

Introduction to Industrial Design

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The Short History of ID

- The birth of ID is often traced to Western Europe in the early 1900s.
 - Peter Behrens worked as an artistic adviser from 1907 to 1914 for the AEG in Berlin
 - Designed consumer goods, investment goods, and rules for artistic aspects for production
 - Corporate identity was used long before it was defined
- Bauhaus movement, 1919-1933
 - Functionalism
 - Scandinavian functionalism
 - Alvar Aalto
- Streamline design 1930
 - Raymond Loewy

The Short History of ID in Finland

- **Fifties: Societal fluctuations of post-war**
 - Kaj Frack's Kilta: Stackability, saving space and affordability
- **Sixties: first attempts for integration between ID, Engineering and marketing in Finland**
 - Tapio Wirkkala founded the A-Studio
 - First debate of design being more than just the mere product aesthetics or styling
- **Seventies: ergonomics were largely discussed**
 - Henry Dreyfuss, Victor Papanek
- **Eighties: the issue of design management were popular**
 - Peter Gorb
- **Nineties: brand building and strategic design**
- **New millenium: means of innovation**
 - Tom Kelley (Ideo), Jonathan Ive (Mac)

Conclusion for past decades

- The role of the industrial designer has changed and broadened consisting several fields
 - Aesthetics,
 - Ergonomics,
 - Usability,
 - Product communication,
 - Overall product experience design,
 - ect.

What Is Industrial Design (ID)?

- The Industrial Designers Society of America (IDSA) definition
 - ”The professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer.”
 - <http://www.idsa.org/webmodules/articles/anmviewer.asp?a=89&z=23>

What Is the Task of Industrial Designers?

- “Industrial designers are primarily responsible for the aspects of a product that relate to the user—the product’s aesthetic appeal (how it looks, sounds, feels, smells) and its functional interfaces (how it is used).”
(Ulrich, K. & Eppinger, S., pp. 189)

Dreyfuss 1967

- Five critical goals that ID:s can help a team to achieve when developing new products:
 - **Utility:** The product's human interfaces should be safe, easy to use, and intuitive. Each feature should be shaped so that it communicates its function to the user.
 - **Appearance:** Form, line proportion, and color are used to integrate the product into a pleasing whole.
 - **Ease of maintenance:** Products must also be designed to communicate how they are to be maintained and repaired.
 - **Low costs:** Form and features have a large impact on tooling and production costs, so these must be considered jointly by the team
 - **Communication:** Product designs should communicate the corporate design philosophy and mission through the visual qualities of the products.
- (Ulrich, K. & Eppinger, S., pp. 190)

ID Education in Finland

- ID is educated in two universities
 - Helsinki University of Art and Design
 - University of Lapland – Faculty of Art and Design
- In five polytechnics

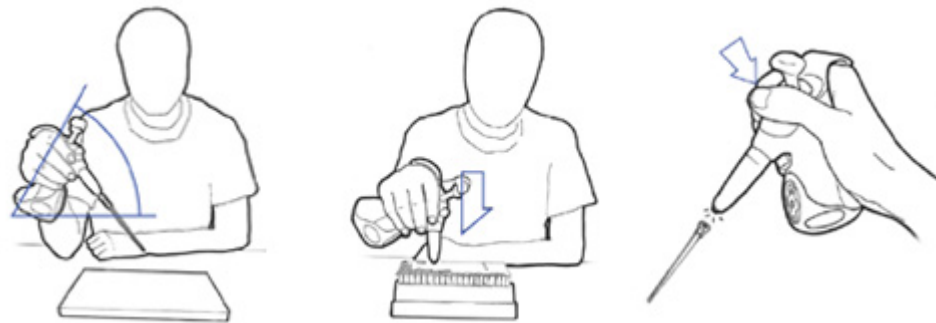
Terminology

- Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. (The International Ergonomics Association – IEA)
- Domains of specialization within the discipline of ergonomics:
 - Physical ergonomics
 - Cognitive ergonomics
 - Organizational ergonomics (IEA)
- Ergonomics - taking the physiological characteristics of people into account in designing a product (Muova)
- Measurements could be:
 - Ease of use
 - Safety
 - Comfort

Terminology

- Ulrich and Eppinger use term *ergonomics* to encompass all aspects of a product that relate to its human interfaces (*Ulrich, K. & Eppinger, S., pp. 191*)

Examples



Example, Frog Design: Extensive ergonomic research (biomechanical analysis) on medical pipette for Vistalab.

Terminology

- ISO 9241 defines usability as “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”
- According to ISO 9241, the dimensions of usability are:
 - Effectiveness: the accuracy and completeness with which users achieve specified goals
 - Efficiency: the resources expended in relation to the accuracy and completeness with which users achieve goals
 - Satisfaction: the comfort and acceptability of use

Corporate Image

- Three essential terms are used while dicussing about corporate image:
- Identity:
 - Identity = personality of company
- Profile
 - Sent 'picture' of company
- Image
 - How people see company and its products

Brand

- David Aaker defines a brand as:
 - “A distinguishing name and/or symbol (such as a logo, trademark, or package design) intended to identify the goods or services of either one seller or group of sellers, and to differentiate those goods or services of competitors. A brand thus signals to customer the source of the product, and protects both the customer and the producer from competitors who would attempt to provide products that appear to be identical.” (Aaker, D. A., Aaker, Managing Brand Equity: Capitalizing on the Value of a Brand Name, New York: The Free Press, 1991)
- Jean-Noël Kapferer defines a brand as:
 - “A brand is not a product. It is product’s essence, meaning, and its direction, and it defines its identity in time and space.” (Kapferer, J-N., Strategic Brand Management: New Approaches to Creating and Evaluating Brand Equity, London: Kogan Page, 1992)

Assessing the Need for ID

- Most products on the market can be improved in some way or another by good ID
- All products that are used, operated or seen by people depend critically on ID for commercial success
- The rules of thumb:
 - The visual message of the product should not contradict with technical research findings

Ergonomic Needs

- How important is ease of use?
- How important is ease of maintenance?
- How many user interactions are required for the product's functions?
- How novel are the user interaction needs?
- What are the safety issues?

Aesthetic Needs

- Is visual product differentiation required?
- How important are pride of ownership, image, and fashion?
- Will an aesthetic product motivate the team?

The ID Process

- Many large companies have internal design department
 - In Finland size normally less than 5 person, Nokia is exception
- Small companies tend to use contract ID services

The ID Process

- Specifically, the ID process can be thought of as consisting of the following phases:
 1. Investigation of customer needs
 2. Conceptualization
 3. Preliminary refinement
 4. Further refinement and final concept selection
 5. Control drawings
 6. Coordination with engineering, manufacturing, and vendors

The ID Process

- 1. Investigation of customer needs (research)
 - Methods: observation, interview, focus groups...
 - Research findings
- 2. Conceptualization
 - Concentration upon creating the product's form and user interfaces
 - Methods: 2D-sketches, 3D-sketches, Collases, mock-ups
 - Evaluation of concepts

Examples



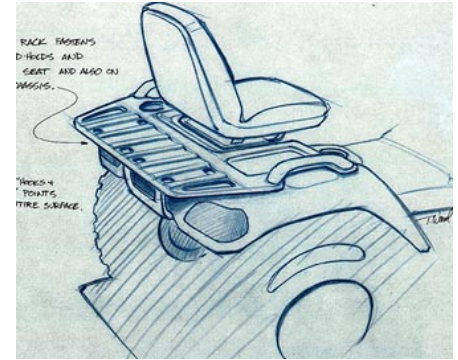
75er Generation / Teenphone / Modifikation / © designfairs GmbH / 10. Februar 2004

Example, Designafair GmbH: Design sketches for Siemens CL75 mobile phone for females.

The ID Process

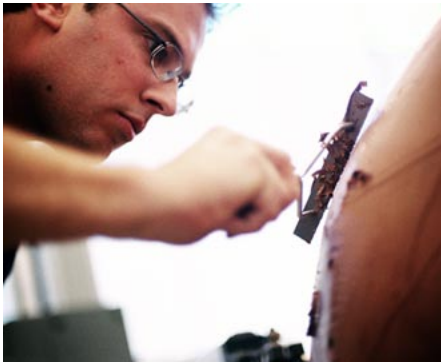
- 3. Preliminary refinement
 - Methods: soft models,
- 4. Further refinement and final concept selection
 - Refinement and implementation of design in CAD
 - Color and material design
 - Model making based on 3D-data
 - Hard models can be used to gain additional customer feedback in focus groups/interviews, to advertise/promote the product at trade shows (car-concepts)
 - Methods: hard models, 2D-/3D-renderings, color stories, moodboards

Examples: Physical Modelling



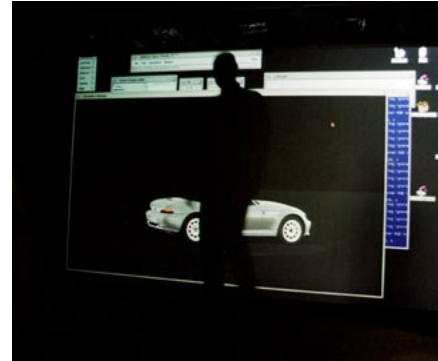
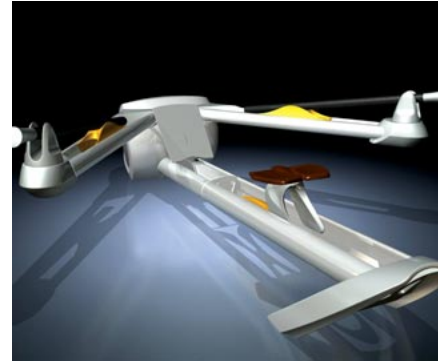
BMW Group, DesignworksUSA: Example of different modelling techniques

Examples: Physical Modelling



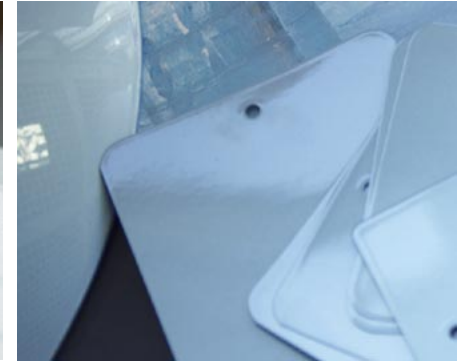
BMW Group, DesignworksUSA: Example of different modelling techniques

Examples: Virtual Modelling



BMW Group, DesignworksUSA: Example of different virtual modelling techniques

Examples: Color & Material Design



BMW Group, DesignworksUSA: Examples of color & material design work

The ID Process

- 5. Control Drawings
 - Control drawings document functionality, features, sizes, colors, surface finishes, and key dimensions.
- 6. Coordination with engineering, manufacturing, and vendors
 - Some ID consulting firms offer quite comprehensive product development services, including detailed engineering design and the selection and management of outside vendors of materials, tooling components, and assembly services.

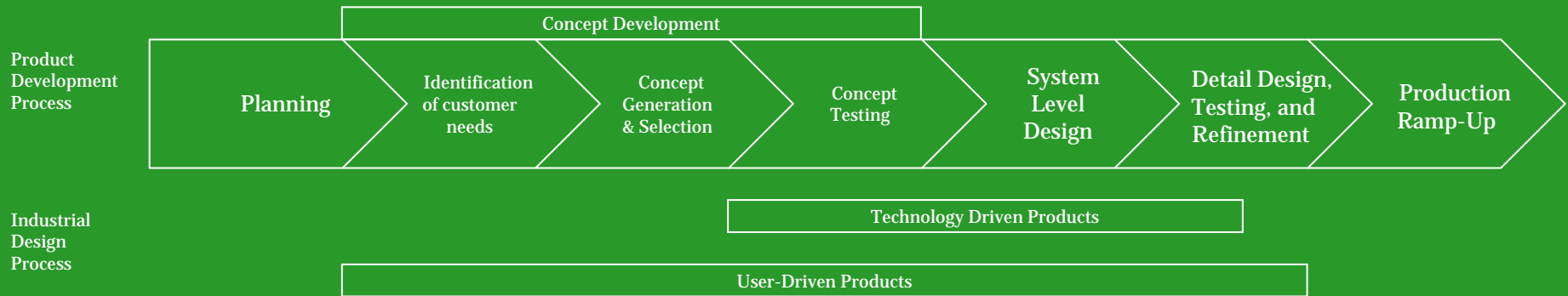
Management of ID Process

- Technology driven products:
 - Risk: If timing of the ID too late in product development process ID is quite much 'extinguishing a fire'
- User-driven products:
 - Typically high degree of user interaction
 - External appearance is often important to differentiate the product and to create pride of ownership

Management of ID Process

- In both case integration between engineering, ID, manufacturing, and marketing research is key factor to achieve successful products
- Integrated product development should be seamless
- The benefit of integration is that the overall product development time reduces and cost savings will be achieved
- The demands of customers and restrictions of manufacturing will come out earlier, which saves from expensive changes in late product development process

ID in NPD



Relative timing of the industrial design process for two types of products. (Ulrich Et. Al., 2003)

When Outsourcing ID?

- **Benefits:**
 - Brings new ideas, methods
 - Offers new competence
 - Allocated resource for specific product development task
- **Difficulties:**
 - Some product areas needs years of training to get used of the whole

Design Brief vs Product Specification

- Design brief describes what product must be
 - It outlines: objectives, scope and functions of required product
- Product specification defines the required performance of the required product outlined in the brief
 - Limits the range of acceptable solutions and sets boundaries to the solution space

Design Brief (Muotoilutehtävä)

- Short when the markets and users are unknown and company wants designer to do research
- Long when the project demands an incremental innovation, based around known technologies, markets and customers
- The designer needs to take in a large amount of tacit and explicit information quickly, and the brief helps to structure this exchange
- Design brief should include as much detail as is either known or felt necessary
- To external designer should also provide such background information from company as history, culture and markets

Example of Design Brief

- **The opportunity:**
 - The problem being addressed
 - The market - target audience
 - The market – competition
 - The customer
 - The place of use

Example of Design Brief

- **Proposed product:**
 - The product vision
 - Key functionality
 - Assumptions & constraints
 - Ergonomic issues
 - Aesthetic issues
 - Technical issues
 - Environmental issues

Example of Design Brief

- **Project:**
 - Objective
 - Project Goal:
 - Business Goals:
 - The value of business, target market share, production volumes, product life cycle, competitors, differentiation, product identity, current marketing material...
 - Budget
 - Cost estimate
 - Schedule
 - Project schedule, starting day, dead-line...
 - Risks
 - Specific requirements
 - CAD compatibility
 - Project management
 - Project manager, responsibilities: marketing, mechanical engineering, CAD, components, testing, manufacturing, subcontracting, assembly...
 - Success criteria

Example of Design Brief

- **The company:**
 - Background information
 - Business strategy

Example of Design Brief

- **ID requirements:**
 - Scope of involvement
 - Skills required
 - CAD-experience, model making...
 - Terms of business

Comments, questions...

Thank you for your interest.

- Some ID links:
 - <http://www.finnishdesign.fi/mvetusivu>
 - <http://www.ornamo.fi/tko>