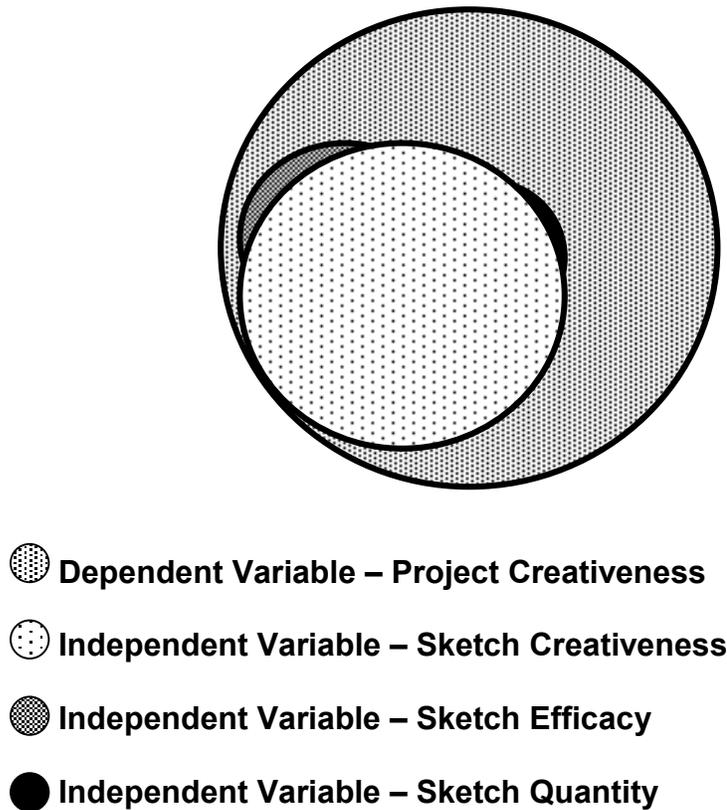
The regression showed that the sketch creativity measure predicted 50.9% ( $p < .05$ ) of the variance as described earlier. Next sketch efficacy predicted 1.3% ( $p > .05$ ) of the project creativity measure. Finally, quantity of sketches predicted only 0.4% ( $p > .05$ ) of the project creativity measure. The only significant predictor was sketch creativity.

**Table III**

**Model Summary – Hierarchical Regression of Project Creativity**

Variable	R Square Change	F Change	<u>df1</u>	<u>df2</u>	Sig. F Change
Step1 Sketch Creativity	.509	80.720	1	78	.000*
Step 2 Sketch Creativity Sketch Efficacy	.013	2.032	1	77	.158
Step 3 Sketch Creativity Sketch Efficacy Sketch Quantity	.004	.568	1	76	.454

**Note.** \* $p < .05$  (N=40)



**Figure I.**

### **Hierarchical Regression of Project Creativity**

This image illustrates the relationship of sketch attributes (creativity, efficacy and quantity) to project creativity as described by the hierarchical regression.

The second regression to be examined was to relate the independent variables of sketch creativity, sketch efficacy and quantity of sketches to the dependent variable of the project function measure. The multiple regression again showed the high intercorrelation of the independent variables. The analysis of variance test showed a significant relationship between the sketch efficacy variable and the dependent variable, project function.

**Table IV**

**Analysis of Variance – Variance of Project Function Described By Sketch Efficacy Rating**

Model	Sum of Squares	<u>df</u>	Mean Square	F	Sig.
1 Regression	76.315	1	76.315	49.044	.000
Residual	121.372	78	1.556		
Total	197.688	79			

**Note.** Relationship of project function and sketch efficacy was significant at  $p < .05$  (N=40).

The high intercorrelation of the independent variables again led to a test of hierarchical regression. Based on the relationship of creativity of process to creativity of product explored in the literature review, sketch creativity was considered the primary relationship of concern for the hierarchy. Sketch creativity accounted for 26% ( $p < .01$ ) of the variance of measure in project function. Sketch efficacy accounted for 13.6% ( $p < .01$ ) of the variance in project function.

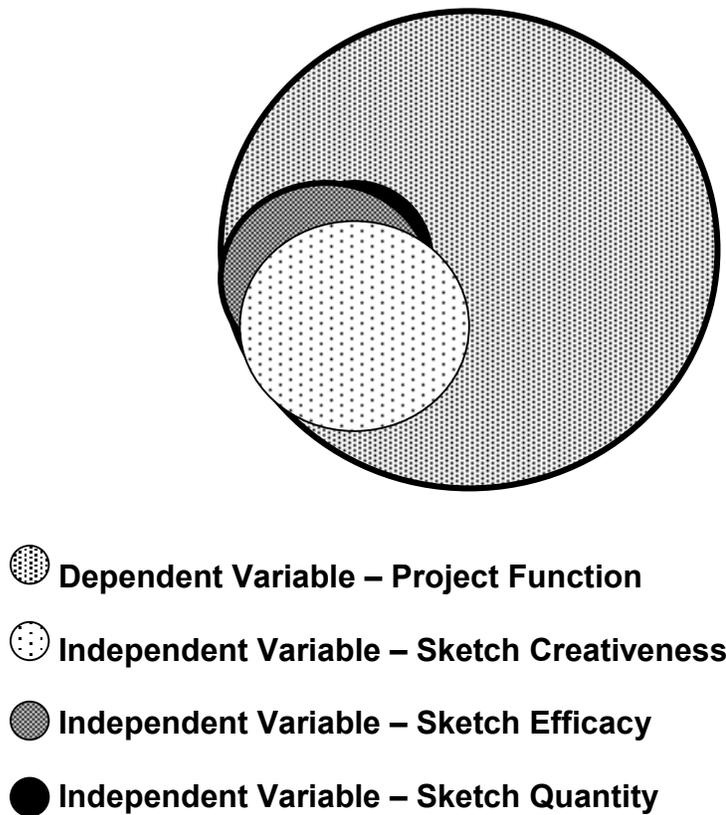
Finally, sketch quantity accounted for only .8% ( $p > .01$ ) of the variance in project function. The first two relationships were statistically significant.

**Table V**

**Model Summary – Hierarchical Regression of Project Function**

Model	R Square Change	F Change	<u>df1</u>	<u>df2</u>	Sig. F Change
Step 1 Sketch Creativity	.260	27.346	1	78	.000*
Step 2 Sketch Creativity Sketch Efficacy	.136	17.313	1	77	.000*
Step 3 Sketch Creativity Sketch Efficacy Sketch Quantity	.008	.973	1	76	.327

**Note.** \* $p < .05$  (N=40)



**Figure II.**

### **Hierarchical Regression of Project Function**

This image illustrates the relationship of sketch attributes (creativity, efficacy and quantity) to project function as described by the hierarchical regression.

### **Validity and Reliability**

Validity and reliability are very important in statistical studies. Their consideration will be explained in this section. Due to the fact that the sample was a convenience sample, the internal validity (Howell, 1997) is compromised. No attempt will be made to generalize the data to any other population. Additionally, students were not randomly assigned to groups.

Reliability in a study increases the chance that the study could be replicated with similar results (Howell, 1997). In order to help protect the reliability of the study, all project documents are included in the appendices. Another measure to increase reliability was to have both instructors evaluated the whole population for the study. Having two evaluators limits bias but bias is still a factor. In future studies, an outside expert judge could add to the reliability and limit bias in this study.

### **Discussion**

These results would indicate that there is a positive relationship between the quality of sketches and the quality of the final product. The hypothesis stated that there would be a relationship between quantity, creativity and efficacy of the sketches produced during the design process and the quality of the final design product. In this case the hypothesis is rejected for quantity but accepted for creativity of sketches and efficacy of sketches.

This relationship can be explained in summation by noting that the quality of the process that goes in to the design product predicts the success or failure of the final product. The quantity of sketches did not significantly describe the

variance in project creativeness and project function above and beyond the sketch quality measures. This may mean that sketch quantity is so correlated with the quality and efficacy of the sketches that it cannot be separated for individual study.

The following chapter contains the discussion from a descriptive multiple case study. The case studies and discussion will explore these results on a smaller more intimate scale.