

# Computer Assisted Production Framework for Mass Customization in Fashion Cloth-Making Industry of Nigeria

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## ABSTRACT

*In order to meet the demands of clients' changing requirements in fashion-designed wears and styles, time / cost of visiting fashion design homes and unnecessary delay in end to end service delivery system in the fashion design industry a computer assisted production framework for mass customization and ordering system is designed. The designed framework can enable the automation of fabric and style selection, personalized measurement of dresses and ordering methods. For the manufacturers, the efficiency of the supply chain that this process engenders will reduce human interaction errors and exertion, and increase production quantum. For the customers, it brings about better fitness with faster delivery system which can stimulate the desire for a variety of clothing outfits, and provide customers' satisfaction, thereby contributing technically to the dynamic interface of computer application and cloth-making.*

**Keywords:** Computer Assisted Production; Framework; Customization; Cloth-Making

## 1.0 INTRODUCTION

Over the years, implementation of mass production has made significant contribution to different manufacturers by reducing administrative, operational costs and processing time. The concept of mass customization, which is defined as the production of goods and services to meet individual customer needs with near mass production efficiency (Tseng & Piller, 2003). Consumers have sought customized products and services since the mass production era of the late 1980s (Eckert *et al.*, 2004). Numerous companies, such as BMW and Land Rover in the automobile industry; Dell, Fujitsu, and HP in the computer industry; and Motorola in the electronics industry, have been reported as successful practitioners of mass customization (Gunasekaran & Ngai, 2005;

Feitzinger & Lee, 1997; Aigbedo, 2007; Pine, 1993).

The Dell case has been considered one of the most successful adoptions of mass customization in the industry. The company helps customers configure personal computers online according to their preferences and quickly delivers the final product. Both consumers and companies have reacted positively toward the practice of mass customization (Piller, 2007). Many customers have higher shopping satisfaction when their needs are more accurately satisfied. Companies benefit from the resultant high loyalty of these customers and often increase product sales. It is in this context that this research work is aimed at designing a computer-assisted production system framework by integrating the key elements to facilitate mass customization in the clothing industry.

Traditionally, body sizes were collected by using contact instruments, such as measuring tapes and calipers. However, the possible intra and inter observer errors may affect the precision of measurement. Besides, the measurement procedure tends to be tedious and requires considerable human efforts. Computer assisted production systems for mass customized cloth making provides a much more flexible and efficient ways of making cloths than the traditional manual methods.

Prior to dimension collection, it is necessary to identify some anatomical landmarks on the human body from the 3D scanning images. Previously, the pre-marking technique was adopted by putting color markers on the location of the landmarks to facilitate automatic identification (Wang et al., 2007). This method has the advantage of high recognition rate, whereas it takes much time for pre-marking and incurs human errors. In order to eliminate human intervention, an automated land marking method was proposed by (Lu & Wang, 2008). Analyzing the geometric characteristics of the human body, the processing time is quite reasonable, and the precision is satisfactory as well. However, the rather high equipment cost and poor portability somehow limits the use of 3D scanners.

Generally, mass production economics are realized by developing computer assisted production systems. The critical elements include collecting body sizes more precisely and rapidly with advanced instruments, generating clothing patterns automatically based on collected body dimensions and building final products in the shortest time. Although many efforts have been devoted to each of them, there is a lack of an integrated system to enable efficient mass production. In addition to the appropriate arrangement of dataflow, it is necessary to involve

the consumers in the processes as well. Therefore, we aim to develop a computer-assisted production system by integrating the key elements to facilitate customization in the fashion industry.

Traditionally, body sizes are collected by using contact instruments, such as measuring tapes and calipers. However, the possible intra and inter observer errors may affect the precision of measurement. Besides, the measurement procedure tends to be tedious and requires considerable human efforts. By taking 2D photographs and analyzing the silhouette of human body, some linear body dimensions can be collected (Meunier & Yin, 2000). In computer assisted production system data can be stored and retrieved with ease. It has the flexibility of generating a different type of clothing pattern and styles rapidly without taking the measures again. Thus, in this study, an integrated framework is proposed for mass customization of fashion cloth-making, in terms of fabric and style selection, personalized measurement and ordering methods.

Fashion business in Nigeria generally, it is the designer's role to translate cultural ideas and influences into new products, style and design. This research work identified problems associated with the traditional ways of mass customization of cloth-making in the Nigerian fashion industry. Some of the problems identified are listed as follows:

- i. Some working class citizen do not have time to visit fashion homes due to their busy schedules, in order to make their custom cloths and not to keep buying already made cloths that they need to sometime amend to fit them.
- ii. Measurement errors made by some in experienced fashion designers or due to work pressure which can later translate to wrong designs in the cloth-making and customers not satisfied or total clothes rejection by the customers.

iii. Delay in end to end service delivery system  
The objective of this research work is to design and model a computer assisted production framework for mass customization and ordering system in fashion cloth-making.

## 2.0 METHODOLOGY

This section examines the methodology that can be used in achieving the software prototype when developed and fully implemented. The methodology shows and discusses the software architectural framework, and the system modeling of the computer assisted production framework for mass customization in fashion cloth-making of Nigeria.

### 2.1 Software Architecture

Software architecture intuitively denotes the high level structures of a software system. It can be seen as the set of structures needed to reason about the software system, which comprises the software elements, the relations between them, and the properties of both elements and relations.

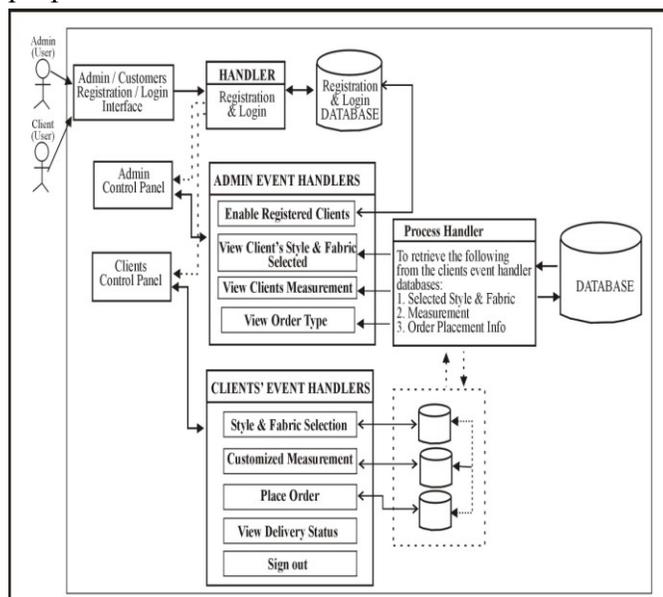


Figure 1. Software architectural framework for the computer assisted production system

Figure 1 shows the computer assisted production framework for mass customization and ordering system in fashion cloth-making.

## 2.2 System Modeling

Unified Modeling Language (UML) is a standardized general-purpose modeling language in the field of object-oriented software engineering. It includes a set of graphic notation techniques to create visual models of objects-oriented software intensive systems. The use case tool was used to model the proposed application.

### 2.2.1 Use-case

Use case diagram is a representation of a user's interaction with the system. Figure 2 shows the use case diagram for the different types of user, and also it portrays the users interaction with the system and its features at their various levels, i.e. the admin and client users respectively.

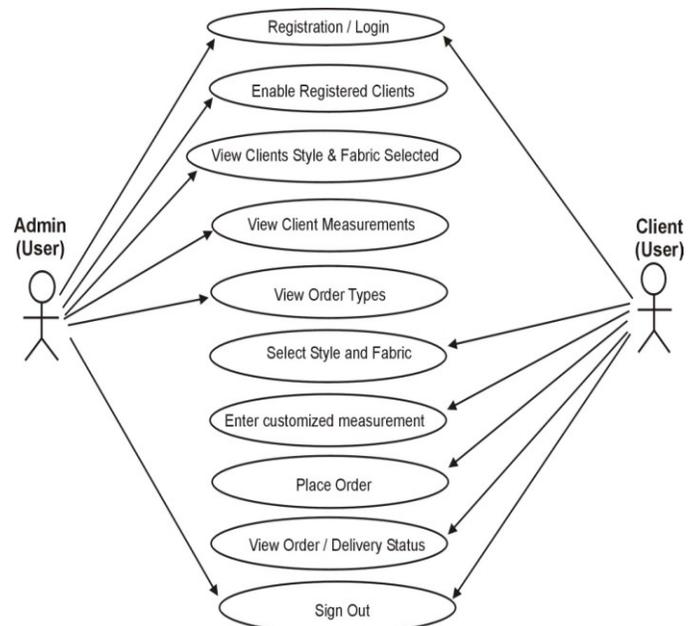


Figure 2 use case diagram showing admin & client interaction with the system

### 3.0 RESULTS AND DISCUSSION

We presented a computer assisted production framework for mass customization in fashion cloth-making industry of Nigeria. From the software architecture, the design will enable two users (admin and client) to use the system when the design is translated to reality by developing it using the right choice of programming language. Both users will have a customized or personalized control panel or executive dash board for performing their various activities. The architectural framework has four major event handlers for handling and processing different activities or task. The handlers are as follows:

**i. Registration / login handler:** this handler will help the system to accept registration details from new users of the application by providing an interface to capture their information and also stores such information when completed in a separate database. The handler also helps to capture user's parameters like username and password for already registered users trying to login to the system by performing an authentication process i.e. matching the given parameter with the information already saved in the database, and thereafter pass control to the user by granting or denying the user access to the system.

**ii. Clients' event handler:** this handler will help the clients' user to perform the following task: - style and fabric selection, take customized measurement, place order, view delivery status, and finally sign out. The style and fabric selection task, customized measurement and order placement is designed to be stored on different database table as shown in Figure 1.

**iii. Admin event handler:** this handler will help the admin user to enable client users' registration processes, view clients' styles and

fabrics selected, view clients' measurement and view the order type requested by the clients'.

**iv. Process handler:** this handler helps to retrieve data from the clients' databases. It processes and forwards it to the admin event handler, and also stores resolved events to a different database for auditing of past events.

### 4.0 CONCLUSIONS AND RECOMMENDATIONS

A computer-assisted production framework has been designed for mass customization in fashion cloth-making industry of Nigeria. The system involves body dimension collection and style / fabric selection by client's direct input to the system interfaces. The framework also allows for direct client ordering and delivery system when fully developed. On system implementation, labor cost / processing time and end to end service delivery will be reduced by performing task in a more efficient and effective manner. The computer assisted production framework can improve not only customers' satisfaction but also the manufacturers' profits when also fully implemented. This architectural framework is hereby recommended for development into a fully fledged software prototype and be put for practical usage in the fashion industry of Nigeria and other developing nations.

### 5.0 FUTURE RESEARCH WORK

The computer assisted production framework for mass customization in fashion cloth-making has been designed generally to suit different software development platforms in order to automate processes in dimension / measurement collection, style and fabric selection, ordering, and so on. However, research efforts are still required to put / translate or develop this design into real life

software application (software prototype) using web engineering process model for usage considering the right choice of web programming / development tools.

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