Integrating Computer-Aided Manufacturing and Computer-Aided Design for Streamlined Carpentry Production in Ghana

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Abstract : As a developing country, Ghana has a high potential to harness the economic value of every industry. Two of the industries that produce below capacity are handicrafts (for instance, carpentry) and information technology (i.e., computer science). To boost production and maintain competitiveness, the carpentry sector in Ghana needs more effective manufacturing procedures that are also more affordable. This issue can be resolved using computer-aided manufacturing (CAM) technology, which automates the fabrication process and decreases the amount of time and labor needed to make wood goods. Yet, the integration of CAM in carpentry-related production is rarely explored. To streamline the manufacturing process, this research investigates the equipment and technology that are currently used in the Ghanaian carpentry sector for automated fabrication. The research looks at the various CAM technologies, such as Computer Numerical Control routers, laser cutters, and plasma cutters, that are accessible to Ghanaian carpenters yet unexplored. We also investigate their potential to enhance the production process. To achieve the objective, 150 carpenters, 15 software engineers, and 10 policymakers were interviewed using structured questionnaires. The responses provided by the 175 respondents were processed to eliminate outliers and omissions were corrected using multiple imputations techniques. The processed responses were analyzed through thematic analysis. The findings showed that adaptation and integration of CAD software with CAM technologies would speed up the design-to-manufacturing process for carpenters. It must be noted that achieving such results entails first; examining the capabilities of current CAD software, then determining what new functions and resources are required to improve the software's suitability for carpentry tasks. Responses from both carpenters and computer scientists showed that it is highly practical and achievable to streamline the design-to-manufacturing process through processes such as modifying and combining CAD software with CAM technology. Making the carpentry-software integration program more useful for carpentry projects would necessitate investigating the capabilities of the current CAD software and identifying additional features in the Ghanaian ecosystem and tools that are required. In conclusion, the Ghanaian carpentry sector has a chance to increase productivity and competitiveness through the integration of CAM technology with CAD software. Carpentry companies may lower labor costs and boost production capacity by automating the fabrication process, giving them a competitive advantage. This study offers implementation-ready and representative recommendations for successful implementation as well as important insights into the equipment and technologies available for automated fabrication in the Ghanaian carpentry sector. Keywords : carpentry, computer-aided manufacturing (CAM), Ghana, information technology(IT)

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