
A LANDSCAPE OF METHODS - A PRACTICAL APPROACH TO SUPPORT METHOD USE IN INDUSTRY

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The implementation of design methods in industry is still rather poor, although they were developed and dedicated to support the often challenging task of product development. The assumption of our work presented in the paper is that a short and concise overview of existing methods together with a selection aid and application hints from practical experience will lead to adequate method use. Hence we created a so-called Landscape of Methods (LoM), an easy-to-use approach to identify and highlight task specific combinations and sequences of method application.

THE PRINCIPLE OF DIRECTED RADICALITY: TOWARDS A LOGIC OF RADICAL INNOVATION

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Intelligent focusing is the crux of effective and efficient problem solving in any domain. Knowledge-level studies of problem solving have supported this view without any reservations. In fact, it is the core of any methodology. My paper begins by reviewing Gerald Smith's search of 'logic of innovation' and emphasizing his characterizations about the nature of intelligent focusing in idea generation. Then I present a hierarchy of methodological constructs for radical innovation that helps to recognize different opportunities of proactive intelligent focusing in this subdomain of innovation. In the final part, I demonstrate the applicability of this view in the context of out-of-the-box thinking using the paradigmatic Nine-Dot problem.

MODELLING THE PROCESS OF CREATING A MUTUAL UNDERSTANDING IN DISTRIBUTED DESIGN TEAMS

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Cooperation is an important issue in design teamwork. This paper is an attempt to contribute a theoretical framework through the modelling of the process of creating a mutual understanding during remote synchronous design sessions. We present here some reflections based on a review of the available literature in engineering design, on the experience accumulated in field studies and on a distributed design protocol we have recently carried out. We propose a model of an elementary design interaction between two participants of the design process. We take the Situated FBS Framework as a basic individual cognitive model and we propose to extend it through the concept of design intermediary objects and cognitive synchronisation.

METHOD ADAPTATION - A WAY TO IMPROVE METHODOLOGICAL PRODUCT DEVELOPMENT

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Users often are not able to select, adapt and apply adequate methods. This is ascertained as a main reason for still reserved method application in product development. Existing approaches are adjusted to specific application areas – adaptation hints are hardly available. The objective is to improve method transfer by providing instruments especially focusing on support in flexible adaptation of methods. Adaptation has to be task-oriented and resources-oriented particularly user-specific and situational. Mechanisms for method adaptation are introduced, which are based on the principle of identification and adjustment of method application conditions that characterize an underlying task and corresponding method attributes of applied methods.

HOW INDUSTRIAL DESIGN INTERACTS WITH TECHNOLOGY – A CASE STUDY ON DESIGN OF A STONE CRUSHER

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This paper takes an empirical look into industrial design (ID) in process and metal industry. The data is based on a case study of an ID pilot project at a company that is a market leader in mineral processing systems. In the paper, the overall structure of the ID project is outlined and aspects of design work are addressed through detailed analysis of interactions between the participants. In addition, the role of visualizations and the nature of design problems are examined. The conclusions of the paper include implications for the organization of industrial design projects. In addition, general notes are made about the nature of ID within the company - and technology intensive areas in general.

AN AESTHETICS FRAMEWORK FOR DISCUSSING 'INCLUSIVE' ISSUES IN DESIGN

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1127

One issue which faces designers and engineers is that of the aesthetic acceptability of products and systems for an ageing population. We may be able to provide for functional and usability requirements but have difficulty with complex aesthetics issues raised by ageing or disability. This paper discusses a framework for considering aesthetics for an ageing population and asks if this is informed in any way by fresh understanding gained from new 'inclusive' models, and if so, do these models limit or enlarge our thinking of aesthetic issues. It explores aesthetics through a three level framework which may prevent engineers and designers overlooking important aesthetic issues.

MAPPING HAPTIC PROPERTIES IN PRODUCT DEVELOPMENT WORK

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To achieve an integrated impression of a product it is important to encompass all five senses. Otherwise, the perception of the product may be misleading and total impression fails. Previous research has focused on visual properties; this study concentrates on haptic properties. Haptics, based on the sense of touch, is active and explorative, since the skin, muscles and joints function together to obtain information. It is the sense of product form, weight, grip span, resistance, the use etc. The interview study aims to map and reflect the level of awareness and knowledge of haptic properties in current product development. Generally, the interviewees were not familiar with this concept but they did work with specific haptic properties.

INTRODUCTION OF THE INTEGRATED PRODUCT POLICY IN SMALL AND MEDIUM-SIZED ENTERPRISES

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In the last years a new environment strategy was developed by the European commission, which is called „Integrated Product Policy“ or IPP. Within this political process the Bavarian government started to support IPP pilot projects in order to facilitate and speed up the conversion of the theoretical IPP concept into practical applications. One of the special focuses was on SME. They have a limited availability of resources for environmental issues as well as a lack of know-how compared to larger enterprises. They need a more pragmatic methodology. This research project has investigated applicable methodologies to support the sustainable development in SME and shows the achieved results within the projects of the industrial partners.

EVALUATING THE ORGANIZATIONAL ROI OF DIFFERENT COLLABORATIVE STRATEGIES

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1105

This paper proposes a modelling tool that evaluates the organizational ROI (return on investment) for different collaborative strategies. This decision-making tool has been developed to identify the most effective collaborative strategies for any given situation, in order to improve collaborative performance. Collaborative phenomena are classified as subjective, intersubjective, objective or interobjective for a comprehensive overview of relevant aspects. For evaluation and comparison of different collaborative strategies, the model uses performance measurement methods. The model serves as a basis for developing a collaborative philosophy.

DESIGN-MANAGEMENT INSTRUMENT FOR EVALUATION OF COMMUNICATION AND COOPERATION IN MULTIDISCIPLINARY TEAMS

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The objective of our research was to develop an instrument for design managers that brings insight into the communication and cooperation in multidisciplinary design teams. From a literature study on concurrent engineering, we derived three areas of special attention, namely team approach, coordination, and IT-platform. For each area, we derived a list of critical factors influencing the communication and cooperation. This list formed the basis for our instrument, consisting of an inquiry to be filled out by the design manager and an interview with the design manager. The instrument was used and tested in three case studies in the building industry, from which preliminary conclusions about the instrument were derived.

LIFE CYCLE STRATEGY

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Life cycle strategy is a strategy, which focuses on an economic and ecological optimum over the entire life cycle from the raw material extraction to the recycling. The purpose of this strategy is to avoid the suboptimization of individual life phases and to prevent the shift of problems from one life phase to another life phase. The goal of the paper is the derivation of the necessity for a life cycle strategy for different products. Furthermore, methodical approaches for the life cycle oriented strategy are introduced. The developed approach is finally verified in a case study. The main focus of the case study was the investigation of life cycle costs and life cycle revenues as well as the prognosis of these costs in the future.

WHAT DESIGNERS THINK WE NEED TO KNOW ABOUT THEIR PROCESSES: EARLY RESULTS FROM A COMPARATIVE STUDY

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The Across Design project at the University of Cambridge and the Massachusetts Institute of Technology is one of the first research efforts to draw comparisons between design processes in different domains. In a series of workshops, designers from different design domains talked about their processes. Their presentation styles mirrored the typical style of their mains from slick PowerPoint presentations on engineering processes to very visual presentations by artistic designers. However the presentations focused on the drivers governing the processes. This paper looks at the key drivers of each domain, especially customers satisfaction as the strongest common driver. Other drivers vary in importance between the different domains.

VISUALIZATION OF THE MULTI-ATTRIBUTE DESIGN SPACE

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1033

A multi-attribute design procedure results in relatively large number of Pareto optimal designs. Since every design is also defined by a set of parameters it is necessary to establish relations between design parameters and design attributes. The multi-dimensional space is visualised through 2-dimensional window. The same view is tried with variable colour for different strata and with variable symbol size and colour. The hyper-surface of multi-attribute designs may be visualized through stratified symbols, the number of strata should be about five and the size of graphical sign diameter is best varied according to the modified Renard series.

THE FAMILIARITY WITH AND THE USE OF DISASSEMBLY-SUPPORTING CONNECTIONS AND FASTENERS IN GERMANY'S MANUFACTURING INDUSTRY...

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The aim of this study was to find out to what degree disassembly-supporting connections are known and used in practice; how knowledge of the existence of such connections affects their use. It could be shown that these connections are mostly unknown. This is one of the main reasons why they are not used in technical products. Other reasons are the lack of information about the characteristics and properties of disassembly-supporting connections and insufficient experience with their application. So there is a strong need for further research at the area of disassembly-supporting connections. Therefore we undertake further analytical and experimental research to determine and provide the relevant information to design practice.

DESIGNING FOR PATIENT SAFETY : A REVIEW OF THE EFFECTIVENESS OF DESIGN IN THE UK HEALTH SERVICE

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The UK Department of Health commissioned a scoping study to deliver ideas and practical recommendations for a design approach to reduce the risk of medical error and improve patient safety across the UK National Health Service. The research team employed diverse methods to gather evidence from literature, key stakeholders, and experts from within healthcare and other safety-critical industries. What emerged was a very consistent picture that pointed to the need to better understand the health care system – from a design perspective – as a complex system of interacting organisations, professions, care environments, procedures and tasks, so that there can be greater certainty that discrete design solutions will contribute to patient safety.

PRODUCT DISASSEMBLY SEQUENCES APPROACH IN THE EARLY STAGES OF PRODUCT DESIGN

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The authors are investigating procedures, which can be used to assess service difficulties and costs at the early stages of product design. A central part of this work is generation of required disassembly sequences for identified service or repair items or for recycling at the end of product life. This paper describes a model of assemblies/disassemblies, which has been developed for this purpose with the associated search algorithms. To facilitate the required search procedures, the concept of a disassembly diagram was introduced. The relationships between this diagram, the assembly model and the search procedures are illustrated in the paper by a simple example.

COST BENEFIT ANALYSIS IN DESIGN FOR SAFETY

Fargnoli M., Ragone E., Tronci M. - *University of Rome "La Sapienza" (ITA)*

1015

Since the beginning of 90's the European community has been committed to facing problems related to Machine Safety issuing new laws and standards aimed to reduce risks in workplaces. In spite of this new approach towards Machine Safety and huge technical and technological progress achieved in recent years, the number of accidents related to machine malfunctioning or an improper use of machines and safety devices continues growing more and more every year. The goal of the research carried out collaborating with the Italian Institute for Prevention and Safety, was to define a Methodical Design Approach aimed at the evaluation and improvement Safety of MSs with acceptable Costs, in accordance with the recent EC Directives.

MERGING DESIGN ACTIVITIES AMONG DIFFERENT APPLICATION FIELDS: FROM MEDICINE AND CULTURAL HERITAGE TO INDUSTRIAL ENGINEERINGBandera C., Filippi S., Motyl B. - *University of Udine (ITA)*

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The aim of this work is to define a uniform methodology for problem solving issues useful in different fields. Two processes related to medical field and cultural field have been analyzed in order to highlight common activities. IDEF method has been used to obtain structured models of the processes. CSCW, Reverse Engineering and Rapid Prototyping have been chosen as links among such different realities. The extracted common activities have been joint into a new, context-independent, work methodology. In the same time, this method extends the usage of tools and techniques closely related to industrial applications.

EXCLUSION BY DESIGN: AN ASSESSMENT OF THE ACCESSIBILITY OF DIGITAL TELEVISION SET-TOP BOXESClarkson P.J., Keates S. - *University of Cambridge (GBR)*

989

The aim of the study reported in this paper was to investigate the accessibility of digital television technology, focussing on the current generation of set-top boxes which provide 'free to view' services. In particular, it was important to identify challenges presented to users by digital television that are not found when using the current analogue equivalent. The findings of the study suggest that only if all of the additional functionality is at least as accessible and usable as interacting with an analogue television, will digital television be as inclusive as analogue. This is a tough target to aim for, but a necessary one unless it is to be accepted that not all users will have access to all of the emerging digital services.

THE ASSESSMENT OF QUALITY IN DESIGN STAGESFargnoli M., Geraci D., Petrucci A. - *University of Rome "La Sapienza" (ITA)*

1009

The importance of Quality has become more and more important as much in the industrial world as in social life. Quality is nowadays understood both as "Total Quality" and as complex property of a product, and represents an imperative to be more competitive and to guarantee an orderly development of production, and to ensure a total compliance of the expectations and of the needs of users and customers. The aim of the research is an attempt to find the right trend to follow to integrate Design Methodologies and the developed Quality Indicators within a proper "Assessment Procedure" that allow us to define the way to cover in order to improve products Quality and assure an optimal compliance with the Quality Standards in Industry.

TRANSFER OF KNOWLEDGE AMONG DIFFERENT BRANCHES WITH USE OF THE THEORY OF TECHNICAL SYSTEMSFormanek J., Hosnedl S. - *University of West Bohemia in Pilsen (CZE)*

1021

The proposed paper will present the developed methodology for transfer of knowledge between two or more different branches. It comes out from the current knowledge of Engineering Design Science, especially from the area of the Theory of Technical Systems. The methodology is general. It is suitable for engineering design both of any new or improved technical product-technical object system (TS). It can be also used not only on the level of constructional structure of a designed TS as usual but also on levels of its organ or function structures. The methodology enables to increase the efficiency and effectiveness of engin. design processes including gaining new knowledge both for designers and for branch where it is being used.

IMPLEMENTATION OF TARGET COSTS IN MASS CUSTOMIZATION DESIGN PROCESSESGahr A., Lindemann U., Saltykov A. - *TU Muenchen (DEU)*

1027

Mass customization is emerging as a popular extension of traditional mass production. Demanding new approaches to the design process, mass customization affects the way using target costs during product development. Placing customers at the centre of mechatronical engineering processes represents a paradigm shift that also creates new demands on cost calculation. This paper proposes the implementation of a target costing model in mass customization to define and to control the monetary environment of individual design processes. The paper also presents a cost estimation tool that has been developed for estimating the customization process-costs during the individual product development.

DEVELOPING COLLABORATION PRACTISES: MODELING THE COMPONENTS OF INDUSTRIAL DESIGN NETWORK

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In many respects Industrial design (ID) is outsourced knowledge in the Finnish B-to-B engineering industry. More than occasionally attempts to integrate the external ID work result try-outs in which the company fails to achieve a successful experience of using ID. It is often assumed that the sources of these miscarriages are caused only by incompetence of ID consultants or poor briefing. The latter can be also consequences rather than causes created by unsuitable mix of collaboration practises that are incompatible with internal capability and objectives. The key research question is to model the components of collaboration practises.

EXPLORING INDUSTRIAL DESIGN MANUALS IN THE FINNISH ENGINEERING INDUSTRY

Hakatie A., Kosonen E. - *University of Art and Design Helsinki UIAH (FIN)*

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In Finnish business-to-business engineering industries, managing the industrial design function is an emerging question. Industrial design manuals and guidelines have been seen as one solution to this demand. This paper explores how Finnish engineering companies have approached the question of industrial design manuals through a descriptive four-level maturity grid. It also identifies seven key activities which elaborate the grid. The paper is based on documentary analyses and ethnographic studies conducted in four global Finnish engineering corporations.

PLATFORMS AND CROSS-ORGANIZATIONAL EFFECTS

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This paper we have argued that product platform strategies are company specific. Companies do not gain much advantage by adopting platform strategies from successful companies because implementation of platform is complex and it involves close interaction amongst functional disciplines within the company (i.e. engineering, marketing, purchasing, manufacturing, etc.) as well as other parties of the supply chain (i.e. suppliers, customers, and competitors). Nevertheless, companies can benchmark and learn from the successful companies, but firms should define the best platform architecture that best fits their organizations, markets, and environment.

OFFICE FURNITURE: (FOR) A NEW GENERATION

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The attempts and requirements to increase safety and comfort of the office working environment as well as work performance are realized in many different ways. Current aspects and actual needs of a dynamic user of the office furniture exceed the available solutions, requiring interdisciplinarity of design with respect to this issue. The review of requirements upon the design of office working areas and equipment should help define a new design concept and forecast new trends in office furniture.

DESIGN OF THE 3D MODEL OF HUMAN BODY ORIENTED TO BIOMECHANICAL APPLICATIONS

JurèeviaLuliaT., MuftiaO., SušiaA. - *University of Zagreb, FMENA (HRV)*

1075

This paper describes a biomechanical model of human body and an automatised method for determination of static anthropomeasures and inertial properties of body segments from anthropometric measurements. The method has been established for measuring female subjects. Characteristic body points on subjects have been recorded using the Elite system and 3D coordinates of marked points were the input data for calculating static and dynamic anthropomeasures using the program written in Matlab. For description of inertial properties, the body has been modelled using 16 geometric solids. The model and method described in this work could be used for computer simulation in biomechanics and computer design oriented to ergonomical applications.

COMPUTER AIDED ERGONOMIC AND AESTHETIC DESIGN

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The paper presents the review of the existing tools and techniques for ergonomic design. These tools are used for checking the ergonomic adequateness of the product, which product has to be designed and modelled before ergonomic analysis. Considering the results of the ergonomic analysis, the model should be redesigned, using designer's knowledge and experience to fix the ergonomic imperfection. Aesthetics is also very important factor when designing new products. Yet, the aesthetic part of design is very subjective, without any computer support of practical value. Therefore, a development of an intelligent computer system for supporting ergonomic and aesthetic design that is proposed in the paper has a great potential.

THE STRATEGY - DESIGN ALIGNMENT: WHICH GUIDELINES TO ENSURE COHERENCE BETWEEN STRATEGIC THINKING AND DESIGN PROCESS

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The intention of this paper is to understand how strategic objectives of a company really interact with operational objectives of the company's design process. The question is: how to guide design in order to make the process as well as the results coherent with the strategy of the firm and eventually increase its global performance. This complex question will be tackled with the particular point of view of management sciences. Taking this point of view, we aimed at participating to the multidisciplinary opening of the research on design which will undoubtedly increase design performances. By presenting the studied case of a French industrial company we will give robust guidelines to ensure coherence between strategic thinking and design process. We'll show in which organisational, cultural and managerial characteristics can be developed.

MEASURING THE CUSTOMER'S PERCEPTION OF DESIGN CHARACTERISTICS AS INDICATORS FOR ADDED VALUE

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1139

When developing marketable products it is important to give them as well practical value as some kind of added value, i.e. social prestige value and individual edification value. Prestige value is evoked most by design characteristics of the product, whereas edification value is reached rather by functional aspects. Even though attributes evoking added value often cause additional environmental impacts there is only low willingness of the customer to accept substitute products. When analyzing the most wanted variants of a product concerning added values it is sufficient to present illustrated product variants or product samples instead of real products, in order to reduce the high effort. So these studies can be arranged more efficiently.

DESIGN METHOD FOR MODULAR CUSTOMISED PRODUCT FAMILIES TO CONSIDER DIFFERENT USE STRATEGIES

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1145

The awareness of life cycle costs has focused the acquisition process of customised products towards total costs during the whole lifetime. Product manufacturer shall take into account several phases during the product use. This variation shall be considered while designing a product family for customisation. In this paper the aspect for product design is the type of use and maintenance policy. The analysis of use phase is made collecting data from a global crane company. A multifactor model has been created for bringing use requirements to guide design. Utilisation of the model in conceptual design can provide better solutions and modular product architecture.

EFFECTS OF INDUSTRIAL DESIGN AND ENGINEERING DESIGN INTERPLAY: AN EMPIRICAL STUDY ON TOLERANCE MANAGEMENT IN THE AUTOMOTIVE ...

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This paper presents results from a study with focus on interdepartmental implications in the automotive industry. Studied scenario is the industrial design and engineering design departments and their interplay in tolerance management. Moreover, effects of a proposed method and tool to support the interdepartmental relation have been studied. Among other things, the study revealed inconsistency in the tolerance management approach, concerning activities and tools. It was revealed that the proposed method and tool could support some aspects of the interplay.
