

A Study on Data Exchange Method in Food Packaging CAD System

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Abstract—Packaging development has its own characteristics thus requires special approaches and methods of work. Although these products have good quality, but aspects are not comparable packaging, the products produced may be difficult to compete in the market especially competitive at international level. This endeavor proposes the development of a new computer-aided design (CAD) system given name as Packaging-Computer Aided Design (*PackCAD*). Since the features of respective software are unique and varied, they should be able to communicate among themselves. The purpose of this work is to study data exchange method to develop content for *PackCAD* system.

Index Terms—Computer aided design, data exchange, food packaging, Malaysia SMEs

I. INTRODUCTION

There are various CAD systems currently available in the market but mostly are inappropriate. This is due to features that are not applied by users for food packaging design. This is certainly extravagant and incurs a high cost of purchasing the system. Therefore, a CAD system specially designed to fulfil the needs of food packaging SMEs is proposed. It is at par with others in respects of design quality and ease of use [1]. According to [2] however, CAD industry has experienced major changes in technology, innovation and paradigm shift over the last two decades. One of the greatest challenges in the development of CAD system is to make it very user-friendly. Users commonly spend a couple of months to accustom enough the system, but the problems persists should the company turns to other CAD systems. According to [3], different companies may use different CAD system to design their products. [4] mention that knowledge in the world is at different level as designers speak different languages and should follow the development of product packaging. In addition, packaging development has its own characteristics thus requires special approaches and methods of work. From the results [5], SWOT analysis for selected country food industry packaging and implications, by region show the threat to SMEs in Malaysia and other developing countries is globalization and open

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economy, where smaller companies unable to cope with increased competition. This makes the motivation of this study to help SMEs to compete globally in packaging design using *PackCAD*.

II. RELATED WORKS

A. Computer-Aided Design System

CAD is a form of software automation that uses various computer-aided design tools that helps engineers, architects and other professionals in the design activity purposes. The CAD is available in various packages ranging from 2D vector based drafting systems to 3D parametric surface and solid design modelers. It is widely used by computing system based on two-dimensional (2-D) and three-dimensional (3-D) [6]. There are a lot of related system in the market led by the needs and industry. The use of CAD in production is of importance and critical due to many great benefits it offers. The most important is to reducing the overall cost of product development in addition to shortening the design cycle. There are findings [1] that show perfectionism (High Quality Conscious) is a major factor influencing consumer decisions when buying a product. According to [7], many researchers agree that the theory of the use of the stage before the start of a purchased product which includes the requirements and needs up to the purchase of consumer ratings of their level of satisfaction. There are numerous studies related to the development of CAD system in industry. [7] & [8] were doing research on clothing, apparel pattern data exchange based on DXF file format developed domestically in China by American standards (ASTM D 6673-04) and the Japanese standard (TIIP1133). It uses XML to describe the dress pattern information. In Traditional jewelry industry, [9] findings in CAD approach to design complex objects, handmade fine art & used paradigm based on the volume element characteristics. CAD system uses solid modeling format to the internal representation format and can export stereolithography (STL). According to [10], studies conducted in connection with the application CAD/courseware (Computer Aid planning process), discussion of the transformation of the traditional furniture manufacturing company agile (Agile Manufacturing Enterprises), design and management of the technical elements of production are made, including concurrent engineering.

B. Malaysian SMEs Food Packaging

SMEs particularly food processing plays an important role for Malaysian economy and is considered the backbone of industrial development in this country. According to [11], to

always compete, operators or manufacturers must be prepared to challenge for shortening product development time, improving product quality and reducing production costs. [12] states in a competitive world in the 21st century, companies need to aggressively improve the way their product development. Most of the problems arise in respects of limited financial and technical capabilities for SMEs compared to larger companies. Packaging of food products is an important factor to enable the packaged food product is produced, distributed and then sold to consumers. Selection of packaging materials, packaging design and graphic design should be compatible with the product, market segments to be explored and adopted the market system. Packaging to suit market needs should be accompanied with a quality product, produced at a competitive cost, followed by the promotional and advertising and branding, so that products can be received by consumers and competitive in the market cleared. The main purpose of packaging design is to meet product demand and market as well as materials, construction, graphics, and the right tools in addition to considering the whole process of product packaging. There are various CAD systems related to product packaging, but not specific to food. Some examples of CAD systems for packaging available in the market are TOPS@Pro, Quick Pallet Maker, KASEMAKE Design Software and Studio Designer.

C. CAD Data Exchange Methods

Product data exchange among different CAD/CAM/CAE systems or even animation and documentation software are of great importance to computer-integrated manufacturing CIM. This sharing of product data is also a key to successful deployment of concurrent engineering. Furthermore, this practice mainly contributes in reducing lead-time of product development. Due to the large variety of CAD systems in the market, design data exchange among different CAD systems is indispensable. Since the features of respective software are unique and varied, they should be able to communicate among themselves. This communication means the transfer of data and minimal data loss [13]. There are three basic methods of data exchange systems translate or transferring data from one CAD system to another CAD file format:

Export and/or import system directly: Some CAD systems can read and/or write other formats directly by simply using an open drawing and sketching as a storage option. Most of the CAD file format is not straightforward convertible. This option is limited to systems that are owned either by the same company or by hacking the file formats though the competition.

Buy direct third party: There is a company specializing in self-CAD data translation software that provides software that can read and/or write an information system from/into another format CAD system. These systems have their own formats and some allow the translation of survey data. Some translators working stand on its own while others require either one or both CAD package installed on the machine translation because they use the code (API) the system to read and/or write data. According to [13], that using a specialized translator is uneconomical and difficult to manage unless plenty number of translator can be reduced to only one translator.

Format Data Exchange Interface: A general method of translation is through the medium format. The transmitting CAD system to export the format and the recipient to import the format. Some formats that are free from CAD vendor are defined by standards organizations. While the rest, even if owned by a corporation, is widely used and considered a quasi industry standard. This is becoming increasingly common for companies with more quasi industry standard formats with the use of open publication of data format. According to [13], it is obvious that in current product development process, design data exchange among the different CAD systems is indispensable. It is also found that the STEP standard for product data exchange is popular over the legacy format such as IGES. STEP has a great influence on many engineering applications and it is widely accepted in the area of mechanical design. IGES whereas has been found to be restrictive because it does not capture data about the product through its life-cycle.

III. RESEARCH METHODOLOGY

The common methodology applied in systems development is System Development Life-Cycle (SDLC). It consists of a sequence of phases where each phase embraces the details of needs and project management. The life-cycle is reversible particular phase can be repeated again if necessary. The main objective of analysis is to review on the techniques available for the exchange or transfer of CAD data. There are potential new method to produce the study such as by [14] approach procedures based on the recovery characteristics of data and [15] using the approach of mapping information between the system design CAD.

Level 1: Initial Analysis. Review the literature of past study. Perform comprehensive literature's on developers' experiences of CAD systems, current utilizations of CAD systems in companies and library studies. Make survey and interview to identify problems and needs. Surveys and interviews are aimed at identifying problems and needs in the use of existing manual systems, infrastructures and designs.

Level II: Development of system software *PackCAD* Analysis Phase: collecting and analyzing the data obtained through interviews with the SMEs and other parties involved.

Synthesis Phase: The proposed design of food packaging is generated in this phase. A User can choose to design the most appropriate packaging of the food produced. *PackCAD* is taking into consideration the transfer of data from and/or to other CAD systems is applicable.

Simulation Phase: *PackCAD* system is able to assess whether the design of packaging is made or selected meet the standards or criteria.

Detail Phase: This phase is to ensure that the packaging designed meets all its goals. Any changes in this phase involves with other materials, dimensions or printing techniques.

Testing Phase: Testing phase uses the Internal Integration & Test Consumerism. All errors reported in the first stage of FAT are collected and corrections and/or modifications are made.

IV. DISCUSSION & CONCLUSION

In this paper we focused on proposed method of data exchange in Level II (development of system software *PackCAD*). This system is proposed with a special intention and attention to support the design process of packaging food products by Small and Medium Enterprises (SMEs) irrespective of the minimum skills in handling computers. Users are only required to select the pullplace (drag-drop) packaging form made in the template (stored in the data library) *PackCAD* in standard form or set free to change or resize the form according to the needs of food produced. The design constructed using *PackCAD* can be easily saved and opened to other CAD system. Along the way of this reviewing process, the justification of the selection method of data exchange to develop content for *PackCAD* successfully achieved. The third method of data exchange formats in the Data Exchange Interface international system standards ISO10303 (STEP) is used for system development.

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