

Variable Printing

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Abstract

Publishing technology has brought the graphic communications industry to a new frontier which is one-to-one variable printing or personalised printing. The principle of one-to-one micro-communication is different from mass communication as the one-to-one communication identifies a recipient first and provides individualised information for that recipient. This communication process will improve the effectiveness of communication and will be the trend for the 21st century.

1. INTRODUCTION

An effective communication is based on the communicator having the ability to generate an appropriate message and the recipient willing to receive it. The critical factors in effective communication include, in addition to recipient's willingness to receive the message, recipient's interest in the message, recipient's capacity to understand it, and, most importantly, recipient's ability to act in response to the message.

One-to-one micro-communication treats recipients as individuals with unique preferences and needs and customizes message and information to meet those needs. Micro-communication focuses on each recipient's value and will own the recipient relationship. Studies have shown that the response rate of personalised mailings to qualified buyers have been ten times higher than those of blind mass mailings.^{1,2,3}

The fundamental technology and major medium for micro-communication is variable printing—the combination of full-colour digital printing and database technology. The concepts of variable printing started around 1970. Major financial firms such as American Express and Citibank NA have been using target-marketing technology to find potential

customers. Because of the improvement in database technology, the increasing availability of databases containing consumer data, and most people's preference for personalised direct mail instead of mass mailings, variable printing has become a new trend for the graphic communications industry.

Based on content and the degree of variation, variable printing can be divided into two generations. The first generation variable printing process prints minimum variable information.^{4,5} The second-generation variable printing has fully employed variable data and digital presses to customize an entire page including colour graphics and photos. Romano (1998) further classified variable printing into twelve different levels, from the lowest level of "Addressed to 'resident,' same contents; every piece the same" to the highest level of "Every pixel on every part of a piece or mailing personalised to the recipient."⁶

The current developments of database technology, online technology, and digital press technology have built a solid foundation for variable printing. Database and software systems allow printers to create and personalise multiple copies of a document. By

analysing information collected online about customer preferences, purchasing patterns, income and other demographics, e-businesses could cater with precision to individuals. Digital presses can print personalised copies with stable quality. With database technology, online technology, and digital press technology, every print can be highly personalised making variable printing a powerful tool for target marketing. Because of the growth of direct marketing and high degree of effectiveness and acceptance, variable printing will keep growing and generate more revenue opportunities in the future.^{7,8,9,10}

2. OVERVIEW OF VARIABLE PRINTING TECHNOLOGY

Variable printing is a powerful tool for direct marketing activities. Its goal is to deliver the right information to the right target. A higher degree of the variable information based on customers' preferences will improve customer communication and increase response rates. It is different from mass communication and broadcasting. The starting point for one-to-one communication process is the target customer which is opposite from that of traditional printing. The one-to-one communication workflow starts with target identification. After generating a target list, content information is generated. The information shown on each print is based on the target recipient's preferences and needs. Therefore, the message is highly personalised and targeted.

In order to deliver appropriate information to the right target, database analysis and database management are the most important tasks when dealing with variable printing. of the importance of the database for variable printing, database preparation^{11,12,13} demands more attention from the printers. The variable printing allows the printers to position themselves as information service providers instead of print product manufacturers.

3. CONSIDERATIONS FOR VARIABLE PRINTING

Important considerations for successful variable printing include:

3.1 Effective Database Analysis, Management, and Maintenance

The most important process for variable printing is database analysis. The function of database analysis is to study the project/activity, familiar with the relationship between activities and business goals, and identify resources in order to reach business goals. Database analysis for variable printing includes intensive research regarding the purpose of the publishing/printing, the available data, each object and method, content information, and more importantly, the database needed to accomplish this project. The next step is to organise available data, sort the relationship between databases, and out-source necessary databases. After databases are established, a definitional program is needed to define and manipulate the objects, methods, and classes of the database structure in order to manage and maintain them. A well-managed database system allows printers to collect, store, and retrieve data and information effectively for variable printing.

3.2 Value-Added Designing

The most important feature of a personalised mailer is to make the receiver to open it. Because most mailers get discarded without even being opened. Therefore, both the outside and inside of the mailer shows something personalised that's truly eye catching.

The contents of the mailer are receiver-oriented. A word or a picture is chosen because of something specific that designer knows about the individual. To show something the customer will like, the designer has to know something genuinely significant about each receiver in the database.

3.3 Variable Printing Planning

The majority of the printing cost of a variable printing project lies in the supply and parts of a digital press such as toner. The appropriate way to minimize cost is preprint non-variable information on an offset press then print personalised information on a digital press.

The postpress spoilage could cause problems for variable printing because the spoilage means someone won't receive the message. A preplanned re-do or recover production process is necessary to deliver the information to 100% of the target population.

3.4 Software Selection

It is necessary to utilise the appropriate software to integrate variable information and digital printing devices in order to produce actual print copies. There are many software programs available; each having its specific function. Today's variable-data software tools offer a wide range of capabilities and are targeted toward various types of applications. The most appropriate variable-data software depends upon the application or type of document it will use to produce. Within a particular variable-data application class, there are numerous tools from which to choose. One of the best ways to differentiate among programs is to assess the level of flexibility and scalability that each program offers.

Flexibility is the measure of a software's ease-of-use and ability to support a wide range of variable-data printing applications such as ease-to-use graphical interfaces and complete control over the placement, orientation and properties of variable elements, including text, graphics and layouts. Scalability is the measure of a software's ability to accommodate large variable-data jobs, in terms of the PostScript file size and the number of variable records. In addition, a scalable software can support multiple client and server platforms.

The process of selecting a variable-data software starts with assessing the complexity of variable printing application, then

determining how much flexibility and scalability the application demands. Low-end applications require a moderate level of flexibility, but because output can range anywhere from low to high volume, they require greater scalability. High-end applications involve complex graphic placement and multiple platforms as well as high-volume output. Therefore, require high levels of both flexibility and scalability. The software should be flexible enough to carry out the project and scalable enough to carry out the volume of output.

Beside software's flexibility and scalability, users also need to be aware that some softwares are tied to a certain front end or output devices, and some softwares can export variable-data files as PostScript files, which can be sent to any digital printing device.

3.5 Digital Press Selection

Printing performance still is an important consideration when producing final prints for variable printing. Different digital presses have different capabilities as well as costs. Choosing the appropriate digital press is critical when dealing with a high-level of data variability. Some major considerations for printers in selecting digital presses are:

- (a) Cost—The cost range for digital presses starts from mid-\$200,000 (Canon CLC-1000) to the high end (Indigo's Ultra Stream and Xerox Docucolor 400 DI) both cost more than \$500,000.
- (b) Speed—The high-speed digital presses such as Ultra Stream, Agfa's Chromapress 32Si, Canon's CLC 2400, and Xerox DCP/50D can perform high-speed printing.
- (c) Multicolour capability—Most digital presses have colour capability. Some high-end digital presses (such as Indigo's UltraStream) have seven-colour printing capability.
- (d) Format—The large format ink jet printers can print up to 72" wide. Some manufacturers such as CreoScitex, Raster Graphics, and Sign Tech have grand size ink jet printers can print up to 196" wide.

The selection of digital presses will be based on the considerations of cost, speed, multicolour capability, and format. Printers determine the priority of these four factors in order to make appropriate selection decisions.

4. DEVELOPING A DISTRIBUTED OBJECT-ORIENTED DATABASE FOR VARIABLE PRINTING

The major driving force for variable printing is database technology. There are four major database models: the hierarchical model, the network model, the relational model, and the object-oriented model. Each model has a different way of representing relationships between record types. Databases have become more complex in response to expanded organisational and variable database printing needs and the inclusion of more sophisticated types of data and information. The latest trend is toward the object-oriented database which provides a structure capable of defining complex data relationships. An object is a focal point about which data and information are collected. An object-oriented database presents conceptual data relationships so that database designers and printers do not need to be concerned with how to physically link records.

With other database models, all the customer records have the same record structure. An object-oriented database provides the flexibility to create variations of a single record type. For example, a database designer can identify potential customers by using information from a variety of sources, such as income information available from voluntary customer questionnaires, household credit risk information available from credit bureaus, food purchase information available from sweepstakes coupon redemption and scanning technology, clothing preference information available from department store charge accounts, and subscription information available from magazines' subscriber lists, etc. An object-oriented database allows database designers to define a variation of the customer record that provides a related field. With the object-oriented database, the

record type for each information is only a variation of customers and does not require a separate series of commands.

Database management is a critical task for variable printing. The object-oriented approach is used to manipulate or manage an object-oriented database. Because each object that forms the database includes a method for performing actions on the data. The object-oriented model requires an approach that provides a way to define and manipulate objects with their associated methods. In an object-oriented model, each group becomes an object and the objects may further be grouped into classes. The database designer can also define the methods that process the data in each object. Careful consideration of which objects inherit which method will improve the efficiency of an object-oriented database.

Databases are almost always shared among many users and applications. Database designers share data to make effective use of available resources and to become more productive. The set of data shared by a group of related businesses, for example, provides each business with a consistent view of a customer, supplier, or business transaction. These shared databases can also be distributed. A distributed database is a database whose data reside on more than one system in a network. These data can be stored, retrieved, or updated from any node in the network. Distributing data provides the needed data and information at a specific location, while allowing those same data to be used at other locations as well. People using distributed databases need not be aware of the location of the database. The application programs, communications software, and database management systems interact with one another to identify, locate, and retrieve the data and information needed by the database user.

There are two common database distribution strategies: geographic distribution and functional distribution. In geographic distribution strategy, a database, or database partition is located in a region where the data

and information will be used most frequently. Each partition is accessible to database users in all the regions. A functional distribution strategy stresses processing functions over physical location. Functional distribution

strategies are effective only when communication network interconnects each database or partition.

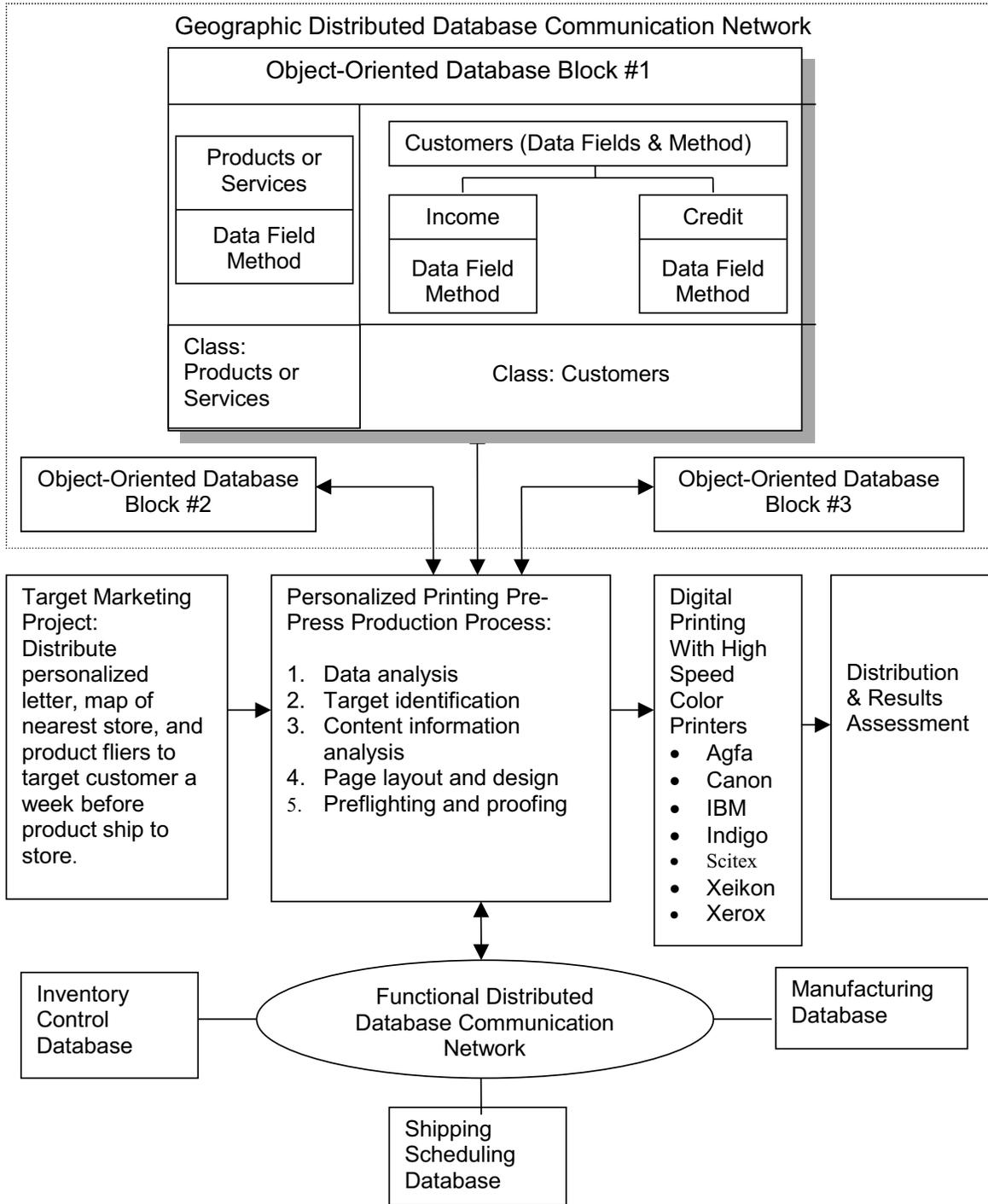


Figure 1: Distributed object-oriented database variable printing system model

The following model (Figure 1) is a system approach that is based on the relationship of a variable printing production process and a distributed object-oriented database. Each distributed object-oriented database block includes several objects and each object has a method and has the ability to interact with other objects. Objects that share common characteristics are grouped into a class. For example, the class customer includes the objects customer, income, and credit. On the other hand, the products/services object is a separate class. The method generates a potential customer list by calculating and matching field information within objects. The functional distributed database also provides timing information for personalised printing project schedule. The workflow of the variable printing is identical to most digital printing. The only difference is that the variable printing pre-press operation is more focused on data analysis and content information analysis in order to provide appropriate variable information for the right target.

6. CONCLUSION

One-to-one micro-communication is a relationship builder, provides effective communication and high response rates, and has created a new opportunity for the graphic communications industry and will become a new trend in the 21st century. Variable printing is the major medium for micro-communication and also is a very powerful value-added tool for marketing and communication. The effectiveness of variable printing depends on the completeness of databases and database analysis. A distributed object-oriented database system allows database designers an effective use of any available data within the network. The

distributed object-oriented database printing system model displays the variable printing workflow and database system network structure. This system model provides the graphic communications industry a clear vision and the methods to adopt this technology in the information age.

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