Enhancing the Realisation of Pattern Parametrisation and Assessing Behavioural Intention to Adopt It

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Abstracts

Pattern parametrisation has the potential to address the inefficiencies and environmental concerns associated with traditional pattern construction practices dominating both industry and academia. However, its adoption is still limited due to a lack of realisation despite its presence in CAD technical applications for decades. This has impeded its ability to shift the pattern industry and academia to a more efficient and sustainable paradigm. Using mixed methods and a three-phased quasi-experimental design, this study aims to enhance the realisation of pattern parametrisation across various industry and academic settings and assess participants' behavioural intentions to adopt it. Findings from a convenience sample of 40 UK-based participants, analysed using Kirkpatrick's (1994) model, indicate increased recognition and intention to adopt pattern parametrisation, as evidenced by participants identifying its diverse applications and aspiring to integrate it into their future goals. This study contributes to theory and has practical applications for both academia and industry.

Keywords: Behavioural adoption intention, Fashion technology, Paradigm shift, Pattern construction, Pattern parametrisation.

Introduction

PARALLEL to advancements in the economy and fashion technology, consumers in the apparel industry have become highly selective, with increasingly demanding expectations for styles, comfort, and fit [1]–[3]. As a result, there has been a transition in the production model from mass production towards customisation aiming at the delivery of high-quality personalised fashion products [2], [4], [5]. Despite the benefits of customisation for apparel businesses, such as reducing returns of ill-fitting garments and enhancing consumer satisfaction, meeting consumers' growing expectations for well-fitting clothing is still significantly challenging [6]. This challenge arises because the creation of patterns that meet individual preferences and requirements entails significant time and labour costs and resource wastage when carried out through traditional construction methods[3]. Traditional methods include both manual drafting and traditional digital drafting, simulating manual drafts in a CAD environment [3], [7], [8].

These methods generate static pattern outputs lacking flexibility for easy customisation and requiring repeated pattern recreation and extensive manual alteration, which consume considerable energy, time, and effort [7], [9]. The fashion industry and academia encounter environmental and efficiency challenges due to the dominance of these traditional methods in both sectors, particularly the bespoke sector, where patterns must be uniquely customised to each individual wearer[7], [10]. Therefore, it is essential to replace these traditional methods with efficient and sustainable alternatives that facilitate customisation by offering accuracy, speed, effort savings, and resource use optimisation.

Pattern parametrisation offers all these benefits and is accessible. Pattern parametrisation is a geometric construction method that generates patterns responsive to individual input data [7]. The key advantage of this responsiveness lies in its capacity for automatic pattern adjustments in response to modifications in the input data [9]. This functionality not only enables dynamic and efficient resizing and simplifies alteration processes but also necessitates a deeper understanding of pattern theory and more cohesive structural drafting[7], [9]. It further fosters stronger body-to-pattern linkages, ultimately improving garment fit [7]. These advantages demonstrably align not only with customisation's requirements but also with the growing advocacy within academia and industry for the shift to a more efficient, sustainable, and environmentally responsible paradigm[7], [9], [11], [12].

Despite its presence in fashion CAD systems for several decades, as evident in early body-to-pattern exploration [13], its widespread realisation and adoption in fashion academia and industry are still limited [7], [9].

Gill et al. (2023) recently established conceptual and technical frameworks for pattern parametrisation, allowing its implementation using any accessible parametric CAD system, and advocated for their dissemination within industry and academic environments. This study responds to their advocacy and aims to facilitate this method's broader realisation and adoption. This was achieved by embedding Gill et al.'s (2023) frameworks into open learning resources hosted on a custom online platform developed specifically for this study. These resources served then as a tool to engage individuals in pattern construction practices across academia and industry with pattern parametrisation. This initiative aimed to enhance their understanding of pattern parameterisation as the optimal method for pattern construction and then assess their behavioural intention to adopt it as a superior alternative to their current traditional practices.

Behavioural Intention Evaluation Framework

This study adopts the Training Evaluation model established by Kirkpatrick (1994) as a conceptual framework to assess the participants' behavioural intentions to adopt pattern parametrisation and categories findings. The Kirkpatrick model assesses the behavioural intention at four levels: (1) reaction measuring users' engagement, (2) learning evaluating conceptual and technical learning outcomes, (3) behaviour assessing the application of acquired learning, and (4) results examining the impact oflearning at the industry level [14], [15].

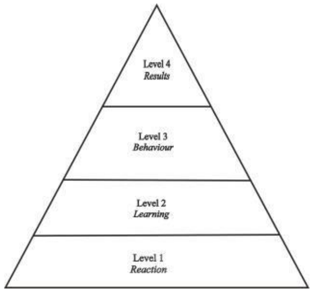

Figure 1. The Kirkpatrick's (1994) model

The Kirkpatrick model has proven effective in assessing behavioural intention to adopt emerging fashion technology and categorising findings[15]–[21]. Hence, the Kirkpatrick model offers a useful framework for assessing participants' behavioural intentions in the present study.

However, the Kirkpatrick model presents two limitations that could affect this study. Firstly, it is solely objective and overlooks the highly subjective nature of the adoption process influenced by users' experiences and expectations[15], [22]. These aspects should be practically investigated when introducing a novel fashion technology or approach, as each user brings varying levels of knowledge, skills, and attitudes toward its adoption [15], [23]. To address this, the model's Results and Behaviour Levels were assessed using qualitative methods, and the reaction level was also assessed using mixed methods.

Secondly, the model considers learners' reactions as the foundational assessment criterion [24]–[26]. While significant, their reactions do not provide comprehensive insights into their behavioural intentions due to their limited understanding of behavioural change [25]. Learners often prefer convenient learning methods that may not lead to behavioural change, whereas transformative learning, which induces discomfort and dissonance, is more effective in facilitating behavioural change [25], [26]. Consequently, actual behavioural intention and reactions may diverge. Flipping the model's levels to make results the foundation of evaluation instead of reactions (Figure 2) can address this issue and redirect attention to what truly matters and treat learning a novel fashion technology as a journey toward industry impact [25], [26].

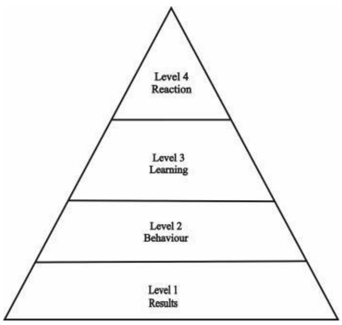

Figure 2. The present study's evaluation framework

To date, the Kirkpatrick model has not been applied to assess behavioural intentions towards adopting pattern construction technologies, especially parametric ones. Therefore, this study extends the model's application to explore this area.

Literature review

The Power of Pattern Parametrisation

As the introduction states, pattern parameterisation's power stems from the linkage it establishes between the pattern inputs and outputs. This linkage automates the application of any changes made in the pattern inputs to not just the element to be changed but all associated elements [7]. This makes parameterisation a powerful approach for fit improvement, a key factor in enhancing garment personalisation, improving fit, increasing customer satisfaction, and, importantly, reducing ill-fitting garment returns and addressing their environmental concerns[9].

Parameterisation improves fit in different ways. Efficient customisation is one of them. Customisation refers to tailoring the pattern to fit an individual's body size, shape, and preferences[4]. Parameterisation allows efficient pattern customisation by permitting the construction of a parametric pattern and then customising it for an unlimited number of customers by merely changing the values of its input variables[7], [27]. As soon as the constructor alters these values, the application algorithm instantly applies these changes to the pattern's geometric elements to modify its size and shape [7], [9].

Parameterisation also enhances fit by providing researchers working on developing better pattern drafting methods that yield enhanced fitting patterns with a powerful experimentation tool[7]. They can develop and test fit proposals and observe their outcomes immediately upon establishing their parameters and scripting their rules. This eliminates the need for energy, effort, time, and paper consumption in testing these proposals repeatedly [7], [9], [10].

Pattern parameterisation further facilitates collaboration among professionals from diverse fashion backgrounds [7]. For instance, fashion designers and textile engineers can communicate their ideas to pattern technicians who translate them into the pattern. This collaboration empowers individuals to build a cross-disciplinary network that fosters more collaborative and inclusive work environments. This can ultimately drive overall growth and development within the fashion industry's subsectors [7].

These benefits collectively render pattern parameterisation the optimal approach to pattern construction and justify the need for this study. Therefore, this study positions itself as the first educational study to lead an initiative to enhance the realisation of pattern parameterisation across the various fashion subdisciplines. It is the first to engage professionals from different fashion backgrounds in a single learning opportunity. It is also the first source to provide insights into users' perceptions of parametric pattern technologies and their intentions to adopt them for personal or professional goals. These insights would enable technology producers to comprehend users' expectations and customise systems that fulfil these expectations, reducing market rejection. They can leverage the outcomes of this study to customise effective marketing strategies to enhance their system's acceptance rates.

Behavioural Adoption Intentions Evaluation

Technology behavioural adoption intention refers to users' willingness to use new technology for personal or professional purposes [28]. Assessing this intention is essential as it is the key determinant of actual usage and significantly leads to it [29], [30]. Therefore, relevant research was thoroughly reviewed to establish a suitable methodological framework for evaluating users' intentions to adopt parametric pattern construction technology in this study and beyond.

This review identified a tendency within the existing literature to emphasise the learning conceptual and technical acquisition as the sole indicator of behavioural intention to adopt technology[31]–[33]. Notably, these studies assessed learning acquisition through a pre-and-post-survey design. This design directly measures the statistical change in participants' average scores (mean) for technical and conceptual knowledge acquisition before and after learning the technology [34]. While scientific and leading to reliable and generalisable findings [35], surveys do not reflect actual use behaviour [36]–[39]. They investigate technology adoption intentions using statistical techniques like structural equation modelling and factor analysis [39]. These techniques reduce complex human-technology interactions to linear, quantifiable relationships and overlook users' perceptions, expectations, and experiences indicating the actual use behaviour [39]. This can potentially lead to missing significant discoveries and hence hinder developments [39], [40]. Even the data collected through surveys is self-reported by the participants and may be insufficient to accurately reflect their actual use behaviour [36]–[39]. Therefore, combining surveys with qualitative methods is indispensable for data triangulation and comprehensively capturing the complexities of actual use behaviours [41], [42]. To the researchers' knowledge, the effectiveness of mixed methods in examining user behavioural intentions towards adopting emerging pattern construction approaches has not been validated.

Nevertheless, Hodges et al. (2020) offer a relevant example. Their study empirically demonstrated the effectiveness of combining pre- and post-surveys with open-ended questions in post-learning to assess user intention to adopt virtual fashion technologies, where pattern parameterisation plays a key role. Hodges et al. (2020) found their mixed methods approach well-suited to examining technology adoption across psychological, behavioural, and cognitive levels.

The evaluation established the scientific foundation for the present study's methodology. It also extends the pattern construction literature by developing and testing a multi-level methodological framework for investigating users' behavioural intentions to adopt emerging pattern construction technologies, particularly parametric technologies.

Methods

Study Design

The study employed mixed methods and a three-phased quasi-experimental design, integrating Kirkpatrick's (1994) model to assess the intention to adopt pattern parametrisation across learning, result, behaviour, and reaction levels.

Sampling

A convenience sample of 40 UK-based participants engaged in pattern construction practices was determined using Cochran's formula. This formula is appropriate for calculating the sample size for research targeting a population with an unknown size [43], as in this study.

Data Collection and Analysis Methods

A post-open-ended question, adapted from Hodges et al. (2020) (How would you benefit from what you learned in the future?), examined participants' adoption intentions at both the Result Level and Behavioural Level. Quantitative pre-and-post surveys, mirroring pattern parametrisation's conceptual and technical frameworks established by Gill et al. (2023), were administered to assess adoption at the Learning Level. The Reaction Level was assessed using a mixed-methods approach adapted from Hodges et al. (2020). This included an open-ended question (What did you like and dislike most about your experience and why?) and a pre-and-post survey consisting of five items adapted from Park et al. (2011)[44]. Quantitative data underwent a paired t-test analysis, whereas qualitative data was thematically analysed based on the theme levels of Kirkpatrick's (1994) model.

Data Collection and Analysis Procedures

Ethical approval was obtained. Then, participants completed the pre-survey (Phase 1), engaged with learning resources (Phase 2), and responded to the post-survey and post-open-ended questions (Phase 3). Data collection tools and learning resources were delivered via an open custom platform developed for this study to ensure accessibility by broader users in industry and academia.

Validity and Reliability of Pre-and-Post Surveys

The validity of the surveys was confirmed through correlation coefficient testing, which assessed item relationships with an overall score of 0.670, revealing strong correlations. Cronbach's alpha coefficient, calculated at $\alpha = 0.712$, indicated good internal consistency, ensuring reliable data collection.

Checking the Assumptions of the Paired T-tests

Since a t-test was chosen for quantitative data analysis, its assumptions were checked beforehand.

Simple Random Extraction

This assumption was satisfied by randomly selecting forty anonymous participants from the initial pool of 70 using Excel's random sampling function.

Normality

Data normality was checked using the Shapiro–Wilk test, appropriate for samples with fewer than 50 participants [45]. The Shapiro-Wilk test results indicated normal distribution for conceptual knowledge (Pretest: .151, Posttest: .117), technical knowledge (Pretest: .191, Posttest: .162), and attitudes (Pretest: .145, Posttest: .104). The Sig. values were above 0.05, confirming the data's normal distribution.

Absence of Outliers

This assumption was satisfied visually through a box plot (Figure 3) for conceptual knowledge, technical knowledge, and attitudes (pre- and post-surveys), which revealed no outliers in the data set. If there are any outliers, they would appear as stars out of the data blue box [46].

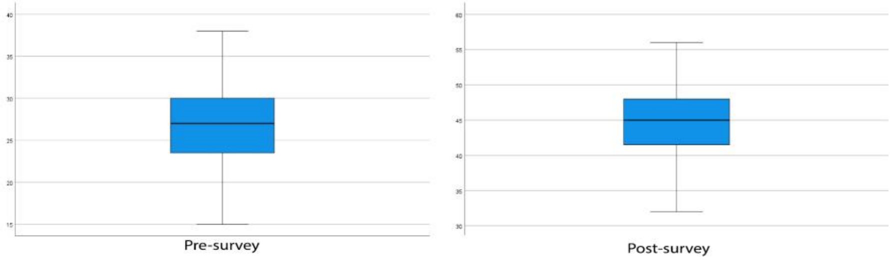

Figure 3. Box plot inspection outcomes for outliers

Matching and Independence of Observations

This assumption was met by ensuring each participant had paired, independent pretest and posttest scores. This ensured that the observed difference reflected the actual effect of the learning rather than any inherent dependency between the tests themselves.

Findings and Discussion

Participants Characteristics

Gender

Of the 40 participants, 35 (87.5%) were female, and 5 (12.5%) were male, reflecting women's dominance in the pattern construction field. This aligns with the UK industry statistics showing that women comprise over 70-80% of the garment manufacturing workforce[47]–[49].

Academic Distribution

The research sample encompasses various fashion-related disciplines, including Fashion Technology, Computer Science, Fashion and Textile, Fashion Design, Textile and Apparel, Textile Engineering, and Textile Technology. This highlights the multidisciplinary nature of pattern construction and the potential benefits of pattern parametrisation for the fashion sub-sectors. For example, those with backgrounds in computer science may be particularly interested in developing parametric patternmaking and automation systems.

Occupational Distribution

The largest portion of the research sample (21 participants, 52.5%) comprised fashion design and fashion technology students. This suggests that the evaluation outcomes provide more insights from fashion technology students' perspectives. The sample also benefited from diversity in other fashion-related occupations. "Home sewers" and lecturers each contributed 4 participants (10%) to the study. Pattern cutters, homemakers, and fashion designers were each represented by 2 participants (5%). Four participants (10%) identified as fashion researchers, and 1 participant (2.5%) was a fashion entrepreneur.

This occupational diversity highlights the relevance and diverse applications of pattern parameterisation across various fashion professions, supporting the need for this study to enhance awareness about it.

By harnessing these diverse applications, pattern parametrisation can foster a more collaborative and inclusive approach to driving overall growth and development within the fashion sector. It can also facilitate collaborative and inclusive efforts to shift the fashion industry towards more sustainability and efficiency.

Experience in Pattern Construction

The analysis of participants' experience in pattern construction revealed a wide range, with tenures varying from one to eighteen years. This variation in experience provides empirical evidence of a potential knowledge gap regarding pattern parameterisation across different career stages in the fashion industry. This gap suggests a lack of awareness, particularly among seasoned professionals, about a method that offers substantial advantages compared to their traditional practices. This finding underscores the importance of this study in promoting the realisation of the technology's potential and accelerating its adoption.

The analysis of participants' characteristics supports the selection of open learning resources for disseminating pattern parameterisation frameworks. This approach facilitated accessibility for a wider range of individuals engaged in pattern construction activities. Consequently, it enhances the potential for efficient knowledge transfer across diverse work environments compared to alternative educational methodologies. This also aligns with the theory of open fashion education and knowledge democratisation advocated as an essential approach for reforming education and industries in the 21st century[50], [51].

Assessing Adoption Intention at the Result and Behaviour Levels

To explore the potential impacts of pattern parametrisation on the industry from the participants' perspective (Result Level) and their intention to adopt it (Behaviour Level), three of the research team thematically analysed participants' responses to the open-ended question about how they will benefit from pattern parametrisation in the future. The analysis involved assigning participant identifier codes to ensure anonymity and categorising responses thematically, reflecting applications of pattern parametrisation and their associated impacts on the fashion industry.

Participants' responses revealed a range of applications and impacts of pattern parametrisation across various fashion sub-industries. Most of the responses centred around fit improvement but from different perspectives. From the professionals' perspective, pattern parametrisation supports the creation of customisable garments with improved fit, even at a large scale. For example, a professional pattern cutter wrote:

“I often need to draft a block customised for each customer. Now, I can draft a base fit-insured pattern for myself and then easily scale it to an unlimited number of customers by just inputting their measurements.”

Improving pattern fit and producing fit-insured patterns at a large scale is the key to reducing ill-fitting garment returns and mitigating their associated environmental concerns [7], [9].

From a research perspective, pattern parametrisation was recognised by researchers as an effective and sustainable experimentation method for exploring the body-to-pattern relationship. A fashion researcher examining drafting methods highlighted this benefit, stating:

“Parameterisation enables the development of pattern experimentation systems to test fit proposals easily while saving time/paper/effort.”

A textile researcher also expressed the significance of pattern parametrisation for improving garment fit but from a textile perspective. He stated:

“Pattern parameterisation facilitates experimenting with any factor that could impact the garment fit, including textile. My research project on the impacts of fabric attributes on garment fit will benefit greatly from this efficient method.”

Pattern parametrisation offers another significant advantage: increased efficiency in the fashion production process, encompassing both time and effort savings. A fashion designer elaborated:

“Pattern parametrisation enables the efficient execution of fashion projects that would otherwise require a more time- and effort-intensive approach.”

Some participants’ responses about efficiency were specific task-related such as resizing the block. A fashion design student wrote:

“I like to know that I can draft patterns and resize them automatically. I never seen this efficient resizing in any patternmaking CAD system.”

Professionals went beyond simple resizing and prioritised maintaining proportionality when scaling patterns, recognising it as more critical than resizing alone. Traditional pattern construction methods typically allow for resizing only at fixed points, often leading to ill-fitting garments [7]. In contrast, parametric patterns, with their cohesive structure, maintain proportionality during resizing [7]. Proportional resizing refers to scaling patterns in a way that preserves the relative ratios and dimensions of their elements [7]. For example, changing the waist measurement necessitates a corresponding adjustment in the intake of waist darts to maintain overall pattern proportions. Proportionality is crucial for well-fitting garments, ensuring that the shape and fit of the pattern remain consistent across different sizes, resulting in properly fitting garments for various body types. In this regard, a Home Sewer stated:

“Resizing patterns proportionally is the main benefit. I tried various methods with limited success; even when using the draping method, there were still errors. This tech enables me to create slopers with formulas that can be scaled proportionally. It is amazing to be able to make a fitted foundational pattern and then scale to fit different body shapes.”

These applications collectively highlight the significant benefits of pattern parametrisation and its potential to shift the fashion industry and academia towards a more efficient and sustainable paradigm.

The findings indicate that participants successfully progressed through the initial two levels (Results and Behaviour) of the evaluation model. The findings also underscore the importance of examining users' perceptions after learning a novel technology, as this approach offers valuable insights into individual user adoption intentions [15], [22]. This study extends the existing literature by identifying the benefits and applications of pattern parametrisation across various fashion sub-sectors, particularly from the user's perspective.

Assessing Adoption Intention at the Learning Level

To assess adoption intention at the learning level (Level 3), participants' acquisition of conceptual and technical knowledge of pattern parameterisation was measured using a repeated-measures quasi-experimental design. Each participant completed the survey twice: once before and once after being introduced to the conceptual and technical frameworks of pattern parameterisation.

Table 1. The paired t-test outcomes

Factor	Test	N	Mean	ΔChange	STD	DF	T	Sig
Technical	Pre	40	10.35	8.35	4.616	39	-10.172	<.001
	Post		18.7		2.377			
Conceptual	Pre	40	7.5	6.6	3.203	39	-12.213	<.001
	Post		14.1		0.982			

The outcomes of the pretest and posttest were analysed using a paired t-test, tracking the difference between their means statically [52]. Table 1 shows the outcomes of the paired t-test.

The paired t-test outcomes indicate that the mean of pre-scores for technical outcomes was 10.35, which increased to 18.7 after being introduced to the technical frameworks of pattern parametrisation. The Δ change in technical skills representing the difference between the pre and post-means [53] is 8.35. This shows a significant improvement, with a t-score of 10.172. A t-value is considered significant when its corresponding p-value (Sig) is less than a predetermined significance level (0.05) [54]. The reported p-value in the data is < .001. This notably low p-value compared to the standard predetermined significance level (0.05) provides compelling evidence of a statistical change in the learners' technical skills attributed to learning.

Regarding conceptual outcomes, participants started with a mean conceptual knowledge score of 7.5 before being introduced to the conceptual frameworks, which notably increased to 14.1 afterwards, indicating a significant Δ Change of 6.6. The t-test results underscored a substantial improvement, with a t-value of -12.213 and a Sig.-value < 0.001. This marked enhancement in participants' conceptual and technical knowledge strongly indicates they progressed through the learning level of adoption intention.

Assessing Adoption Intention at the Reaction Level

Participants' reactions toward pattern parametrisation were assessed using mixed methods. The quantitative data collected through repeated attitude measures (pre- and post-survey) were assessed statistically using a paired t-test.

The results of the paired-samples t-test for participants' attitudes toward adopting pattern parameterisation show a statistically significant difference between the pre- (M = 10.53, SD = 3.762) and post- (M = 14.83, SD = 1.615) means. The attitudes' post-mean score (M = 14.83) increased significantly compared to the pre-mean scores (M = 10.53). The t-value is -6.797 with a significance level of $p < .001$, indicating that the observed difference is unlikely due to chance. In other words, participants' attitudes toward adopting pattern parameterisation became significantly more positive after interacting with it and recognising its advantages for their work.

To examine participants' reactions toward the technology beyond the limitations of the quantitative assessment, the researchers conducted a thematic analysis of participants' responses to the open-ended question about what they most liked and disliked about pattern parameterisation and why. This analysis aimed to assess both positive and negative reactions to ensure a holistic picture of participants' attitudes. After the thematic analysis, researchers found that participants' positive reactions mirrored pattern parametrisation's benefits and facilitating functionalities for their work, as examined in Section 0.

Nevertheless, participants reacted negatively to the conceptual complexity of coordinate systems discussed in Gill et al. (2023). For instance, a pattern cutter with nine years of experience in manual pattern cutting remarked, "I struggled to understand coordinate systems. How would they impact my pattern outputs?".

It was expected that participants with traditional pattern construction skills would find drafting patterns within coordinate systems challenging because, in traditional pattern construction, patterns are constructed vertically, and their points are positioned following a rule-based system without explicit recognition of the XY coordinate systems [55], [56]. However, in a parametric CAD environment, the construction process occurs horizontally due to screen orientation and the pattern's points are positioned within an XY coordinate system [7]. Therefore, transitioning from manual to parametric CAD pattern construction necessitates the introduction of XY coordinates, a key difference between traditional and parametric pattern construction [7].

The theory of threshold concepts and liminality explains the discomfort experienced by some learners while learning coordinate systems. According to this theory, learners undergo a transformative journey as they navigate the liminal space between ignorance and understanding a threshold concept [57], [58], such as pattern parameterisation in this study. This liminal phase is characterised by a shift in current knowledge and practices [59], often perceived as a challenge and a source of discomfort. However, without this discomfort, learners would not be able to make this shift [60]. This explanation could be a compelling justification, especially since this feedback came from a pattern cutter with nine years of experience in traditional pattern construction, where resistance to changes in practice may be particularly strong.

However, the coordinates table did not appear perplexing to participants with experience in computer science and engineering, where working with coordinate systems to understand two-dimensional objects and their relationships is common. Therefore, the introduction of the coordinate systems served a dual purpose. It aimed to enhance the skills of existing pattern cutters, aiding them in transitioning to pattern engineering within a comprehensive CAD environment. Simultaneously, it provided a familiar entry point for individuals accustomed to coordinate systems, helping them perceive the pattern as a coordinate system.

These qualitative and quantitative outcomes collectively suggest that participants had a positive predisposition towards adopting pattern parametrisation, addressing the reaction level of the evaluation model.

Conclusion, Contributions and Implications

Several researchers have employed pattern parameterisation in developing novel fashion systems, such as simulation (prototyping) technologies, pattern construction automation systems, and digital draping systems [3], [61]–[65]. However, this study is the first to promote pattern parameterisation to address traditional pattern limitations and enhance the realisation of its scientific underpinnings applied to any parametric software. It is also the first study to include different parties of the stakeholder community, such as students, researchers, and professionals from different fashion academic and professional backgrounds at varying proficiency levels, in a single learning opportunity. This approach emulates the collaborative and cross-disciplinary nature of fashion industry workplaces, where individuals from diverse fashion backgrounds and experience levels often converge within a single professional environment [66].

The key finding was the participants' enhanced understanding of the technology's applications and benefits across diverse fashion sectors, coupled with their demonstrated positive attitudes toward its adoption. The open resources approach was the external factor that facilitated achieving this outcome. The participants favourably received the resources as they facilitated their comprehension of how pattern parameterisation could be integrated into their professional practices. The pedagogical approaches of teaching pattern parametrisation and enhancing the realisation and adoption of emerging pattern construction technologies have not yet been established. Therefore, this study's approach could provide a foundation for future approaches.

The findings also revealed challenges related to the adoption of pattern parameterisation, mainly the complexity of the coordinate systems. While the learning materials provided clear explanations and relevant application examples, hands-on experience was identified as crucial for developing a deeper understanding and enhanced familiarity with coordinates. Identifying these challenges would inform future teaching strategies.

The mixed methods used in this chapter extend the literature by examining factors that could enhance users' realisation and intentions toward adopting pattern parametrisation. For example, the results of the pre-and post-survey repeated measures analysis revealed that exposure to the pattern parameterisation frameworks positively enhanced participants' realisation and developed more positive attitudes toward its adoption. The interpretations of the qualitative data revealed that the more users are provided with the opportunity to learn how to parameterise patterns, the more they realise its applications in their work-related tasks and their potential to improve their current practices.

The application of the Kirkpatrick framework contributes to the evaluative literature in multiple domains. To our knowledge, this framework has not yet been applied in research assessing the behavioural intention to adopt novel pattern construction technologies. The initial two levels, Result and Behaviour, were assessed qualitatively and framed by recognising that participants' awareness of the technology's applications and benefits for their work-related tasks motivated their intention to adopt it. The subsequent two levels, Learning and Reaction, were evaluated quantitatively by comparing the pre-and-post-survey scores. Consequently, this study provides valuable insights into the utility of the Kirkpatrick framework for assessing users' behavioural intentions towards adopting novel pattern construction technologies.

Although this study's findings contribute to understanding how educational initiatives can enhance the realisation of novel pattern construction technology, specifically pattern parameterisation, and assess users' intention to adopt it, further development and testing of pedagogical approaches are required. While comparing pre-and post-survey means revealed positive differences across the three variables (conceptual, technical, and attitudinal), definitively attributing this solely to exposure to the technology's frameworks is challenging. Qualitative data provided supplementary insights, but deeper investigation using various methodologies is still needed.

Also, the sample size, relative to the broader fashion industry, limits the generalisability of findings. Therefore, studies employing larger samples would be particularly valuable.

A crucial subsequent stage should involve the complete transition from traditional construction practices to pattern parameterisation, which may necessitate additional educational and industrial endeavours. This is because incorporating pattern parameterisation into academic and industry environments is essential for enhancing sustainability and efficiency. While many significant potentials remain to be explored within the realm of parametric pattern technology, the findings of this study contribute to the expanding body of empirical research on the topic and facilitate the development of optimal pedagogical adoption practices.

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