

Variable Data Printing (VDP): A Case Study of Implementing Variable Data and Digital Printing in the Communication Technology Program at Eastern Michigan University

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Keywords: Variable Data Printing, Database Publishing, Fulfillment, DesignMerge, InDesign

Abstract

Information Technology, printing, and fulfillment industries are converging to create a new paradigm, variable data printing. The merging of databases and design allow for individualized output, complete with mail fulfillment, new roles for printers, and new collaborations in education. New technologies allow all parts of the printing process to be digital. Information Technology, design, print and fulfillment are merging to lead us into a new age of image creation and delivery. This new format must be incorporated in the education of current and future students in this field.

The following statement of the future of the industry appears in the April 2007 **Advertising and Marketing Review** *"The future is variable data, it may cost a little more per piece but it is a lot more successful and effective which is more important than cheap,"* said Bill Jones of Vision Graphics.

This paper addresses the implementation of variable data printing in the classroom. The digital presses that are becoming standard in the industry do not easily fit into the budgets of secondary, community college or higher education programs. The development of a class in the Communication Technology Program at Eastern Michigan University began with discussions at the Teachers' Conference at Graph Expo 2009. The industry professionals were showcasing digital presses and teachers were trying to determine how to include this new aspect of the industry in the classroom. The development of a class followed the steps listed below:

1. Selecting the page layout program. Adobe InDesign was already in place.
2. Selecting a program that would allow for easy and affordable implementation of the concept. Meadows Publishing DesignMerge was chosen.
3. Selecting an output device that would simulate the digital press environment at a cost within the program budget. The Canon Image Runner was selected.
4. Develop the curriculum – DesignMerge tutorials and instructor created projects and content were generated, tied to concepts associated with variable data.
5. Understanding and becoming a partner in the fulfillment process. This is not traditionally a role of the print professional and certainly a new area that the educator has to include.

The challenges of moving into digital printing are quite different from those of the traditional print shop. The digital environment requires that the designer have contact with, and at least a rudimentary understanding of, databases. This is an area that instructors of printing are typically not prepared to teach based on the education they received in school. This paper will illustrate how this content was developed and how it can be incorporated into the curriculum, at any level, without having a huge learning curve related to databases. We will also address the cost considerations of moving to variable data printing. While the top industry digital presses are far outside the typical educational budget, there are ways to obtain output that will teach the concepts on a budget that most programs can afford. The selection of the specific variable data software chosen, DesignMerge, was instrumental in this process, based on cost and output capability.

Variable Data Printing: A Case Study

Information Technology, printing, and fulfillment industries are converging to create a new paradigm, variable data printing (VDP). The merging of databases and design allow for individualized output, complete with mail fulfillment, creating new roles for printers, and new collaborations in education. New technologies allow all parts of the printing process to be digital. This new format must be

incorporated in the education of current and future students in this field. Information Technology, design, print and fulfillment will merge to lead us into a new age of image creation and delivery. While this is exciting and allows the print industry to keep pace with the electronic media of the Internet, it also creates a kind of chaos for those teaching and preparing the next generation to be qualified to enter a rapidly changing workforce.

Today, we are surrounded by a multi-level convergent media world where all modes of communication and information are continually reforming to adapt to the enduring demands of technologies, changing the way we create, consume, learn and interact with each other (Jenkins).

Less than a decade ago the discussion of information technology, printing, and fulfillment industries would hardly have been in the same sentence, much less taught by the same person. However, technology has changed the world. Information technology databases, laser (digital) printing technology, and advertising/marketing/public relations, and mail services are becoming a part of the same technology classes. This convergence of technologies is known as variable data printing.

Convergence in this instance is defined as the interlinking of computing and other information technologies, media content and communication networks that have arisen as the result of the evolution and popularization of the Internet as well as the activities, products and services that have emerged in the digital media space (Wikipedia).

Documents designed to be populated with data and images from a database that also includes mail fulfillment, are rapidly becoming subject matter for the curriculum in many classrooms. The intent here is to show the interdisciplinary link between these different areas of education and how they fit together for the purpose of teaching variable data printing.

Hewlett Packard has long been a leader in the production of copiers, scanners, printers and various other devices utilized in the reproduction of printed documents. In October of 2007, Hewlett Packard helped to usher in a new revolution in the printing industry, when they filed application number 11/932,659 for a patent for variable data printing (USPTO).

According to Cope and Kalantzis,

The key difference between this technology and all preceding printing technologies is variability. Rapidly printed consecutive pages can be different from each other just as easily as they can be the same, and with no fluctuation in speed and printing functionality. The implications of this technology are revolutionary... In the case of fully variable, digital print:

- Every print is an original;
- Economics of scale are flat
- Niche markets can be viable as mass markets and small cultures can thrive alongside large.

In 1962, Thomas Kuhn wrote The Structure of Scientific Revolution, and fathered, defined, and popularized the concept of “paradigm shift” (p.10). Kuhn argues that scientific advancement is not evolutionary, but rather is a “series of peaceful interludes punctuated by intellectually violent revolutions,” and in those revolutions “one conceptual world view is replaced by another.”

This Variable Data Printing (VDP) Paradigm Shift is a change from one way of thinking to another; a revolution, a transformation, a sort of metamorphosis. This shift just does not happen, but rather is driven by agents of change. In this instance, the change agent is the teacher, not just of print media, but also those teaching information technology, design, as well as other aspects associated with the complete process. Each area must embrace the knowledge base of the other, whether or not they are active participants, in the delivery of that information. In other words, teachers must understand the broad ranging implications of technology in order to be optimally effective within their own domain, and to deliver their piece of instruction that makes up the whole.

Communication Technology at Eastern Michigan University (EMU)

The Communication Technology program at EMU is an undergraduate bachelor of science major. The curriculum is an interdisciplinary mix of the technologies of communication (i.e., computers, graphics, media, telephony, etc.) and general business skills. Students supplement their broad understanding of the interrelated technologies of the modern information age with a required cooperative work experience and approximately 16 hours of elective coursework. Graduates of this program typically enter the workforce at the entry level and move up to mid-management positions within 3 to 5 years.

The program emphasizes technical skills necessary to gain entry-level employment in the IT area the student chooses. Along with the technical skills, most of the courses have very strong teamwork, interpersonal communication, written communication, problem solving, and presentation components. It is essential for graduates of the program to have a mastery of these skills before they attempt the job search process and become a part of the workforce.

The area of graphics (design & layout, printing, desktop publishing, digital media, etc.) has been evolving for the past several years to accommodate this change. The

traditional film conversion, stripping, flatting and platemaking have given way to polyester plate output from specialty laser printers. When variable data began to be the next technology to be embraced, it was obvious that even bigger changes were imminent.

In order to move to a variable data platform, there are four key criteria that need to be taught. Unlike the traditional print program that focused solely on the mechanics of layout, design, and ink on paper, the new era of print requires an understanding of the interrelated areas of:

- Information Technology (IT)
- Document Design and Layout
- Digital Production Printing
- Fulfillment

The influence of IT on the print industry, and the ability of many people to recreate documents and images in their own home using a ‘printer’ (Cope and Kalantzis), has pushed the entire publishing process to be digital in format. Merging databases, using new design programs with the ability to format variable data, has created the ability to ‘publish’ where it was previously very cost prohibitive. As stated by Romano,

“The rise of digital-only print services by a generation of entrepreneurs is a phenomenon. Some are new services and some are spin-offs from existing businesses. There will be a growth in small digital printing businesses on a worldwide basis as copy shops upgrade, photo shops expand, and sign shops extend their offerings.”

As the traditional ink-based printing declines, digital printing will begin to dominate the industry (Romano), creating a host of new applications for published materials. These trends will also present opportunities for those who are able to harness the power of IT applications and pair it with creative design.

As print providers change their approach to the evolving business they must take into consideration that past processes must change. This evolution requires that they re-assess their infrastructure and add services such as document management, web access to document repositories, electronic document distribution, data mining, variable data printing, distributed printing, fulfillment, and kitting services. This provides “one-stop shopping” for printing and related services. Print service providers must make these changes to assure their future success (Gilboa).

This new era of converged technologies is both exciting and uneasy. There are few who understand all of the pieces and, therefore, very few schools who are teaching students how to become a part of this emerging industry. It is clear that IT, design, print, and fulfillment have a new relationship that will lead us into the next age of image creation and delivery. As industry is changing and adapting to new technologies and new demands in the marketplace, so must education reach across disciplines to best prepare students for these new realities in the workplace.

The Print Industry Today

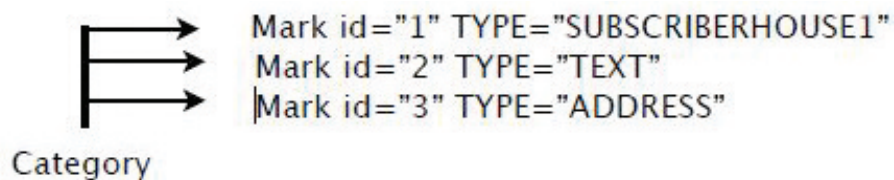
Information Technology

Use of XML requires only a basic understanding of the technology. This involves the ability to recognize a document or data file structure, express the structure as a simple DTD (document type definition), and then properly tag the document or data file (Barzelay, 2009, September 2).

At the root of variable data printing lies a simple yet exceedingly scalable file format known as XML. To the untrained eye, XML is yet another markup language pertinent to web development in some way shape or form. However, in addition to being germane to web formatting, XML has become a de facto standard in word processing and office productivity encoding. Albeit XML is not as rich as Perl or Ruby in terms of functionality, it still provides a hierarchal and structured way of formulating a simple flat database into design applications to create personalized content. So now the question is, how exactly does such a scalable, flexible platform like XML impact variable data printing?

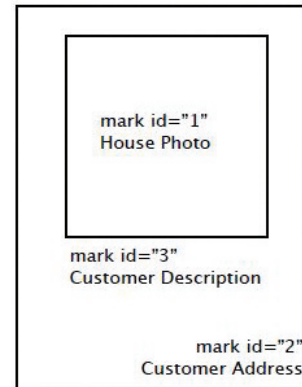
XML is incorporated into applications such as InDesign, which are built around open standards. Open standards empower third-party software developers to create applications that get rid of the flat, rudimentary print processes of yesteryear and replace them with multi-leveled personalized directly printed content.

For example, in June of 2004, Reasons magazine published an issue that was a brilliant epitomization of variable data printing. Of the 40,000 June issues of Reasons sent out, each one was personalized per subscriber and had a satellite photo of each readers' house on the cover. A feat like this doesn't come easy and requires a degree of flexibility on the designer's part and a savvy IT team formulating the .XML precisely. For example:



Data elements in XML are identified by start and end tags, which reflect the content of the element, for instance “<last_name>Smithers</last_name>”. An XML file of repeating data is essentially a set of records where the tagged elements occur in a set sequence (Barzelay, 2009, July 28).

```
<XML Document>
<Page id=covermag>
<mark id="1", x="a", y="b", w="c", h="d">
<external-data="http://magazine.com/house1.jpg">
</external-data>
<mark id="2", x="e", y="f", w="g", h="I">
<external-data="http://magazine.com/customeraddress">
</external-data>
<mark id="3", x="j", y="k", w="l", h="m">
<external-data="http://magazine.com/descriptioncustomer">
</external data>
</mark>
</Page id="covermag">
```



Although this is an extremely elementary depiction of the work involved, it is a prime example of the flexibility and personalization provided by variable data printing and streaming content into design and directly into print.

Document Design and Layout

The design of documents today must have a degree of flexibility. This flexibility is quite easily obtained using a powerful page layout software program such as InDesign by Adobe. Through the use of styles in the style palette, the formatting of various elements of a page can be tailored to suit the mood of the document. The advantage to variable data printing is that multiple styles can be created for the same text placeholder. For example, the word ‘headline’ can be used to identify the location for the document headline. Styles can then be created that will establish as many different treatments to the text as needed. The example below shows a very casual style, a bold style, and a fancy style. The style is applied to each individual document by establishing a link, through the XML code, back to the database. This may be completed by the programmer or through a software link that makes the coding transparent to the user with a product like DesignMerge by Meadows Publishing Solutions. Figures 1 and 2 demonstrate the placeholder text and the resultant text in the linked documents.



Figure 1. The InDesign Style Palette showing the three separate headline styles: Casual, Bold and Fancy and the placeholder for the headline that has been tagged to work with the information in the database.



Figure 2. The result from applying the style to the placeholder for the tagged headline.

Variable Data

Variable data has many similarities to mail merge. Mail merge capabilities are not new. Word processing programs have incorporated this type of operation for many years. However, this has been limited in its scope to text only. The power behind variable data printing operations is that it extends to graphics as well. In the document, just as the text frame is identified, so is the graphics frame. Once identified, the specific graphic that populates the space at the time of imaging is determined by the link back to the database. This allows a specific picture or graphic to be associated with a particular individual or group, and then printed only onto the page, or pages, that are linked to that individual, or group, in the database. Figures 3 and 4 below illustrate the process.

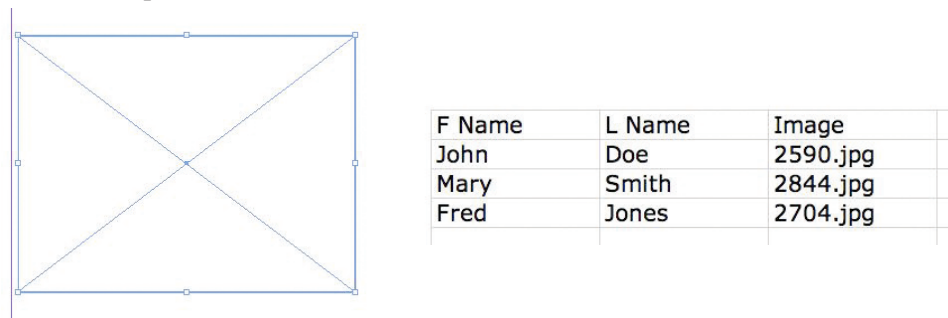


Figure 3. The InDesign graphic frame is tagged by the software and identified as the location to place the .jpg image identified in the database.



Figure 4. *The InDesign images of Washington DC (2590.jpg), Vancouver (2844.jpg), and Chicago (2704.jpg) will appear in the graphic frame corresponding to person they are associated with.*

Digital Production Printing

The digital print production process has undergone a drastic transformation over the past several years due to the advances in technology. In the simplest terms, digital printing is laser printing. However, it is accomplished with high quality, color, fast delivery and duplex output. In fact, the digital ‘presses’ of today rival offset printing presses in both volume and quality.

In addition to speed and quality, many of the digital presses today include finishing and binding as part of the process. When these features are incorporated into a press, a finished document emerges. At this point, with the entire process being digital, it is conceivable to produce a one-of-a-kind document without incurring the traditional costs of production. In the same sense, variable content documents can be produced in ways not feasible by any other traditional print process.

A variable data press looks very similar to a traditional copy machine as seen below.



Figure 5.1. *The Canon ImagePRESS digital press*



Figure 5.2. The HP Indigo 7000 series digital press

While the equipment may resemble a copy machine and it does, in fact, use toner as opposed to printing ink, that is where the similarity ends. The digital press contains a great deal of sophistication. The press has the ability to process the variable data that is streaming into it and, depending on the processor, can deliver finished pages at speeds of several thousand per hour. Finishing operations such as applying covers, binding, and trimming, may also be available depending on the size, quality, and options available for the particular press model.

Curricular Choices

In order to teach this new mix of print and data it is necessary to choose the beginning point. Desktop publishing is the foundation of this new era. There are essentially two desktop publishing software programs that rise to the level of quality and flexibility necessary in the industry today; Adobe InDesign and Quark Express. Both are quality programs that work well for use in a variable data environment. InDesign was chosen several years earlier when the decision was made to teach desktop publishing. Adobe InDesign, at the time PageMaker, was made available to schools at an affordable price and was selected as the platform for teaching desktop publishing. Since this was the available product when the time came to explore variable data, the next choice was to determine which product, or method, would best work with the software already in place. There were many options available.

The first major decision was to determine whether to approach this from a data/programming or a software perspective. For anyone familiar with XML coding it is easy to see why a software solution that can be used in conjunction with, or embedded into, the desktop publishing software is the preferred choice. This requires less change to the desktop course and curriculum. More importantly though, is the fact that it keeps the desktop publishing professional more focused on design and layout than on code. This was a major factor since layout designers

are more creative and the coding process is an intrusion on the creative design process. Both, an imbedded software product or XML coding are possible using the standard version of InDesign CS5.5. So the teaching of variable data can be taught from either perspective. The imbedded software solution seemed best and Meadows DesignMerge was selected.

Meadows Publishing Solutions DesignMerge®

Many different software solutions were available. Some of the primary vendors of VDP software applications are XMPie, Creo, PageFlex, Meadows Publishing, and Atlas. Meadows Publishing Solution's product DesignMerge seemed the best choice. The installation is easy any it works seamlessly with InDesign. There is also great flexibility in how the database can be approached. Therefore, learning how to work with the database can an easier process and allows the student to gain experience as they work with more complex databases.



Meadows
PUBLISHING SOLUTIONS

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Printer Choice

An output device that will allow for color printing and also accommodate the variable data in the document that is being populated from the database is essential. The choices could vary from a tabletop laser printer to a large-scale digital press. As with most educational institutions, budget was a major factor in the decision of an output device. The final choice was a Cannon Image Runner, priced under \$3000.00. While it is not a production speed printer, rated at approximately 6 pages per minute for full color, it was certainly sufficient for students to understand the concept. Speed and high volume are not necessary for students to gain knowledge of the process. This also keeps the cost of supplies at a reasonable level, where shrinking resources are constantly a consideration.

Project Assignments for Class

The initial tutorial assignments provided by DesignMerge were an excellent introduction to the basic operation of the program. Students were taught how to make, change, and use a database. Students created a rudimentary database containing a first

name, last name, address 1 and address 2, city, state, and zip code for 10 people; this database was the basis for all future assignments. Continuing to modify, or add to, the database throughout the course had two advantages: it negated having to prepare a new database for each assignment, and more importantly it emphasized the fact that the database may contain additional information that was not utilized for every project.

While there are many ways to approach the database, the two chosen were Microsoft Word and Microsoft Excel. These both integrate very well with InDesign and DesignMerge. A small database, such as the one below, is sufficient for teaching the concept of VDP. If output is going to be generated, the volume needs to be kept to a manageable size by either using a small database or by grouping students for projects. Group work for a creative design project is probably not the most advantageous to the individual student, however.

	A	B	C	D	E	F	G
1	Fname	Lname	Address 1	Address 2	City	ST	Zip
2	Roxie	Mcsorley	145 Main St.		Ann Arbor	MI	48103
3	Mathew	Yandell	1543 State ST.	Apt 3	Ann Arbor	MI	48103
4	Darren	Raine	1423 Jarvis		Ypsilanti	MI	48197
5	Allan	Gear	34157 College	Apt 1	Ann Arbor	MI	48103
6	Kurt	Bate	1543 State ST.	Apt 7	Ann Arbor	MI	48103
7	Lance	Cichon	2365 Michigan Ave		Ypsilanti	MI	48197
8	Darryl	Nicastro	9475 Huron St.	Apt. 432	Ypsilanti	MI	48197
9	Clinton	Billie	9475 Huron St.	Apt. 333	Ypsilanti	MI	48197
10	Max	Trickett	435 Stadium	Apt 2	Ann Arbor	MI	48103
11	Julio	Johannsen	9475 Huron St.	Apt. 212	Ypsilanti	MI	48197
12							

This database was used to create basic business collateral, consisting of envelopes and business cards. While using simple designs, it was easy to teach students how to decide what to tag, and with which rules. Entries that did not have an Address2 needed to be coded to delete that particular line so the form would be correct. This was also an excellent opportunity to have students sort the database, so that letters could be in order of city for easy mailing, or business cards could be sorted by name making them easy to find and distribute.

A project was designed to demonstrate the power of VDP. Students were charged with creating sports fliers that required extra columns to be added to the database. These columns signified which sport the person had an interest in and their gender. This project showed that with just a simple database, a company could send out personalized fliers that targeted the personal interests of each recipient, with little effort.

The two pages below were generated from one design utilizing different data to drive the various elements of the finished document. The color of the background, photograph used, master page, etc. are all driven by data in the database which was linked to rules imbedded in the tags that were coded to text or graphic frames.

DesignMerge Sports Review

FOOTBALL

Dear Mr. Harry Smith,

American football, known in the United States simply as football and sometimes as gridiron outside the United States and Canada, is a sport played between two teams of eleven. The objective of the game is to score points by advancing the ball into the opposing team's end zone. The ball can be advanced by running with it or throwing it to a teammate. Points can be scored by carrying the ball over the opponent's goal line, catching a pass thrown over that goal line, kicking the ball through the opponent's goal posts or tackling an opposing ball carrier in his own end zone.

American football is closely related to Canadian football but with some differences in rules and in the configuration of the field, in particular the presence of eleven players on the field rather than twelve and the allowance of four downs per possession rather than just three. The larger number of downs results in more offensive rushing in American football than in the Canadian game.

In the United States, the major forms are high school football, college football and professional football, which are essentially similar but feature slightly different rules.

High school football is governed in the U.S. by the National Federation of State High School Associations. College football is governed in the U.S. by two bodies: the National Collegiate Athletic Association and the National Association of Intercollegiate Athletics. The major league for professional football is the National Football League. Over the years, there have been other notable professional football leagues, including the All America Football Conference during the 1940s, the American Football League during the 1960s, the United States Football League during the 1980s, and the currently active United Football League.



The sport is also played outside the United States. National and collegiate leagues exist in the United Kingdom, Germany, Italy, Switzerland, Finland, Sweden, Japan, Mexico, Israel, Spain, Austria, Romania and several other European, American, Asian and Pacific Island nations. The International Federation of American Football acts as an international governing body for the sport on five continents, but the organization has little standing in the United States compared to the aforementioned bodies and leagues.

Yes! I want to receive the quarterly publication of **DesignMerge Sports Review**
for the low price of \$22.00!

Name Harry Smith
Address _____
City, State, Zip _____
Credit Card No. _____ exp. _____
Signature _____



Return form to DesignMerge Sports Review PO Box 122 Ypsilanti, MI 48197.
Make checks payable to DesignMerge Sports Review.

FOOTBALL

DesignMerge Sports Review

Dear Ms. Suzie Jones,

American football, known in the United States simply as football and sometimes as gridiron outside the United States and Canada, is a sport played between two teams of eleven. The objective of the game is to score points by advancing the ball into the opposing team's end zone. The ball can be advanced by running with it or throwing it to a teammate. Points can be scored by carrying the ball over the opponent's goal line, catching a pass thrown over that goal line, kicking the ball through the opponent's goal posts or tackling an opposing ball carrier in his own end zone. American football is closely related to Canadian football but with some differences in rules and in the configuration of the field, in particular the presence of eleven players on the field rather than twelve and the allowance of four downs per possession rather than just three. The larger number of downs results in more offensive rushing in American football than in the Canadian game. In the United States, the major forms are high school football, college football and professional football, which are essentially similar but feature slightly different rules.

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Yes! I want to receive the quarterly publication of **DesignMerge Sports Review for the low price of \$22.00!**

Name Suzie Jones

Address _____

City, State, Zip _____

Credit Card No. _____ exp. _____

Signature _____

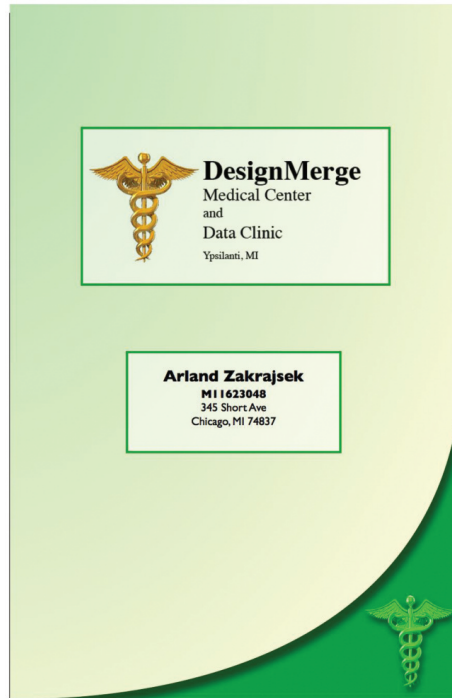
Return form to DesignMerge Sports Review PO Box 122 Ypsilanti, MI 48197.
Make checks payable to DesignMerge Sports Review.

As a final project, the students were to create a medical release form, which combined all of the skills they had learned throughout the semester. For this assignment multiple columns were added to the database; Patient#, Injury, Xray, Care, Prescription, Doctor1, Doctor2, Doctor pic1, Doctor pic2, Phone1, Phone2, and Follow up appointment.

	A	B	C	D			
1	Fname	Lname	Address 1	Address 2	City		
2	Roxie	Mcsorley	145 Main St.		Ann		
3	Mathew	Yandell	1543 State ST.	Apt 3	Ann		
4	Darren	Raine	1423 Jarvis		Ypsil		
5	Allan	Gear	34157 College	Apt 1	Ann		
6	Kurt	Bate	1543 State ST.	Apt 7	Ann		
7	Lance	Cichon	2365 Michigan Ave		Ypsil		
E	F	G	H	I	J	K	
City	ST	Zip	Sport	Patient#	Gender	Injury	X
Ann Arbor	MI	48103	Soccer	F21704896	F	Clavicle	C
Ann Arbor	MI	48103	Basketball	M34682291	M	Elbow	E
Ypsilanti	MI	48197	Football	M11623048	M	Foot	F
Ann Arbor	MI	48103	Soccer	F99716632	F	Leg	L
Ann Arbor	MI	48103	Football	M01770184	M	Jaw	J
Ypsilanti	MI	48197	Baseball	F68242883	F	Hand	H
L	M	N	O	P	Q	R	
Xray	Care	Prescription	Prescription	Doctor1	Doctor Pic1	Phone1	
Clavicle.jpeg	Clavicle.txt	Acetaminoph	Acetaminoph	Mary	Dr. Mary.jpg	(734)55	
Elbow.jpeg	Elbow.txt	Ibuprofen.doc	Ibuprofen	Mike	Dr. Mike.jpg	(734)55	
Foot.jpeg	Foot.doc	Aspirin.docx	Aspirin	Mary	Dr. Mary.jpg	(734)55	
Leg.jpeg	Leg.docx	Morphine.doc	Morphine	Mike	Dr. Mike.jpg	(734)55	
Jaw.jpeg	Jaw.docx	Ibuprofen.doc	Ibuprofen	Mike	Dr. Mike.jpg	(734)55	
Hand.jpeg	Hand.doc	Aspirin.docx	Aspirin	Mary	Dr. Mary.jpg	(734)55	
R	S	T	U	V			
Phone1	Doctor2	Doctor Pic2	Phone2	Follow Up Appt			
(734)555-1834				N/A			
(734)555-2845				10-Jan-11			
(734)555-1834 Mike		Dr. Mike.jpg	(734)555-2845	1-Feb-11			
(734)555-2845				None			
(734)555-2845 Mary		Dr. Mary.jpg	(734)555-1834	29-Dec-11			
(734)555-1834				15-Jan-11			

Image cropped and expanded to show detail

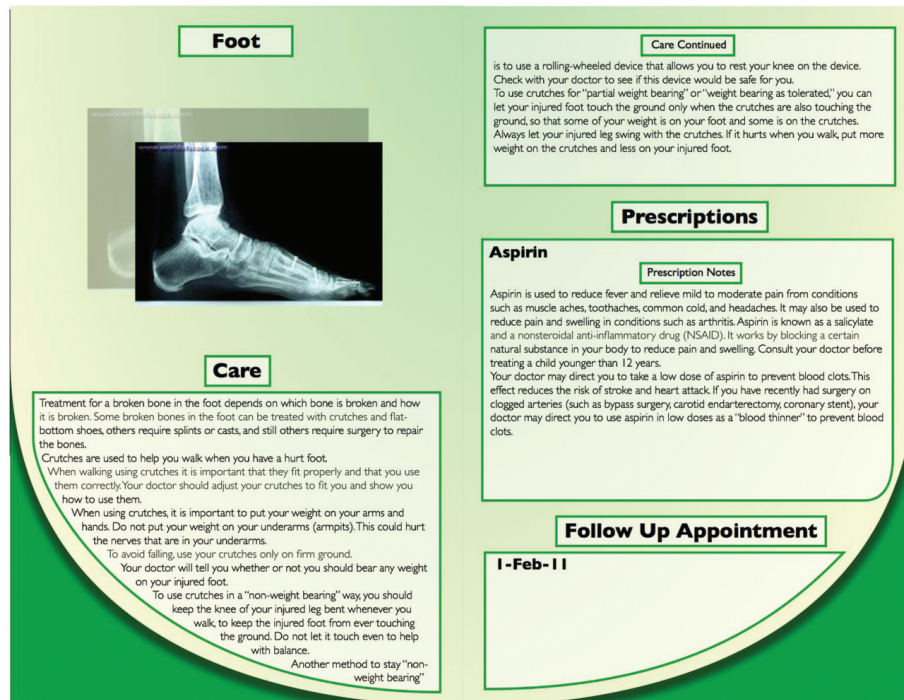
This product illustrated how a clinic or hospital could generate personalized patient follow-up material at the time of discharge, from a patient database rather than generic paperwork. For instance, the typical medication for an injury might be a pain medication such as codeine, which a specific patient is allergic to. This personalization would prevent confusion on the part of the patient. This assignment helped to indicate the power of variable data beyond its use as just a marketing tool. The document below is one that was created by a student for this assignment.



Front



Back



Inside

Fulfillment

Fulfillment has not traditionally been a concern of the printing company. Once a job was complete, it was merely boxed and delivered to the client or to a mail services provider. The printing company is now capable, thanks to VDP, of organizing the database according to state, postal code, region, or whatever sorting is necessary for the post office to process the mailing of the documents most efficiently. Similarly, if the documents are not to be mailed individually, the database may be tailored to a distribution by company, divisions, or some other unit. The database can be made more sophisticated by the addition of supplemental units to add other variable data such as PostNet, United States Postal Service zip codes, Codebar, ISBN, Code-39, EAN-13, etc. This not only streamlines the printing process, it adds data that would ordinarily require time after the completion of the print step. While this creates a new function for the print shop, namely that of storage and delivery by sorted groups, this process is definitely offset by the increased volume of printed material that the print shop will be requested to provide based on the diversity of services.

The first database below shows that a sort by city is very effective. However, when the addresses are all the same, such as the buildings on a campus, the city identifier is not adequate. A secondary sort by building, as shown in the second version of the same database illustrates the flexibility of variable data printing and also shows how important it is for the print professional to be able to understand this and deliver the finished product to the client

A	B	C	D	E	F	G	H
Fname	Lname	Address 1	Address 2	City	ST	Zip	Sport
Roxie	Mcorley	145 Main St.		Ann Arbor	MI	48103	Soccer
Mathew	Yandell	1543 State ST.	Apt 3	Ann Arbor	MI	48103	Basketball
Kurt	Bate	1543 State ST.	Apt 7	Ann Arbor	MI	48103	Football
Allan	Gear	34157 College	Apt 1	Ann Arbor	MI	48103	Soccer
Max	Trickett	435 Stadium	Apt 2	Ann Arbor	MI	48103	Football
Darren	Raine	1423 Jarvis		Ypsilanti	MI	48197	Football
Lance	Cichon	2365 Michigan Ave		Ypsilanti	MI	48197	Baseball
Darryl	Nicastro	9475 Huron St.	Apt. 432	Ypsilanti	MI	48197	Baseball
Julio	Johannsen	9475 Huron St.	Apt. 212	Ypsilanti	MI	48197	Basketball
Clinton	Billie	9475 Huron St.	Apt. 333	Ypsilanti	MI	48197	Football

Fname	Lname	Address 1	Address 2	City	ST	Zip	Sport
Ted	Capell	121	Best Hall	Ypsilanti	MI	48197	Basketball
Hugh	Mister	123	Best Hall	Ypsilanti	MI	48197	Basketball
Clinton	Ricardo	156	Best Hall	Ypsilanti	MI	48197	Basketball
Cody	Mayhue	222	Buell Hall	Ypsilanti	MI	48197	Soccer
Loraine	Munsey	415	Buell Hall	Ypsilanti	MI	48197	Football
Fernando	Bruder	245	Downing Hall	Ypsilanti	MI	48197	Football
Noemi	Hofmeister	425	Downing Hall	Ypsilanti	MI	48197	BaseBall
Sandra	Bachmann	276	Hill Hall	Ypsilanti	MI	48197	Football
Ted	Mallery	333	Wise Hall	Ypsilanti	MI	48197	Soccer
Emilia	Yeates	521	Wise Hall	Ypsilanti	MI	48197	Football

Conclusion

The print industry is changing. The new concepts and duties of a print shop that have been presented here illustrate the need for the curriculum, at all levels of instruction, to change. Students leaving our programs today must be equipped with the tools and skills necessary for the digital environment that has become so integral to the industry. While design, layout and many of the traditional elements of the graphic arts industry remain; the new technology must also be incorporated. Teaching VDP will add a very important skill to the resume of any student. If desktop publishing is already in the curriculum and either Adobe InDesign or Quark Express are already being taught, a school can relatively easily, at reasonable cost, move a program forward into variable data printing.

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