Editorial

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It is a well-known fact that a successful product is one having the highest value, the lowest cost, and the shortest time-to-market, i.e., the time interval from product design conceptualisation to product launch. In order to design such a product, it is necessary to ensure that the product design and manufacturing processes are closely aligned with the product requirements. As a result, in recent years, integrating product and process design in an organisation has been widely advocated in order to realise an efficient and profitable product design and realisation process.

Apart from the integration aspects, it is equally important to focus on some human-centric concerns,

such as understanding the product end-users' behaviour, needs and requirements. A good user model or simulation may facilitate design efficiency, and bridge the gap between product end-users' and designers' mental models. User modelling is an explicit representation of the activities of individual users or groups of users. As technologies become more and more innovative, it has become a big challenge in designing new gadgets, such as mobile systems, robots, gaming environment, etc.

This special issue is a collection of papers offering various viewpoints of process modelling and simulation for product design and realisation. In the first paper, 'A DSM-based project scheduling system for collaborative product development', Lin, Chen, Chang and Chen propose a prototype web-enabled scheduling system that incorporates Design Structure Matrix (DSM) to support New Product Development (NPD) projects in a collaborative product development environment. The prototype system is implemented on the Internet, based on an agent architecture. An example is used to illustrate the performance of the prototype system. The authors conclude that the proposed system is able to assist collaborative NPD projects in obtaining appropriate execution sequence of project tasks, generating project schedule effectively, monitoring the development process, and handling the dynamic events such as task delay and iteration.

In the second paper, 'Integrating pre-purchase affect in product concept development', Seva, Duh and Helander develop a conceptual model, so-called Pre-purchase Affect Model (PAM), that integrates pre-purchase affect evaluation in the conceptual development of a product design framework. The model predicts how product attributes and the compliance of these product attributes to purchase criteria endanger affect and triggers decision-making. To validate the criteria selection of PAM, a field survey was conducted to determine what criteria consumers use to purchase electronic products and items of clothing. A total of 23 and 21 criteria were identified for buying clothing and electronic products, respectively. After the consumer has selected the appropriate criteria and compared the criteria to the product attributes, pre-purchase affect will result. The authors claim that the use of PAM will help designers define which attributes are capable of eliciting various kinds of affect.

Based on the understanding that existing simulation approaches for product development processes are far from practical use, in the third paper, 'Person-centred simulation of product development processes', Licht, Dohmen, Schmidt, Schlick and Luczak present an executable simulation model that goes beyond existing approaches. The proposed approach enables modelling and simulation of product development processes with respect to the aspects of time, costs and quality. The proposed model, which is formally described by timed stochastic coloured Petri nets, has been implemented with a standard simulation software package. It has also been illustrated and validated using an empirical case study. The results are promising and reveal the potential of the proposed approach.

In the next paper, 'The development of a fabric retrieval system using a similarity modelling approach', Shieh, Cheng and Sun describe a new implementation of a fabric retrieval system, which focuses primarily on the similarity judgement of a human's Kansei (a Japanese word for sensibility) for fabric images. In the proposed system, the colour composition information is quantised and used to index the colour features of each fabric image. The colour features and the corresponding Kansei features are then trained using a Neural Network (NN) model. Fabric designers can retrieve existing fabrics or create new designs from the system by adjusting the rating scale of the Kansei impressions. The authors suggest that the proposed similarity modelling approach, which integrates colour features and human perception features into a NN training model, can be further extended to costume fashion design, product styling design, etc.

In the last paper, 'A systematic method for mapping customer requirements to quality characteristics in product lifecycle', Wang and Ma present a fundamental research effort on the modelling and propagation of customer requirements throughout the whole product development lifecycle. A model that maps customer requirements to quality characteristics is proposed. It covers three processes, viz., the qualification and classification of customer requirements, the generation and transformation of product quality characteristics, and product quality characteristics optimisation. The proposed approach adopts an Analytic Network Process (ANP) to establish the weights of different customer requirements and product quality characteristics. The intra- and inter-relations for customer requirements and quality characteristics are then modelled. The matching and conflict resolving algorithms are also proposed. A case study is used to demonstrate the effectiveness of the proposed approach.

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