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INTEGRATION OF DETACHABILITY WITH MULTI-FUNCTIONALITY FOR RELIEF PRINT CARVING TOOLS

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ABSTRACT

This study aims to develop adaptable tools by incorporating removable attributes and multi-functionality from pre-existing items, specifically in the context of relief print tools. The idea came to fruition after observing the usability of current commercial carving tools in terms of their efficiency, especially portability, space-saving, and cost. The methodology used is prototyping research, whereas the prototype product is tested in an actual environment. We explore how this fusion streamlines the relief printmaking process, elevates printmaking productivity, and allows for customization to meet the needs of art students individually. The collected data is then analysed to showcase the benefits of this integration. Hopefully, this study paves the way for a new era of proficiency and precision in relief print, offering related fields an option to discover. By combining detachable components with multi-tools, this study offers a fresh perspective on relief printmaking, addressing the demands of any institution that seeks increased versatility and convenience for its students.

Keywords: Relief Printmaking, Tools Development, Prototype, Multi-tool, Product Testing

INTRODUCTION

The field of conventional printmaking has experienced ongoing development and advancement throughout its history as institutions and artists persistently strive to enhance creative practices by exploring adaptable equipment and tools. Bilyeu et al. (2022) state that the advent of printmaking technologies contributed to shifts in how media is both produced and consumed from relief, intaglio, planographic, and stencil. In addition, the development of art moves in a more varied and diversified direction that expands from technique to tools (Zhang & Zheng, 2022). This means that as new technology is introduced, so is the process of its artmaking. Printmaking in the past was very clear and limited, where an image could be reproduced as part of an edition (Abdullah et al., 2022). Thus, innovation is constantly required to widen the approach to this aspect. This research aims to explore methods of improving the printmaking process, specifically the relief technique, by developing versatility that incorporates features available in the market but not in commercialised tools. Limited tools and machines for working on printmaking make this technique challenging to practice (Arazzi & Sayahdikumullah, 2021). From here, the tools determine the study; thus, we can identify the challenges through field tests. The impetus for this undertaking originated from a thorough assessment of current commercial carving tools, revealing the possibility for enhancements in efficiency, mobility, space utilisation, and cost-efficiency. The field tests will involve art students, as the proposed prototype is mainly to commemorate their needs. The primary objective is to enhance the relief printmaking process

by improving efficiency, increasing production, and addressing the specific requirements of art students.

To understand the possible integration, relief prints have their own specific tools to be identified. According to Medley (2020), relief prints, or block printing, refers to a woodcut or linoleum cut; it requires tools like carving tools, a roller, brayer, spoon, or a flat disk called a “baren”. These tools' usage varied depending on the stages of the printing process. The most important problem facing artists of printmaking, considering the reality in which we live, is the spirit of speed in the age and keeping pace with development (Basiony, 2021). Development that includes tools that the institution currently uses. As we delve into the details of this exploration, carving tools are used during the creative phases of image-making. The field of visual art largely depends on image-making as a prior vision to perform, draw or write and bring astonishing ideas into their work (Rahul, 2023). This phase is the most time-consuming and usually is completed after multiple sittings. This requires students to spend ample time. Thus, tool selection can greatly influence their productivity. Therefore, the research implements a scenario for one student as a candidate for image-making using the commercialised and prototype tools within an identical setup. The results are then analysed.

DESIGNING THE PROTOTYPE

The Commercialised Tools

Carving tools specifically designed for relief printmaking have played a crucial role as essential implements for artists and printmakers in the domain of commercialization. Every artmaking tool has undergone a gradual process of development, resulting in enhanced sophistication and specialisation to cater to the requirements of artists who aspire for meticulousness and adaptability in their artistic endeavours (Öztürk, 2021). Hence, with research and development, it is important that tools should also be in a constant state of adaptability. An illustrative instance can be observed in the linocut carving tool, which has garnered significant acclaim within the realm of relief printmakers. These tools commonly incorporate a diverse range of interchangeable gouges and blades, enabling artists to produce delicate details or sweeping strokes effortlessly. The longevity and comfort experienced throughout the carving process are ensured by the ergonomic design and use of robust materials in these commercial instruments. Consequently, artists can safely engage in the exploration of their creative potential, recognising that the utilisation of these dependable instruments will facilitate the accurate and efficient transfer of their artistic visions onto printing blocks (Hughes et al., 2023). Commercialised equipment, such as linocut carving tools and related instruments, play a crucial role in the realm of relief printmaking by facilitating artists in translating their creative thoughts onto paper with exceptional precision and artistic flair (Chittenden, 2021). However, it is identifiable that these commercialised tools are mostly supplied in multiple units, which results in cluttered storage.



Figure 1. Commercialised Carving Tools
(Source: amazon.com)

The commercialised tools are effective but usually come in sets (refer to *Figure 1*), which sometimes can be overwhelming to art students. These kinds of tools are widely used in many institutions mainly because the options are limited. Though its effectiveness is undoubted, there is still room for improvement, and that is the sole objective of this research.

Design of Various Tools in the Market

In today's consumer market, product design increasingly prioritises multifunctionality to increase user convenience and adaptability (Cooper, 2019). This trend is particularly evident in the domain of commonplace tools, such as screwdrivers. Modern screwdriver sets frequently include interchangeable bits, enabling users to tackle different varieties of screws with a single, versatile instrument.



Figure 2. Detachable and multifunction screwdrivers
(Source: terminator.ae)

This screwdriver's multifunctionality not only eliminates the need for multiple separate screwdrivers but also conserves valuable storage space (refer to *Figure 2*). In addition, the detachable nature of these bits allows for simple replacement and customization, ensuring that users have the appropriate instrument for the task at hand. Beyond screwdrivers, similar principles of multifunctionality and detachability can be found in a wide range of products, from domestic appliances to outdoor gear, all designed to streamline tasks and enhance user experiences in today's dynamic and ever-changing world. The integration of detachable bits with multi-functional tools available in the market today gives the idea for it to be implemented in the prototype design of the carving tools within this research. The significance of companies' capacity to innovate has become increasingly crucial in enhancing their profitability and sustaining their competitive advantage (Artz et al., 2010). Hence, the product should undergo thorough R&D corresponding to its users' needs.

METHODOLOGY

In developing a new product, frameworks for its research and development require to be fully prepared as part of the product development cycle with little or no need to return to earlier stages in the design process (Camarda et al., 2019). The objectives of this research are to identify, develop, refine, and demonstrate a newly designed tool. Thus, it is identified that the most suitable methodology to be used for this research is the prototyping methodology. There are several research models within the prototyping methodology.

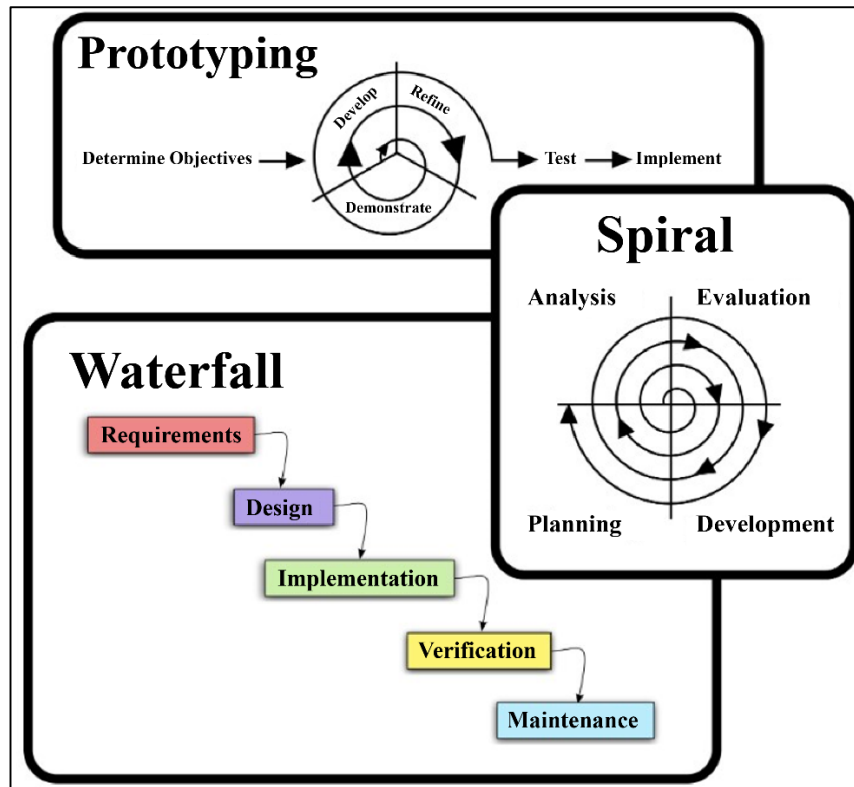


Figure 3. Prototyping Research Models
(Source: wikimedia.org)

Based on the frameworks above (refer to *Figure 3*), prototyping research is the most suitable model to demonstrate the main objectives of this research. A prototype is a sample implementation of the system. It provides limited and main functional capabilities of the proposed system. (Moves in a circle) Build on earlier versions (Volchko, 2017). In teaching practices, art students are recommended to use products of similar brands to level their learning experiences. This also will act as an observational stage for researchers to determine objectives for developing a particular product to be refined. In this case, commercialised tools are seen as cluttered and sometimes take up unnecessary space. After the objectives were identified, it was to save space, reduce cost and be portable-friendly. Hence, developing the new prototype is easy after reviewing the design available in the market to be integrated. The prototype will undergo a process of development, refinement, and demonstration.

RESULTS

The outcomes of the prototyping process for a product design aimed at detachable multipurpose carving tools have exhibited significant promise, highlighting the possibility of this inventive approach in augmenting both the utility of carving tools and the overall user experience. Several major conclusions were revealed during the iterative process of prototype development and testing. The enhanced versatility of the carving tools was achieved through the incorporation of removable components, which facilitated the seamless interchangeability of blades or tips, hence enabling the tools to be effectively utilised for a wide range of carving applications. The result was a prototype product named MCARV with magnetic detachable multi-functional blade bits. 'M' stands for magnetic, and 'CARV' stands for Carving Tools.



Figure 4. MCARV Prototype carving tools
(Source: Authors' rendition)

MCARV Prototype carving tools (refer to Figure 4) have been tested in an actual image-making scenario. Students positively received the inclusion of this feature, as it enhanced the efficiency of their work processes and minimised reliance on other tools, resulting in heightened convenience and improved cost-effectiveness.



Figure 5. MCARV Backend compartment for storage
(Source: Authors' rendition)

MCARV comes with a backend compartment to reduce unnecessary space consumption (refer to Figure 5). Furthermore, the carving tool's ability to perform several functions, facilitated using replaceable attachments, provided users with the capability to engage in a wider array of artistic endeavours, including intricate detailing as well as more substantial carving undertakings. The good comments received for the prototype's user-friendliness and ergonomic design underscore the significance of using user-centred design concepts in the development of tools. In summary, the findings indicate that detachable multipurpose carving tools possess the capacity to fundamentally transform the process of carving, presenting a flexible and effective resolution that addresses the varied requirements of art students or even artists. We have tested the scenario on 3 students and tabulated their feedback. The scenario requires them to produce similar images using commercialised tools and prototype tools and compare their results based on their ratings of the provided criteria.

Table 1 *Feedback on the comparison of commercialised tools and MCARV carving tools based on the provided criteria*

Students		Commercialised carving tools	MCARV carving tools
A	Portability	7/10	8/10
	Space-saver	4/10	10/10
	Effectiveness	9/10	7/10
	Total Score	20/30	25/30
B	Portability	6/10	7/10
	Space-saver	5/10	10/10
	Effectiveness	8/10	8/10
	Total Score	19/30	25/30
C	Portability	7/10	7/10
	Space-saver	5/10	9/10
	Effectiveness	9/10	7/10
	Total Score	21/30	23/30

With an average score of 24 out of 30 for MCARV carving tools and 20 out of 30 for Commercialised tools, it is safe to say that MCARV really deduces the idea of portability and space-saving. However, MCARV's effectiveness falls behind due to its bulkier build, which requires adaptability and time for students to use comfortably.

DISCUSSION AND IMPLICATIONS

The evaluation yielded noteworthy findings on the performance of MCARV carving tools, which obtained an average score of 24 out of 30, surpassing the commercialised tools that achieved a score of 20 out of 30. These results offer useful insights into the relative advantages and disadvantages of the MCARV prototype when compared to existing commercially available alternatives. It is worth noting that the better score achieved by MCARV demonstrates its effectiveness in addressing key issues of relief printmaking equipment, specifically in terms of portability and space efficiency. These factors are of utmost importance for art students and professionals who frequently operate within confined studio environments or require convenient transportation of their equipment. Nevertheless, it is crucial to consider the ramifications of MCARV's larger physical structure, which led to a somewhat reduced efficacy rating compared to commercially available instruments. One notable discovery is the importance of adaptation and the necessity for students to undergo a learning process to utilise the MCARV tools effectively. This suggests that whereas MCARV presents benefits in terms of portability and space efficiency, there might be a compromise in terms of user comfort and instant efficacy. The increased size and weight of the design may potentially impede the user experience, particularly for individuals who are new to the instrument or are accustomed to utilising more conventional alternatives.

Prototyping new products is one sweet spot where the industry can gain new valuable knowledge and understanding of design technology (Jussila et al., 2020). The findings of this study emphasise an important factor to be considered in the design and production of versatile and separable carving instruments. The design problem of achieving a balance between portability and space-saving features while ensuring user comfort and efficacy is a multifaceted task. The MCARV prototype demonstrates notable strengths in several domains; nonetheless, there is room for improvement in terms of its size and the ability to enhance user-friendliness. The significance of continuous revisions and user-centred design is underscored to enhance the MCARV carving tools for a wider range of users. In a more comprehensive context, these findings also emphasise the necessity for a sophisticated methodology in product creation, wherein the compromises between various characteristics are meticulously assessed and harmonised to fulfil the varied requirements of users. The distinctive attributes of the MCARV prototype present a promising trajectory for relief printmaking tools. However, it is imperative to undertake further enhancements to establish its viability as a functional and efficient option for artists and students.

CONCLUSION

In summary, the assessment of the MCARV carving tools in comparison to commercially available alternatives provided insights into the possibilities and obstacles associated with the advancement of multifunctional and detachable carving tools. Although MCARV has superior portability and space-saving capabilities, its somewhat larger physical structure and the requirement for user flexibility have implications for its overall efficacy. The findings underscore the significance of achieving a nuanced equilibrium between novel functionalities and user satisfaction in the realm of product design.

The MCARV prototype demonstrates considerable potential in improving relief printmaking tools, providing significant benefits for artists and students operating under limited spatial constraints. However, additional refining and a focus on user-centred design are required to enhance the usability and effectiveness of the system, especially for persons who are new to the practice of relief printmaking.

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