A REVIEW OF STATE-OF-THE-ART TECHNOLOGIES FOR SUPPORTING A DESIGNER'S ELECTRONIC LOGBOOK

McAlpine H.C., Hicks B.J., Culley S.J. - *University of Bath (GBR)* 565

It is common practice for designers in the UK to keep a personal record of their work in a paper-based logbook. These records represent a large amount of design related information that may not be recorded by other (formal) means. However, efficient access to this information is largely prevented by current paper logbooks. This could be overcome through the creation of an electronic designer's logbook, which would provide a more complete understanding of previous design issues and better support for concurrent and distributed design. Using the findings of a review of existing technology and previous work by the authors, a hybrid technology strategy is proposed which forms the technical platform for an electronic designer's logbook.

COMPUTER AIDED EARLY PHASES IN DESIGN – FROM MARKET NEEDS TO THE OPTIMAL PRODUCT REPRESENTATION

Birkhofer H. - *Darmstadt University of Technology (DEU)* 431

Linear flow splitting is an innovative technology enabling the forming of branched sheet metal profiles. This paper focuses on the concept of an algorithm-based approach of designing such profiles, starting with market needs and ending up at the optimal product representation. High performance algorithms "created" topology and geometry of profiles from formalised verbal requirements. This approach has the perspective to solve the problems of the exponentially increasing number of variants in terms of more complex profiles. The approach seems to be able to keep an overview of the inter-linked network of requirements and product properties and to meet the optimal solution in the entire solution space distinctively.

DISCOVERY IN DESIGN: DEVELOPING A PEOPLE-CENTRED COMPUTATIONAL APPROACH

Parmee I.C., Hall A.E., Miles J.C., Noyes J., Simons C. - *Bristol UWE (GBR)* 595

The paper describes activities of the Discovery in Design (DiD): People-centred Computational Issues Cluster established under the UK AHRC/EPSRC 'Design for the 21st Century' initiative. The objective of the Cluster has been to identify primary research aspects concerning development of people-centred computational design environments that engender concept and knowledge discovery across diverse domains. The Cluster has investigated the utility of established and emerging computational intelligence, enabling computational technologies and people-centred issues across diverse design domains relating to widely differing disciplines including engineering, drug design, software engineering, biosensors, material design and virtual product design.

TOWARDS A STRATEGY FOR MAPPING OF DESIGN PROBLEMS TO SUITABLE SOLUTIONS – A CASE OF DESIGN AUTOMATION USING CBR

Cederfeldt M. - *Jönköping University (SWE)* 471

In order to make the designing of product variants more effective and efficient by automating the process, there is a need to break down and analyse the design process. In doing so, a clearer picture of the actual process will emerge. From this a problem definition and a system specification can be outlined. This paper presents one such case of breaking down a design problem, defining its process character and capturing its inherent domain knowledge. This is then mapped to suitable tools, and computer implementations. One of the tools chosen in this work, Cased Based Reasoning, is further addressed together with some implementation issues of CBR as well as the advantages of a variant design approach to setting up of CBR indexing templates.

RAPID DEVELOPMENT OF INFORMATION APPLIANCES: FUTURE APPROACHES FOR DESIGNERS

Evans M., Gill S. - *University of Salford (GBR)* 527

This paper considers the particular development needs of information appliances (PDA's, mobile phones,...). It proposes an approach that provides designers the opportunity to not only design and develop future information appliances, but to take these proposals out to potential consumers and test their concepts. The challenge of information appliances development is discussed-rapid technological development that is so rapid, that at times it is simply not possible to get the right product to the right market in a form that consumers desire before it is superseded. Going beyond this, innovators need to uncover new opportunities by exploring peoples unmet and unarticulated needs. Ethnographic observational research supports this inquiry well.

PRODUCT STRUCTURING FOR CROSS-X PDM

Vielhaber M., Burr H., Eigner M. - *DaimlerChrysler AG (DEU)* 655

The product creation process in automotive engineering is getting more and more complex. Challenges arise from the ever growing complexity of the products themselves as well as from consistently condensed and interlinked processes in distributed, cross-x engineering networks. One major building block in any strategy to cope with these challenges is to develop a powerful, efficient and flexible data management backbone for the product creation process. With the IT realization however being the easier part of such a solution, the development of a holistic product structuring concept across the different domains, business units and companies seems to be the bigger challenge. This paper discusses steps towards such a product structuring concept.

FORM DIVISION IN AUTOMOTIVE BODY DESIGN - LINKING DESIGN AND MANUFACTURABILITY

Dagman A., Söderberg R., Lindkvist L. - *Chalmers University of Technology (SWE)* 495

The spatial relations between the individual parts in an assembled product can be critical for the functional and aesthetic quality of a product. These relations are the result of a form division. How well the relations are realized when manufactured is partly settled by the geometrical robustness of the concept. The geometrical robustness is affected by the position of the locating points and the shape of the geometries themselves. This paper presents a tool for form division from a geometrical robustness point of view in the early phases of the PD process, where the geometry is not set. The tool itself combines both industrial design aspects as well as manufacturing aspects and allows design changes in order to increase the robustness.

EMBEDDING GENERAL CONSTRAINT RESOLUTION INTO A CAD SYSTEM

Singh B., Matthews J., Mullineux G., Medland A.J. - *University of Bath (GBR)* 625

Computer aided design (CAD) has facilitated designer's task by automating many of the activities involved in a conventional design process. This can be further augmented by use of constraints in CAD systems. However there is still need for incorporating general constraints. This paper highlights some of these constraints. Constraint modeller software that incorporates these constraints is described here. Based upon this constraint modelling approach, a new constraint modeller-CAD interfaced system has been created. This system can offer combined advantages of these two systems and has been demonstrated in modelling, assembling and simulating the action of part of a confectionary wrapping machine.

FUNCTION MODELLING SUPPORTS CONCEPTUAL DESIGN OF INNOVATIVE PRODUCTS

Brix T., Döring U., Höhne G., Lotz M., Reeßing M. - *Technical University Ilmenau (DEU)* 439

The development of innovative products is based on the generation of new concepts. For evaluation and selection of potential innovative solutions it is important to understand and predict their properties. To do this in the early design phases the designer needs special methods and tools. Virtual prototyping is such a method and it can be applied even in early design phases. The paper presents a computer supported tool for this purpose and shows applications of function modeling in the conceptual design phase dealing with the development of ultra high precision positioning and measuring machines as well as mechanisms. The aim is the generation of a quantified layout as the base for subsequent design phases, especially the embodiment design.

FUNCTIONAL PRODUCT DEVELOPMENT – DISCUSSING KNOWLEDGE ENABLING TECHNOLOGIES

Nergard H., Ericson A., Bergström M., Sandberg S., Törlind P., Larsson T. - *Lulea University of Technology (SWE)* 587

The concept of functional products affects the business as a whole. The hardware will be offered to customers as one part incorporated in a total offer. The offer as a whole compromise services related to and/or designed into that hardware. The product development level will be affected, this emerging development process is called Functional Product Development (FPD). Computer tools to support decisions in engineering design are commonly used by design teams. Today, these tools are considered to be internal and support engineering specific knowledge. However, FPD insists on collaboration between companies to achieve additional knowledge. The purpose in this paper is to discuss new demands on computer tools to support decisions in FPD.

LEAN IMPLICATIONS FOR THE DESIGN OF PRODUCTS

Stauffer L.A. - *University of Idaho (USA)* 641

The paper is a brief introduction to lean concepts and how they can extend from manufacturing and service processes to that of the interaction between a person and how they use a product. We show how the main concepts of lean—value, pull, and flow—pertain to the relationship between the user and the product. We also show how the categories of waste (overproduction, transportation, motion, inventory, waiting, excess processing, and defects) provide a framework for describing the waste that occurs during the user-product interaction. Reducing this waste should result in a product that provides the user with a more satisfying experience. Philosophically, we believe lean principles can set a new context for thinking about ergonomics as it relates to product design.

IMPLEMENTING NEW PRODUCT DEVELOPMENT BEST PRACTICES IN HOUSE-BUILDING DEVELOPMENT PROCESSES

Soetens B.R.F., Roozenburg N.F.M., Smulders F.E.H.M. - *Delft University of Technology (NLD)* 633

Ballast Nedam, a large construction company in the Netherlands, wanted to investigate which practices of the industrial product manufacturing industry could advantageously be transferred to the housing development process. A preliminary study into this subject was carried out at the Faculty of Industrial Design Engineering of the Delft University of Technology. This paper presents practices from NPD that can potentially improve house-building processes and discusses concrete options for implementing these practices in the housing development process.

PROPOSITION OF A NEW MODEL FOR EARLY PHASES OF INNOVATION PROCESS

Pialot O., Legardeur J., Boujut J.F., Serna L. - *ESTIA (FRA)* 603

The paper discusses about a new model dedicated to be used during the early design phases of innovative ideas development. Our main goal is to propose a model to foster formal and informal interactions during the first operations of innovative projects. This model aims to encourage development and evaluation around new ideas proposals taking into consideration potential, technology and concepts feasibility. A tool proposal is also presenting to illustrate the use of our model and highlights the possibilities of networking among stakeholders of innovative project.

GLOBALIZATION AND CROSS-CULTURAL PRODUCT DESIGN

Diehl J.C., Christiaans H.H.C.M. - *Delft University of Technology (NLD)* 503

There is an emerging interest in the impact of cultural dimensions on the experience and interaction between people and products. Globalisation has led to a situation in which product design teams from one culture or context often have to develop a product which will be used in a (totally) other cultural environment. Globalisation also confronts companies to decide between ‘global’ or ‘local’ featured design of products. As a result it has become essential for the industrial design education and profession to take the context and culture of the end-users more serious and to look for consequences regarding industrial design. As a result cross-cultural product design has increased in value and interest within the research and education programmes of the faculty of Industrial Design Engineering at Delft University.

CULTURE-DRIVEN PRODUCT INNOVATION

Moalosi R., Popovic V., Hickling-Hudson A. - *Queensland University of Technology (AUS)* 573

The paper explores how culture can be used as a source of product innovation within Botswana's context but it has been observed that designers have not yet been able to encode cultural human factors to the same extent as cognitive and physical ones. Design should be embedded in users' culture as it is seen as a mirror and agent of change within the society. The basis of this paper is that there is little in-depth research that can assist designers to use culture as a catalyst to designing innovative products. The paper concludes by discussing how designers can integrate socio-cultural factors by 'conscious design effort' rather than 'incidentally' in order to produce innovate, pleasurable and culturally sensitive products.

THE ORGANISATION OF AN INNOVATION PROJECT ASSISTED BY A CREATIVITY MODEL

Alberti P., Dejan P-H., Cayol A. - *Université de Technologie de Compiogne (FRA)* 425

This obligation to innovate makes you wonder how to implement creativity and therefore the methods leading to it while taking advantage of the knowledge and capabilities of the company and thus take advantage of the internal wealth. To give a first approach, this article starts with an insight on the methods and definitions already existing in creativity to end with the hypothesis of the construction of a model. A second part deals with the methodology of conception and validation of a model. Then the main part of the article presents the model and the actions that allowed validating and completing it. We tested the validity of our model comparing it to a creativity approaches applied to different projects.

INTEGRATED INNOVATION CAPABILITY

Buergin C. - *ETH Zürich (CHE)* 455

The paper outlines a structure of a company's innovation capability integrated in its business environment. The structure is set up in different levels which affect a company's capability to innovate. As well as a basis of an instrument is described to measure and to lay the foundation for actions to improve the innovation capability.

UNDERSTANDING AND DEVELOPING INNOVATIVE PRODUCTS AND SERVICES: THE ESSENTIAL ELEMENTS

Tan A.R., McAloone T.C. - *Technical University of Denmark (DNK)* 647

Innovation is synonymous with successful development and implementation, and therefore peculiar to innovation is that it has to prove itself on the market before we can deem it innovative. This paper suggests an approach for understanding the principles for innovative products which is based, not on the product itself, but on the activity and the effect on stakeholders. Innovative products are products that contain a difference, with appropriate, valuable and desirable effects induced on the company, consumer and society. The approach is exemplified through a case on the Sony Walkman. When designing products companies should consider the main stakeholders and the effects of products throughout their life cycles.

INFORMATION MANAGEMENT FOR THE DIGITAL FACTORY - BRIDGING THE GAP BETWEEN ENGINEERING DESIGN AND DIGITAL PLANNING

Burr H., Vielhaber M., Weber C. - *DaimlerChrysler AG (DEU)* 463

In today's development processes, an efficient information handling is an essential success factor. In this article, the so-called shell model is introduced. The shell model is a data model for a seamless support of product development processes, integrating information regarding products, processes, and resources. The concept is derived from requirements from the body-in-white process chain in automotive development, dealing with the transition between design engineering and production planning. Yet, this concept is applicable for a variety of other disciplines with similar boundary conditions. In the end some alternatives for the application of the shell model in heterogeneous data management environments are presented.

TRACEABILITY OF SIMULATION DATA IN A PLM ENVIRONMENT: PROPOSITION OF A STEP-BASED SYSTEM THAT SUPPORT PARAMETER INTEGRATION

Ducellier G., Charles S., Eynard B., Caillaud E. - *UTT (FRA)* 511

The exchanges between experts represent a key challenge for collaborative product development. It is based on prior researches developed in the domain of Simulation Data Management and proposes the use of parameter manager integrated to the SDM and offering a full integration with the CAD Application. This parameter manager enables the updates of geometric modifications into the SDM in order to manipulate multiple geometrical configurations of the product analysed. It conducts to results using different geometrical configurations based on the same FEA Analysis and provides information regarding the impact of the geometrical parameters on the FEA. Finally, first experimentations are set and in-coming researches are presented.

PRODUCT MODEL SUITED FOR THE ERP SYSTEM

Galeta T., Kljajin M., KarakašiæM. - *University of Osijek (HRV)* 535

In a purpose to support the product development process through the ERP system, an appropriate product model should be accomplished and implemented. The paper represents product model suited for the particular ERP system: ERPINS-M. ERPINS stands as an acronym for the Enterprise Resource Planning ININ Solutions, while M annotates a version of the ERP system particularly tailored for the metal industry. Authors have reconsidered an influence and adaptation possibilities of existing standards in scope of the product development process. Since specific ERPINS-M system architecture does not allow the full implementation of considered data schemas, core ideas and concepts of considered schemas are utilized for a derivation of the product model.

INTELLIGENT SEARCH FOR PRODUCT DEVELOPMENT INFORMATION - AN ONTOLOGY-BASED APPROACH

Ponn J., Deubzer F., Lindemann U. - *Technical University Munich (DEU)* 1203

The active management of information and knowledge is nowadays considered an important means to achieve an enterprise's competitiveness, which is especially relevant for the information intensive domain of product development. In this paper, two industrial case studies are presented, where deficits in knowledge management via digital databases were addressed. The mechanisms to access relevant contents within the regarded databases in specific search situations showed high potential for optimization. In both cases, an ontology-based approach was chosen to address these issues. As a first step towards a solution, initial ontologies were developed for defined use cases, (partially) implemented and evaluated. Results are discussed in the paper.

A WEB-BASED INFORMATION PORTAL FOR THE EARLY STAGES OF DESIGN

Sauer T., Degenstein T., Chahadi Y., Birkhofer H. - *Darmstadt University of Technology (DEU)* 617

In developing new and innovative products in the age of information technology, knowledge and information management are becoming increasingly important factors for companies. The early design phase is especially essential to the success of a company. According to the differences of existing products, the tasks of a designer are very heterogeneous. To support engineers in the field of product development, an approach for supporting engineers with information is necessary. Such an approach has been generated within the pinngate-project at the pmd department at the Darmstadt University of Technology. The paper presents the concept of a web-based information tool which is based on a sub-project of pinngate and relates the first experiences using the tool in a R&D-project.