Journal of Information Systems Education, Vol. 16(3)

Teaching Tip

Data Validation Matrix for Programming Courses

John F. Schrage
Computer Management Information Systems Department
Southern Illinois University at Edwardsville
Edwardsville, IL 62026-1106
jschrag@siue.edu

ABSTRACT

Controls are obviously needed for any application no matter how processed. Errors occur in the processing of the data with the severity dependent on the dollar relationship between the error and its results. The nature of each error, from the bit to the file usage, can be traced to specific sources. The cause frequently implies the method of choice for correcting that situation. Man, in a generic sense, has always used his thinking ability coupled with business knowledge to control and edit the manual process. These same aspects must also be used in machine processing. The computer can methodically edit and control data for applications, even to including examining character bit structures, but only in so far as human instructions are provided to the machine. To facilitate computer intervention in the data validation process, a validation matrix has been developed and used for over 25 years in this collegiate programming setting.

Keywords: computer programming, data validation

1. INTRODUCTION

The organization should be examining all data input/entry within every application so programming errors do not affect the monetary structure of the organization. Programmers should be implementing general edit techniques in all application areas. Surveying the normal procedures by which a beginning programmer is taught data validation programming and processing gives some concern. Changes to data validation appear to be happening in those organizations which emphasize interactive use of data. Some languages are adding validation key words to the language structure to aid programming; while many languages provide for data validation by the "brute force" mode of checking fields or character by character into a buffer mode. While the data validation techniques seem to be taught in many academic programs and business training settings, what is taught and what is implemented seem to differ.

2. VALIDATION MATRIX

Initially developed by a now-retired faculty member and then revised during classroom use by the author over the last 10 years, the data validation matrix has been a major topic discussed in the business programming courses and has been requested by former students that did not keep the sheet from their classes. When the author has included the data validation matrix as an aid in the application-related courses of the business area, students seems to have treated the material as "nice to know". When bad data (character, field, record, and so forth) within a programming assignment or machine related application assignments have been given, the need for better error prevention becomes obvious and the need for controls leave the "nice to know" area to become "essential needs" for the situation. Programming students have thought that data validation was "busy work" in programs and accounting students were more concerned that the application worked, but when faced with bad data, the problem of dealing with the lack of validation were evident. The programming courses have thus changed to include more validation that is tested first by the student and then by the instructor when the project appears to be finished. For our programming classes in Visual Basic, COBOL, and JAVA, the validation matrix, as shown in Table 1, is explained and demonstrated with programming examples. Some of the validation appears to be automatic based on the language and its constraints.

Each entity scope in the table, with the nature of the error condition, is described in the language specific course with an example. For example, when a numeric field is specified/defined in the graphic interface of Visual Basic or COBOL and then a non-numeric character is attempted to be entered, the field rejects the contents [based on the ***context*** nature field notation from the validation table] and expects

Scope of the Entity	Nature of the Error	Source of the Error	Probability of Occurrence to Structure	Hazard to Organization in Data Processing	Detect by the Validation Process	Cost to the Firm	Technique for Detection
character	bad bit structure	hardware fault	very low	high	usually	low	parity bit
field	context – alphabetic, numeric, blank	user; data preparation; program	medium	based on use	based on data entered checking	low	processing test on data for context of alphabetic, numeric, or blank
	content – specific values range values	user; data preparation; program	medium	based on use	based on data entered checking	varies	data test for specific content or range of data
	check digit value error	user; data preparation	high	based on use	partially at a cost	high	check digit & manual review
record	non existent	program; data preparation	medium	varies	always	low	record/file logic check
	wrong type	data preparation; design error	low	usually low	normally	low	key/field test in edit process
	duplicate	data preparation; design error	medium	varies	normally	low	prior data comparison to reject duplication based on criteria
	sequence	data preparation; design error	medium	varies	normally	low	prior data comparison on data field sorting
	internally inconsistent	data preparation; design error	low	high	at a cost	high	logical comparison between data
file	none exists	data preparation; program operations	low	low	always	medium	control language; cataloged files
	wrong structure	data preparation; program operations	low	low	normally	medium	control language; cataloged files
	wrong content	data preparation; program operations	medium	high	partially at a cost	high	label media correctly
job task	wrong run sequence	data preparation; program operations	medium	high	partially at a cost	high	control language; cataloged files
	wrong runtime frame	data preparation; program operations	medium	high	partially at a cost	high	calendar control

Table 1: Data Validation Matrix for Programming Courses

the data entry person to enter the correct response – a number. No message is given just a beep and the cursor is sent back to that text box. The TRY -- CATCH aspect in Visual Basic heavily uses the ***context*** and ***content*** field error conditions to validate data entered in the user interface portion of the programming code. Other languages and settings need code to be written by that programmer such that the data processing does not attempt to accept the entry.

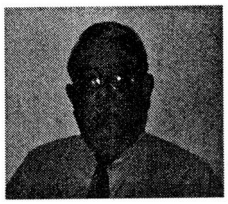
3. CONCLUSION

Data validation has to become a common aspect in the training of beginning business people, especially those planning to obtain a position in the computer programming area. The need for editing in the microcomputer environment is probably more important than mainframe in that the backing up of files is not as prevalent as the larger installation. Educational programs should be stressing the implementation of controls within applications, especially in the design and programming courses. The data validation matrix chart has been a key point in programming courses for over 25 years in our business oriented degree program. The chart has been updated several times since first being used and also published in an accounting journal.

4. REFERENCE:

Benjamin, J. and Schrage, J. (1983) "Minimum Data Validation Expected in Accounting Systems Applications", Information Systems and Management Consulting, Vol. 7, No. 3, 1983, pp. 14-17.

AUTHOR BIOGRAPHY



John F. Schrage is Chair and Associate Professor of CMIS at SIUE. Professor Schrage has computer experiences in education, business, and government settings. He has taught all courses in the MIS program but mainly teaches programming and systems courses. His business experiences have been mainly small firm oriented with law firms, small town government, art marketing and galleries, and farms. His current research interests include, "providing the secure computer setting", "computer education in lifelong learning," and "using computers in the business environment". He will be retiring from SIUE in the near future and is currently looking for other endeavors.