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DESIGN RELEVANCE IN AN INDUSTRIAL DESIGN ENGINEERING WIKI

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ABSTRACT

WikID, an Industrial Design Engineering (IDE) wiki, is an online initiative targeted at designers to facilitate the finding of relevant information on the World Wide Web. Because the users of this website have the freedom to author and edit articles, it is necessary to reach consensus on which information is relevant to industrial design engineers. Therefore we have investigated 'design relevance' in literature and have conducted field research containing interviews with experts. As a secondary objective we wish to provide article-writing guidelines for users that help them to decide on design relevance and simultaneously lower the existing technical barrier towards writing and editing articles. Outcomes from the literature study are descriptions of the scope of IDE in terms of products, used disciplines and design aspects. These results were used to create a mission for WikID. We conclude that design relevance is not a property of information, but the situation where user expectations are met. The data that was gathered from the interviews showed commonalities between articles in the same category but not between every article. Therefore each category benefits from its own article-writing guidelines. These were applied on the website as 'forms' in order to validate the results.

KEYWORDS

Knowledge management in conceptualization, design knowledge, design relevance, Wiki users, scope of design engineering, semantic mediaWiki forms

1. INTRODUCTION

In the field of Industrial Design Engineering (IDE) a multitude of sources is looked at during design activity before the necessary information is found [22]. In recent years the World Wide Web seems to become an alternative to more traditional sources. A reason not to use the WWW is that however most information can eventually be found, searching for it can be very time consuming.

An initiative to facilitate this process was the creation of WikID, an Industrial Design Engineering wiki that aims to offer information in a compact manner, especially targeted at industrial designers. Whilst Wikipedia already offers a lot of this information, there is a distinct difference between WikID and Wikipedia; Wikipedia aims to be an encyclopaedia, and therefore tries to be as complete as possible. WikID aims to be a design tool. It offers information in a compact manner tailored to its user group, being the Industrial Designers.

WikID also differs significantly from Knowledge Based Systems [9] for designers and engineers, such as WebCADET [14] and KIEF [29], because they use automated reasoning to provide the user with relevant information. In order to enable automated reasoning, the knowledge base that is used by the system needs to be machine-readable, while the knowledge base used by WikID only needs to be human-readable.

1.1. Problem area

In WikID, as in any community project, the activity of the community plays a great role in the success of the entire project. The online tool is already in a working state and contains an increasing number of articles to attract potential users. Joris van 't Ende has already conducted a study [19] to determine whether there is a potential for an active user base and if so, how the process of creating an ac-

tive community can be accelerated. We further investigate his finding that collaborative websites with a clear *mission* are more successful than those without. Recognizing that the domain of IDE can be described in various terms, it is necessary to decide on a framework to discuss it. For WikID, distinguishing IDE from other design disciplines is expected to be an ongoing debate and a mission will serve to set and discuss common goals, as well as serve as a reference for a consensus on the *design relevance* of information.

One of the essential elements for a starting wiki that was mentioned in the report [16] is *seedposting*, filling the wiki with an amount of articles to attract potential users. However, seedposting is very time consuming and that is why we have implemented an article copying tool. With this tool users can copy an article from another wiki, most probably Wikipedia, to WikID under the GNU Free Documentation License [7]. This speeds up seedposting, but a direct copy from Wikipedia will not be in line with WikID's mission. The article copying tool therefore allows the user to select sections of the article. We will investigate the possibility of article-writing guidelines that will help users in selecting sections of articles to import as well as help with the creation of new articles.

1.2. Purpose

To provide a clear mission we need to clarify two concepts: the *scope* and *depth* of information in WikID. The scope, asking: 'on what topics will we provide information?' is now defined as 'topics in the field of Industrial Design Engineering'. The depth, asking: 'what information is applicable during the design process or, in other words, 'when is information design relevant?' has not yet been defined. We will attempt to define these concepts in an operational manner, to enable staff and community to determine if a written article is in line with the mission.

To provide article-writing guidelines that will facilitate seedposting we need to be clear about how a user can write articles that are in line with the mission (namely, whether a subject falls within the field of Industrial Design Engineering and how to decide what information about the subject is design relevant). Authors might intuitively provide a satisfactory answer to the first question but, in order to prevent disagreements within the WikID community, it deserves further attention. Someone with experience in dealing with information in design practice will probably be able to answer the second question, but an inexperienced student or someone specialized in an IDE related field, but without experience in design practice, will likely be unable to answer it adequately.

WikID's article-writing guidelines should assist users in answering these questions. As a goal for this study we have set out to provide operational definitions for 'scope' and 'depth' to be used for WikID's mission (goal A). Our second goal is to create article-writing guidelines to help users decide on design relevance (goal B). In the following section we elaborate on how we will achieve these goals.

1.3. Methods

To provide operational definitions for the concepts 'scope' and 'depth', we have formulated the following research questions:

A.1 On what topics will WikID provide information?

A.2 When is the information design relevant?

In answering these questions, we will first perform a desk study to determine the degree to which existing theories might already answer them. After the desk study we will decide whether additional research is necessary to complement existing theory, or whether we have found sufficient answers to these questions. Finally, we will attempt to summarize our results in a simple model (the mission page), as an aid for WikID users.

In order to compile article-writing guidelines to help users decide on design relevance, we have formulated the following question:

B.1 Which article-writing guidelines assist users in deciding on the design relevance of information?

The desk study performed to answer A.2 will also provide the theoretical basis to answer this question. By means of an explorative study, we will gather data from subjects experienced in deciding on design relevance in order to expand our theory with a set of guidelines. The detailed description of the followed methods is given in section 3. After compiling these guidelines, we will test them with WikID's users in order to validate our theory.

2. DESK STUDY

This section deals with the process and results of the desk study performed to clarify WikID's *scope* and *depth*. The goal is to construct an operational definition – designed for, but not limited to WikID – to enable moderators and users to determine whether ar-

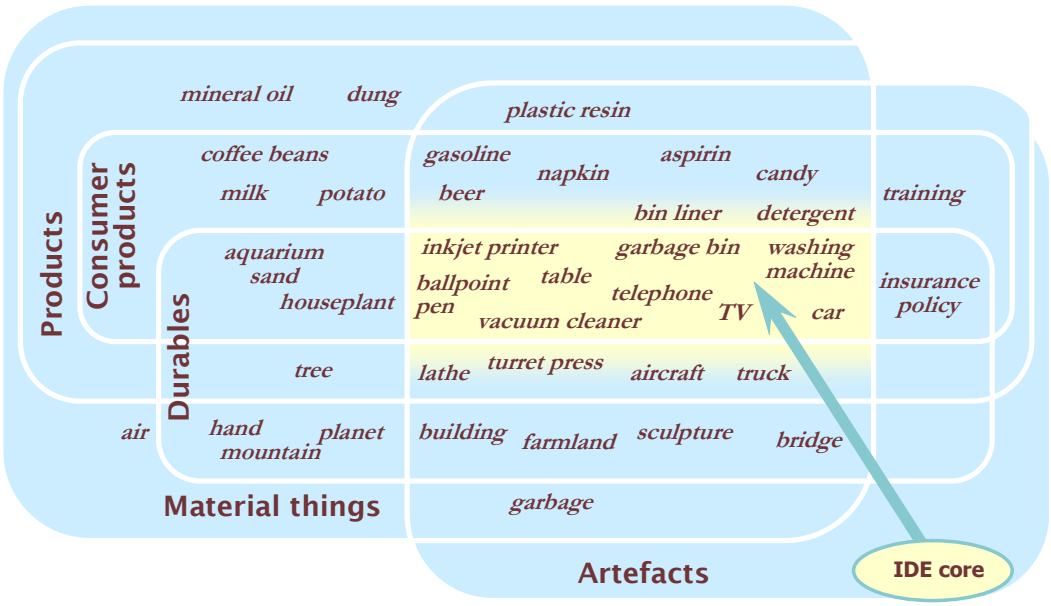

Figure 1 Scope of the prpducts (Van der Vegte).

ticles are in line with WikID's overall purpose. We expect to provide a satisfactory answer to our first research question and to provide a partial answer to our second research question in the desk study.

2.1. Scope: on what topics will WikID provide information?

Since WikID is an initiative of the Faculty of Industrial Design Engineering at the Delft University of Technology, the scope is connected with the current views of this faculty. The desk research therefore starts by looking at their mission statement.

"The field of industrial design engineering consists of all activities concerning methodical and creative innovation and the development of (parts of) consumer goods. The objectives of the Faculty of IDE are described in the mission statement (2004):

'Creating successful products people love to use'

[. . .] The Faculty of Industrial Design Engineering's concern is to study, innovate and improve the development of durable products and their related services for people, on the basis of the balanced interests of users, industry, society and environment." [17]

This tells us that these design engineers develop consumer goods, consisting of durable products and their related services. In this activity they balance the interests of users, industry, society and environment. To achieve their goals, they use knowledge from the disciplines of design, technology of materials and production, engineering mechanics, mathematics, formgiving, technical drawing, presentation technique, ergonomics, product development, business & organization, marketing and research [17].

Scope of products

IDE bachelor students are taught that products which are tangible, man-made, series or mass-produced, made predominantly for consumers and durable are 'typical IDE products' [20], illustrated by a Venn-diagram. We refer to products that conform to all criteria (Table 1) as the 'IDE core' and we refer to the border regions of the IDE core, simply as border regions, see Figure 1. A more complex representation of the product scope might also be more detailed, but keeping our goals in mind we aim for simplicity.

Table 1 IDE core criteria.

Core criteria
1. the product is tangible
2. it is human-made, artificial
3. it is series or mass produced
4. primarily for personal or family use
5. durable, usage over time

Products that lie outside the IDE core, which are considered to be in the border regions sometimes are so because it is arguable that they are intended for use in daily life or are frequently used, involving significant interaction between user and product [20]. This

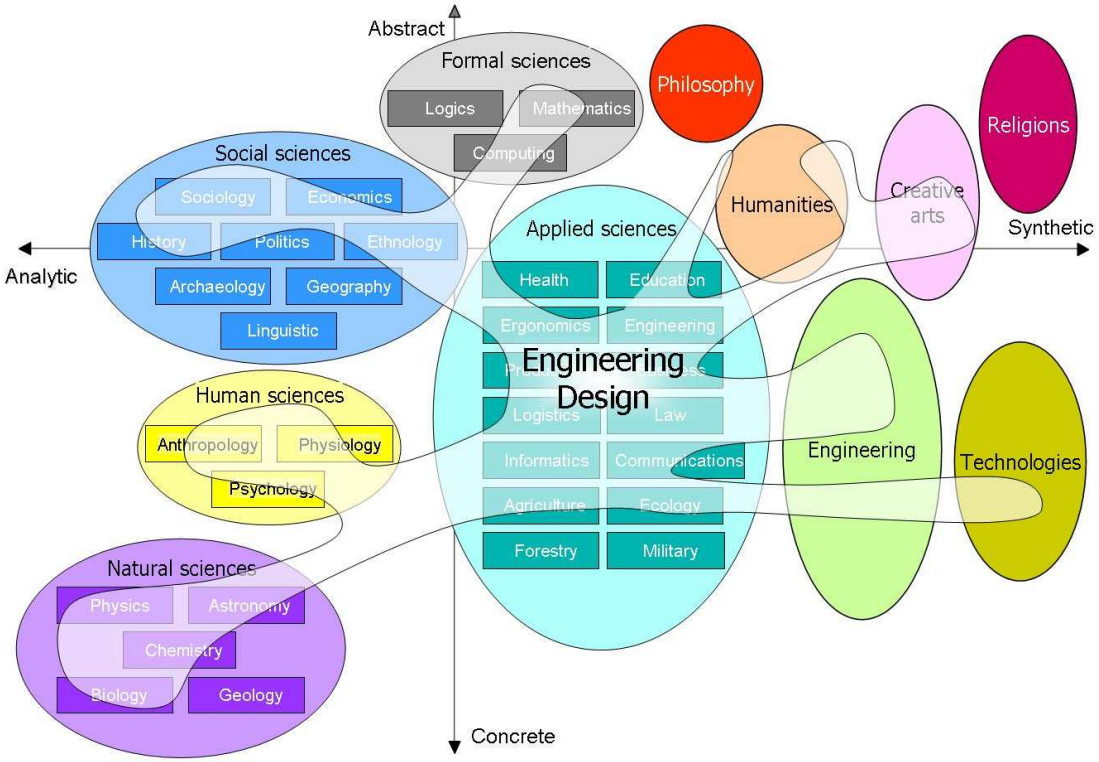

Figure 2 Matrix of disciplines and the role of engineering design (Horváth).

is the case with the turret press in Figure 1, which is not a consumer product and therefore not included in the core. However, consumer products that are not durable are also often considered to be in the border region if they are integral to the functioning of a product that is included in the core. A similar bridge might be found for certain non-material consumer products.

Scope of disciplines

Recognizing that the scope of products still includes some of the work of related design practices, such as fashion design and graphic design, we choose to look at a second scope. The problem in classifying this correctly is primarily due to the fact that other design practices also work towards series and mass produced durable consumer products. The most discernable difference between these practices and IDE is that the knowledge used to design originates from very different disciplines.

In a third year course in research methodology students learn about the differences between science and design. The slides for the first lecture state that science aims to find truth where design aims to find efficiency [2]. To explain the relationship between science and design, a chart of a matrix is given, where various disciplines are organized on two polar axes, from analytic to synthetic and from abstract to concrete. We reproduce this chart as Figure 2 Matrix of disciplines.

Knowledge in IDE is constructed using knowledge from various sciences as well as more synthetic disciplines. To realize efficient product design, a transition must be made from mono-disciplinary to multi-disciplinary knowledge. Therefore the field of industrial design engineering has an integrative approach to knowledge management. To illustrate this relation, it is sketched on top of the matrix of disciplines, reproduced in Figure 2 [10].

Current structure in WikID: design aspects

In 2005 a method to structure information was studied for C-DET, a precursor to WikID [23]. Vroom et al. produced a list of design aspects that is currently in use in modified form. The top level of this categorization is noteworthy, because it is another way of describing the domain of industrial design engineering. It tells us which aspects are commonly ad-

dressed during the product design process. The entire design- aspects list can be browsed through on WikID [25]. Design Aspects is one of the three main categories in WikID. The other two are Design Theory and Product Domains.

Table 2 Top-level design aspects.

1.	materials
2.	production
3.	ergonomics
4.	aesthetics
5.	legislation
6.	packing
7.	working principles
8.	energy techniques
9.	logistics
10.	quality
11.	costs
12.	environment
13.	product safety
14.	components
15.	remaining aspects

2.2. Depth: when is information design relevant?

To start a literature search for design relevance, we expand our search terms to be context specific. When is "domain" "knowledge" of "industrial design engineering" "relevant information"?

While we are reaffirmed in the idea that it is important to support designers with relevant domain knowledge [21], none of the sources found specifically define design relevance. An overview of the activities of the Design Methodology Group does, however, provide us with a list of authors who might have written about this subject [6]. Our search is continued in the direction of publications by these authors, following references from and to interesting papers.

Studies by Henri Christiaans

First we discuss an overview of research conducted by Christiaans et al. at the DUT between 1993 and 2000 [3]. In [5] the results of an empirical research are presented which shows that subjects using their information retrieval system used it mostly in the analysis phase and in defining the design specifications. Most subjects started with user-related topics but in later phases mainly searched for legal norms and standards.

A later study by Snoek, Christiaans & Hekkert [15], studying the influence of contextual information on the design outcome, demonstrates that outcome is positively affected by the relative amount of contextual information that is processed. However, this study showed that the use of contextual information did have a negative impact on feasibility and constructability of the designed objects. As an overall conclusion of the overview, Christiaans & Restrepo [4] state that consideration of valuable contextual information is often absent in design activity, but that it is not clear what contextual information actually is and how it can be of most use to designers.

According to [4], information access is primarily important during problem structuring and secondarily during problem solving. During problem solving, the designer mainly uses technical data, while during problem structuring the designer needs more contextual data, causing more complexity in information access. Because of the vagueness in written sources dealing with contextual data, designers will often make extensive use of human sources. On design relevance Christiaans & Restrepo state the following: *"access to information will be improved if the information provided is deemed by the user as relevant, for relevance is not a property of the information itself, but an attribute endowed by the user in a certain situation*". The key to creating design relevant articles lies in meeting the designers' expectations of the content of the document. They conclude, that *"we need a better understanding of the structure of the problem and solution spaces, as well as of the process of structuring problems, as it will allow further insight into the process followed by designers"*.

Studies by Céline Mougenot

The first study by Mougenot et al. that we encounter, deals with differences in the use of pictures between printed media and internet sources in the early stages of the design process [13]. It tells us that *"today's computational tools don't allow looking for inspirational materials at a chosen level of abstraction"*, implying that designers would like to do so. Assuming this is the case, it would be beneficial to stimulate diversity of inspirational materials through WikID's article writing guidelines. More importantly they unveil that in searching for pictures on the web their subjects share a common interest. When referring to pictures as belonging to a creative sector, 69,1% of the selected images belonged to *product design*, *architecture* and *interior design* in similar proportions for each designer. This could imply that in the

broader area of formgiving, it is possible to distinguish certain areas of preference in dealing with inspirational materials.

The second paper provides us with a clear approach towards dealing with contextual information, presented as problematic by Christiaans et al. They present the creation of software named TRENDS, which allows designers to search for multimedia in a flexible way [1]. TRENDS is based on Conjoined Trends Analysis (CTA) which is used in turn to facilitate designers to enrich the solution space by looking at various domains of influence while identifying formal trend attributes, such as shape, color and texture. While the solution they present is very interesting, it is focused solely on images and is therefore of limited relevance to WikID. The methods needed to use CTA digitally also go beyond the limitations of MediaWiki, the software WikID is running on.

2.3. Findings

In the scope of products (Figure 1) we can discern an IDE core that is composed of products that conform to the core criteria (Table 1). Products that do not conform to all of these criteria might also be interesting to industrial designers. It is expected that authors who wish to write about these products can argue why a certain product is considered to be interesting.

The scope of disciplines (Figure 2) shows that IDE mostly uses knowledge from the concrete disciplines, together with a slight preference for synthetic disciplines as opposed to analytic. The design aspects [25] provide a tailored structure, crafted to the purpose of WikID. Yet they are unavoidably always referring to the past. As the future of IDE plays out, the open MediaWiki software provides users and staff with the possibility to let WikID grow together with the world it provides knowledge on.

Now, asking again on which topics WikID will provide information, we can answer that topics will contain knowledge from certain disciplines that can be used in the design of certain products (specified by 2.1). The current structure in WikID is appropriate and expandable, built to last. On a practical note, staff should be alert for top-level category additions and changes because they have important implications for WikID's knowledge structure. Asking when information on an appropriate subject is design relevant cannot be answered by studying literature. Thinking as design relevance as a property of the information leaves the user, the person dealing with information in WikID, out of account. It is perhaps not possible to reason our way to design relevant content for a large user group in one step, but using a step-by-step process, we can certainly work towards it.

To arrive at a tailored solution for WikID, we have to keep taking into account that from the use of a wiki system follows the need for thinking in terms of mass collaboration. No desk study will accurately predict what users want to read about an appropriate subject, unless it gathers direct data from WikID users. Users will consider information to be design relevant if it helps with problem structuring and problem solving in their current design situation. Following the conclusions from Christiaans & Restrepo [4], we predict that they will primarily need contextual data and secondarily need technical data to structure and solve problems.

Providing design relevant information on appropriate topics lies in meeting needs and expectations from other WikID users. The designated places for this multitude of meetings already exist in MediaWiki; they are the talk pages that are available for every article in WikID. By using semantic properties in WikID in a clever way, it might even be feasible to present an overview of requests in for example a certain category using real-time data from WikID itself. A successful application of this concept might work by showing where there is a shortage and where there is an excess of certain metadata descriptors, tags or keywords.

3. FIELD STUDY

Following the findings from our desk study (2.3.) we can say that in order to fill WikID with design relevant information, or in other words meeting current user needs and expectations, we need to take into account the mass collaborative nature of any wiki system and allow users to communicate their needs to the whole community. In a field study we will gather data from WikID users and potential users.

3.1. Subjects

Our subjects will be chosen for their experience in the field of IDE. Subjects are active as design students, university staff or work in design practice. Most subjects are, or have been, in some way connected to DUT. To participate in the study subjects need at least a basic knowledge of the concept of a wiki, therefore persons who are unfamiliar with Wikipedia are excluded.

3.2. Equipment

Subjects perform a list of tasks on WikID and Wikipedia using a provided laptop or another available pc in spaces where auditory distraction is judged by the researcher to be below a workable threshold. The researcher takes notes, records audio and provides technical assistance. Both the web browser history in the laptop and activity on WikID are recorded.

3.3. Procedure

Introduction

While the researcher sets up the laptop, the subject is presented with the text from section 1. Introduction. At this point the researcher may answer any question the subject has about WikID. The instructions that the subjects are presented with are available online [4] and are discussed in this section.

User account

If the subject already has a user account on WikID, he or she logs in. If not, a user account and personal page are created to record basic data, such as their name and number of years of experience with IDE.

Article selection

The subject is presented with a list of wanted pages, which contains over a thousand entries of articles that are wanted in WikID but do not yet exist. When the subject has intuitively selected an article from the list, Wikipedia (or another source) is searched for an article that can serve as the basis for the new article in WikID. This step can be repeated until the subject is satisfied with the selection.

Import wizard

The import wizard in WikID is used to copy the selected Wikipedia (or other) article to its new destination in WikID. Then, still in the wizard, the subject selects sections from the Wikipedia (or other) article that they judge to contain design relevant information. The researcher takes care to refrain from influencing the subject's decision making, only asking him or her to verbalize considerations and perhaps to pause for a moment to clarify a taken action.

Editing

Now that the sections containing design relevant information have been copied to their destination article, the article can still be edited manually. Because we are interested in the subject's considerations and not their skill in editing MediaWiki source code, the researcher may perform the edits, but only acting on clear commands that are issued by the subject. For the sake of duration no information is added, only removed. On inquiry, the subject will be informed that additions can be made in the next step. This step ends when the subject is satisfied with the final article result.

Talk page

If the subject wants to add information to the article, they have an opportunity to do so. However, they are told that the talk page, linked by the 'discussion' button in MediaWiki, also provides the chance to leave suggestions for improvement. They are encouraged to note at least one mention of a section that could be improved and a more general mention of information that would be useful but is absent in the current article.

Interview

The researcher informs the subject that we are looking for rules of thumb to assist users in deciding on design relevance. The subject is asked to look into his or her memory for decisions made concerning design relevance, perhaps in the performed tasks but also in earlier experiences, and is invited to talk about the possibility of using personal rules of thumb. If they succeed in stating any personal rules of thumb, they are asked if these rules of thumb might be modified to be of value to a broader public.

4. RESULTS

A total of ten subjects with 3 – 30 years of experience with IDE completed the procedure in the period from April to June 2009.

4.1. Gathered data

Due to the compact nature of this publication and the volume of our data, the detailed results of the interviews are available online [27]. The topics of the articles that have been added in this study are: mp3 player, walker, welding, plasma cutting, bicycle, telematics education, headphones, composite materials, compact disc and manufacturing. These were chosen by the subjects.

4.2. Interpreting data

The gathered data show that most similarity occurs between topics in the same category. For instance, the articles named mp3 player, walker, bicycle, headphones and compact disc are all articles in the main

category Product (Domains). And between the articles within such category, we found most similarity. Therefore the decisions, ideas and arguments of our subjects were clustered into the categories of products, production techniques and materials. The categories production techniques and materials are both categories within the main category of Design Aspects. The results from the telematics education and manufacturing articles were considered not to be concrete enough for this approach. The order of the results is derived from the order of the imported articles. Interesting comments that are not directly related to our research questions are discussed further in the discussion section 6.

The main category: Products (domains)

The results for this main category Product (domains) are based on the similarities in the articles about mp3 player, walker, bicycle, headphones, and compact disc.

Considered relevant

The following information parts in articles about product (domains) are considered to be design relevant:

- History (recent predecessors, development)
- Operation (technology, structure)
- Subdivision (different variations on the main product)
- Standards (per region)
- Usage (risks, personal, professional, environment)
- Visual description (components)
- Competitive products (benefits and limitations)
- How the product functions (physics, construction)
- Regional name (British equivalent)
- Recent patent

Considered irrelevant

The following information parts in articles about product (domains) are considered not to be design relevant:

- Controversy (media debate)
- History (first commercial mp3 player)
- Expired patent
- Popular culture (rock group)
- Social and historical aspects

Requested by subject

The following information parts would be useful according to the subjects, but are missing in the current article:

- Quantitative information on usage
- Specific information on operation per subtype
- Taxonomy
- Link to trustworthy website for trends and social aspects

Category Production techniques

The results for this category Production Techniques (within the main category Design Aspects) are based upon the similarities in the articles about welding and plasma cutting.

Considered relevant

The following information parts in articles about production techniques are considered to be design relevant:

- State-of-the-art
- Subdivision
- Possibilities and limitations
- Safety issues
- Costs of the technique
- Physics formula

Considered irrelevant

The following information parts in articles about production techniques are considered to be design relevant:

- History
- Details of the devices used with the technique
- Costs of the devices

Materials (composite materials)

In the current study only one article about materials has been added (about composite materials). However in a former study [18] the category materials (which is one of the categories in the main category Design Aspects) was the main subject. Therefore we will use the information found in the current study to check the results of the specific form for materials that is already present within WikID.

Considered relevant

The following information parts about composite materials are considered to be design relevant:

- Introduction (from history)
- Possibilities for molding and tooling
- Mechanical properties
- Examples of subtypes
- Application in products

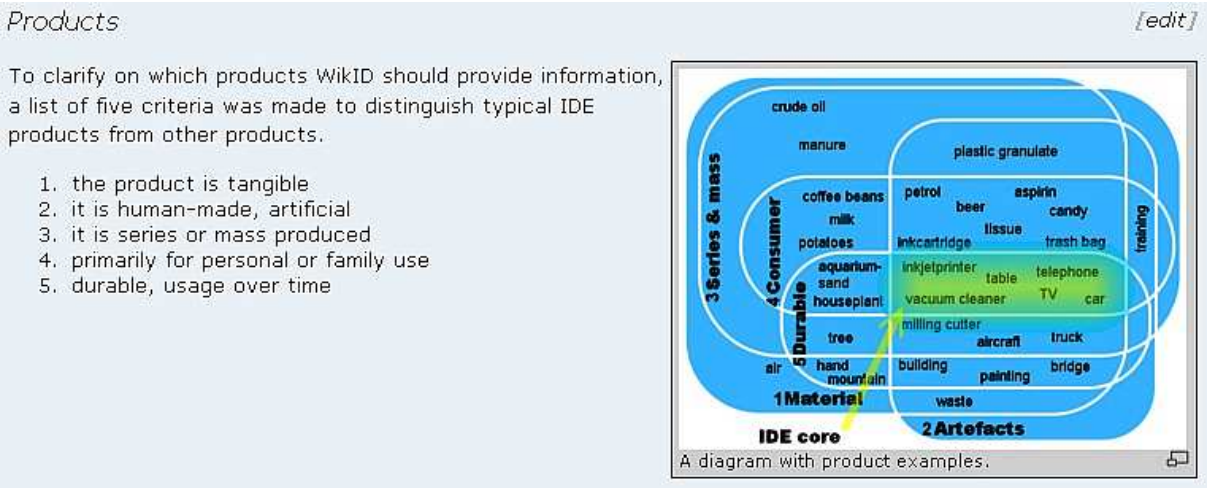

Figure 3 The scope of products in WikID's mission.

Considered irrelevant

The following information part about composite materials is considered not to be design relevant:

- Reference of historical literature

Requested by subject

- Examples of products using the material
- More internal and external links

4.3. Findings

The subjects who chose to import an article with a product as topic broadly consider the same information to be relevant. Only one subject contradicts other users in stating that *"WikID doesn't seem to be the place for background information"* [13]. The subjects who chose a production technique as a topic also complement rather than contradict in their idea of design relevance. However, from the difference in relevancy between products and production techniques we conclude that there is no single set of rules-of-thumb that will assist users in deciding on design relevance throughout the whole of WikID. There are multiple sets possible: one for products and one for each of the design aspects. Following the field results [27], we expect that no such set is needed for design theory, because each theory that is applicable by designers is in principle design relevant.

It is possible to attach a template or form to a category in WikID. This on the one hand assists users with deciding on article content and structure, but on the other hand also benefits the uniformity of information in WikID. This uniformity creates possibilities for semantic queries, the automatic generation of overview pages and the ability to re-mix information in a creative manner while always keeping content up-to-date. Section 8 deals with the creation of templates and forms for products and production techniques. Since our results on materials (4.2.) nor add to nor contradict with our current templates and form for the materials category [18], no revision of this template is necessary.

5. VALIDATING RESULTS WITHIN WIKID

Reviewing our goals (1.3.), we set out to provide an operational definition for the scope and depth of WikID and to provide guidelines to assist users in deciding on the relevancy of information. To validate the results of this research, a mission article and several forms that invite users to contribute information which is considered to be design relevant by their peers were created on the website. The discussion pages for the mission and the forms will serve to evaluate and improve on their first versions.

5.1. Mission

The mission page [28] serves mainly to enable the community to set and discuss common goals. It contains the definition of the scope, as in paragraph 5.1. Figure 3 shows a screen caption of this part of the mission. Since our definition of the depth (2.3.) is still dependent on both the user and the topic of any given article, it is not yet fully operational. Therefore the mission refers to the separate forms for products, materials and production techniques based on section 4.2. as partial definitions for the depth.

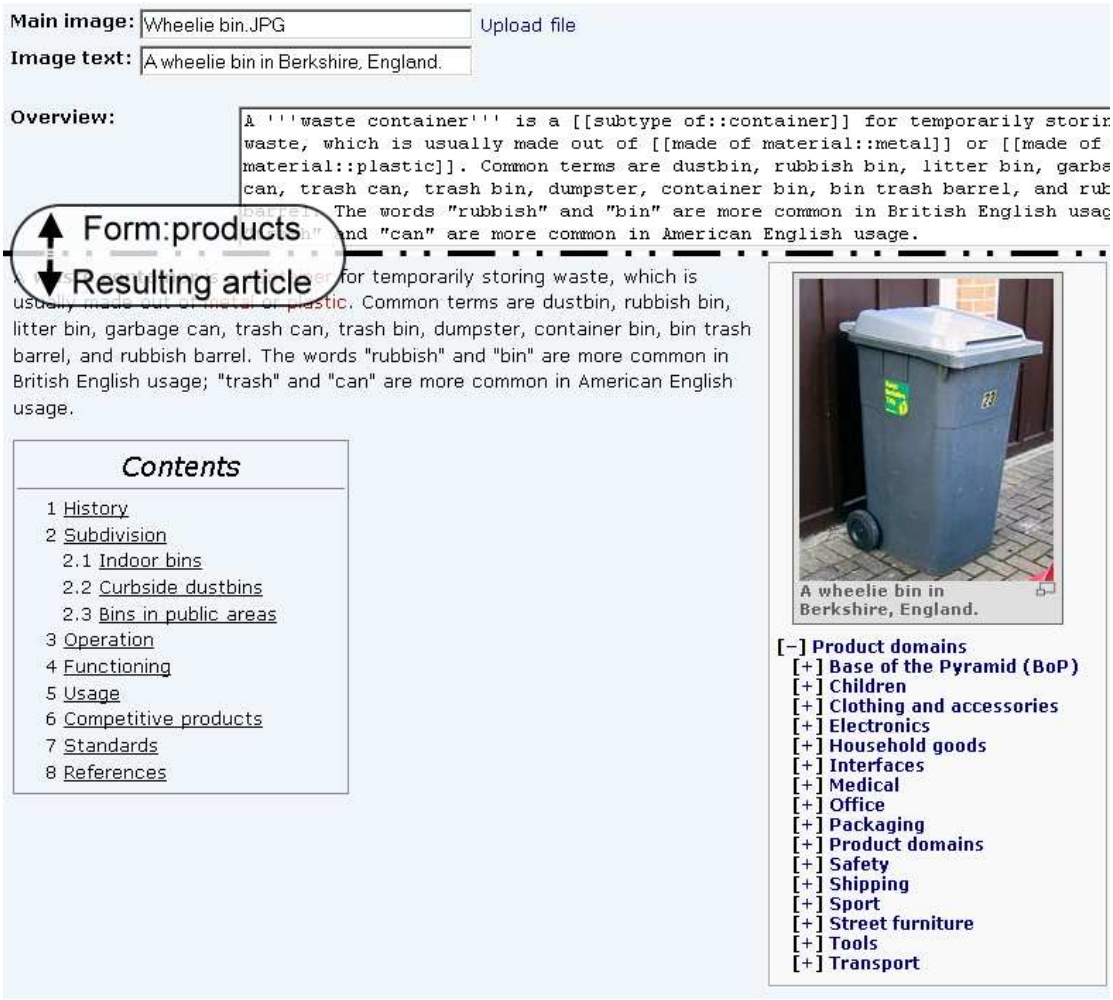

Figure 4 Part of ‘Form:Products’ and the resulting article ‘Waste container’ .

5.2. Forms and templates

The MediaWiki extensions Semantic MediaWiki and Semantic Forms were used to create forms that ask the user for the information that the subjects from our field study considered to be design relevant. This information is passed on to several templates to render the resulting article. Since several of the subjects have suggested that WikID should focus more on the use of images, an option to include an image through the form has been added to all forms. To illustrate how a form and a resulting article appear to users, Figure 4 is added as an example.

Figure 5 shows the entire products form. The top input field asks the user to upload a main image and to add a description for it. The following ten text fields ask the user for information that was considered relevant by the subjects from the field study. Some of the fields contain even more specific instructions for authors. For instance, in the history field they are asked: “please focus on recent history and development”. At the bottom a category is selected in which the resulting article is placed and the possibility is given to mark the article as infringing copyright, being incomplete or containing false information. If the ‘watch this page’ checkbox is checked, the user will be informed of subsequent changes to the article.

The production techniques form (Figure 6) looks quite similar, but asks users to contribute different information. It also has an extra ‘used on’ field at the top, which is used to generate semantic data of which materials and products can be used with this particular technique. This enables for instance using a semantic query to generate a list of all production techniques that can be used with wood.

The existing form for materials is included as an appendix. All templates that are used by the forms can be found online in Category:Building blocks [24].

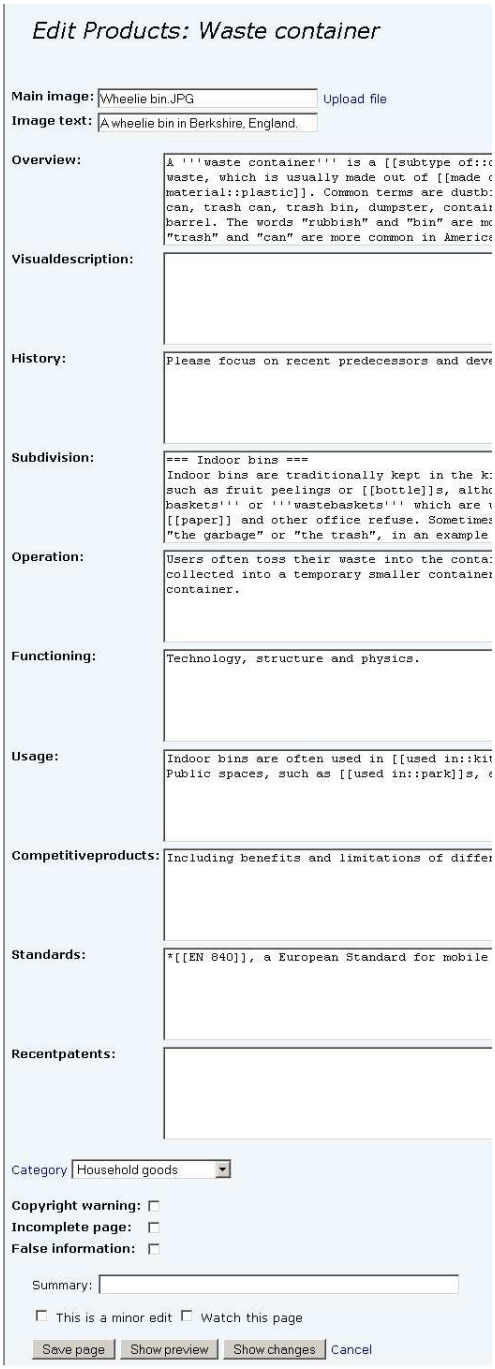

Figure 5 Form:Products.

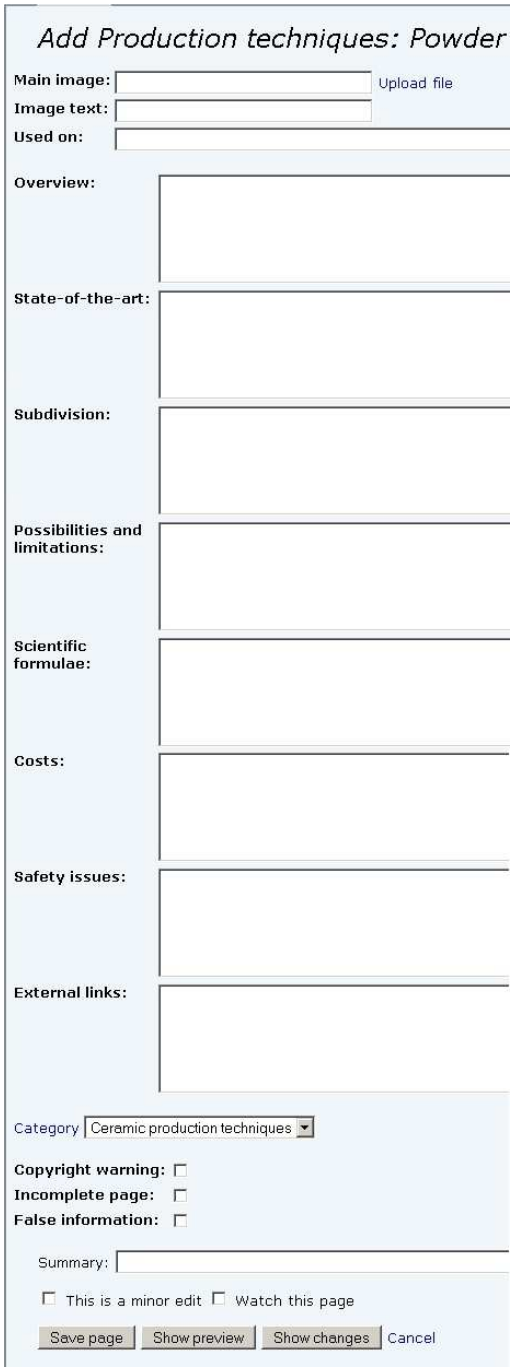

Figure 6 Form:Production techniques.

6. DISCUSSION

In the course of this research several interesting issues that were not directly related to our research questions have presented themselves. They are dealt with in this section, because they either evaluate an existing aspect of WikID or present a topic for future study.

6.1. Navigation

During the field study the subjects often displayed sub-optimal navigational skills and required assistance from the researcher. They had most trouble with navigating from an article to parts of the category structure and from an article to other articles in the same category. In the implementation of the aforementioned forms (5.2.) the option arose to add new navigation templates that will automatically be

Figure 7 The result of 'Template:Related articles' on the 'Soldering' article.

added when the form is used to create a new article. The CategoryTree extension was used to place a category tree under the main image, as seen in Figure 4. At the bottom of the article a template is inserted to display neighboring articles and their main image, as seen in Figure 7.

6.2. Import wizard

The articles that are created when a user imports an article from Wikipedia with the Import wizard include links to articles and images that do not exist on WikID. Often the links point to articles that should not be in WikID at all, yet they are added to the 'wanted pages' list. This is confusing when users check the wanted pages to see where their contribution is needed. Therefore an extension [8] is currently being written by Alex Olieman and Roel Obdam to edit the links on these pages, offering functionality to unlink the words and upload missing images.

6.3. Transclusion

As one subject has indicated [27], importing articles from an external source is only a good option if it is expected that the article will soon be improved on by the community. It is better to transclude the article from the source until original user content is written to replace it. Transclusion includes (part of) a document into another document by reference. In this way information from external sources can be embedded into internal articles, ensuring that the content remains as up-to-date as its original source. This is especially valuable in the starting phases of an online community because only a small number of articles can be improved by user contribution, leaving most imported articles as a duplicate of their external source until the community grows. To enable this functionality in WikID the wiki configuration needs to be changed [12] and an extension is needed to provide extra functionality [11].

7. OVERALL CONCLUSIONS

The detailed findings of our desk study are found in paragraph 2.5. and those of our field study are found in sections 4.3. and 5. For the sake of overview we repeat our research questions in this section, each being followed by a compact conclusion.

A.1 On what topics will WikID provide information?

Industrial designers use information from existing disciplines, showing a preference for disciplines that are both concrete and synthetic, such as the applied sciences and engineering. WikID should provide information on these topics as long as care is taken to make them accessible to industrial designers as opposed to for instance physicists.

Within IDE, knowledge from existing disciplines is also used to construct new, IDE specific knowledge. This knowledge is by default relevant to designers and WikID should always provide information on it.

WikID can also provide information on products that either serves as inspirational material for design activity or that is the result of design activity. To discern typical IDE-products from other products, a list of criteria was made (Table 1).

A.2 When is the information design relevant?

'Design relevancy' cannot be seen as a property of information, because only the user of the information can deem it to be relevant. On a per-case basis, the

information is relevant when user expectations are fulfilled.

Our field study shows that, although different designers have different expectations or preferences when dealing with information, if topics reach a certain

level of similarity the expectations between designers are also more similar.

When applying this into guidelines to help users decide which information is design relevant, it is important to acknowledge the differences between most topics and therefore create guidelines for a specific group of topics (being a category in WikID) in which expectations are similar.

B.1 Which article-writing guidelines assist users in deciding on the design relevance of information?

Several WikID users have already commented that lack of time is the greatest barrier towards contributing. Instead of listing guidelines (prescribing), we have chosen to use forms, inviting users to contribute certain pieces of information.

The guidelines that are based upon our field study have been put into application on WikID. Users are asked to evaluate them and improve on their first versions.

Based on the results of this study, there is now a framework for discourse on design relevance in WikID. This enables authors to write about topics that identifiably belong to the domain of Industrial Design Engineering. The creation of forms will cause there to be more similarity in the structure of articles within a category, so the information in WikID will better meet the expectations of the users and will be more accessible to the user group.

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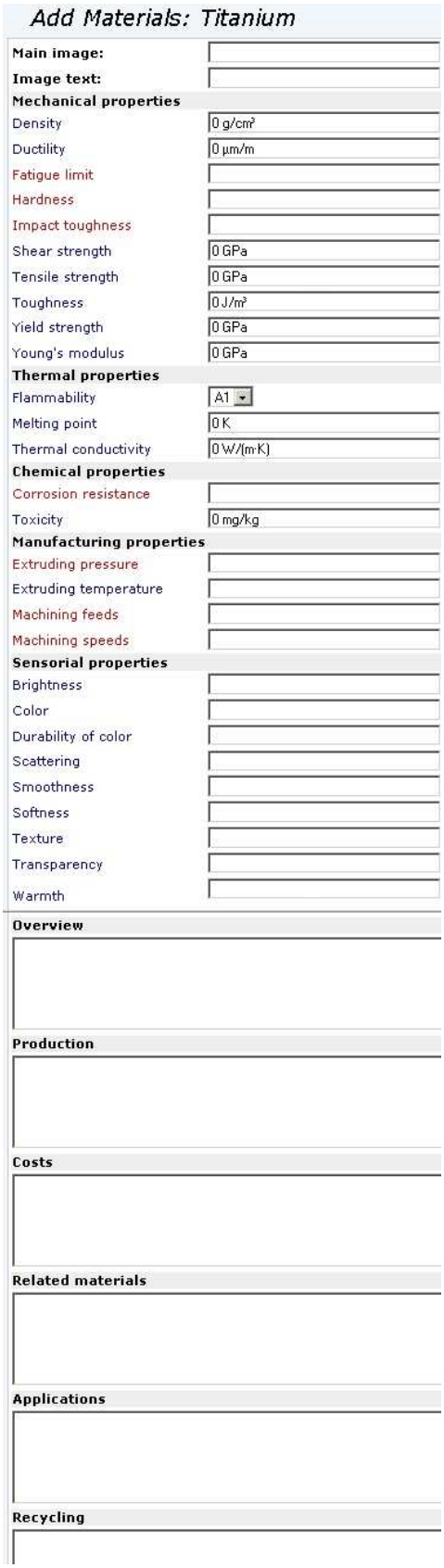
APPENDIX: FORM:MATERIALS



Add Materials: Titanium

Main image:	
Image text:	
Mechanical properties	
Density	0 g/cm³
Ductility	0 µm/m
Fatigue limit	
Hardness	
Impact toughness	
Shear strength	0 GPa
Tensile strength	0 GPa
Toughness	0 J/m²
Yield strength	0 GPa
Young's modulus	0 GPa
Thermal properties	
Flammability	A1
Melting point	0 K
Thermal conductivity	0 W/(m·K)
Chemical properties	
Corrosion resistance	
Toxicity	0 mg/kg
Manufacturing properties	
Extruding pressure	
Extruding temperature	
Machining feeds	
Machining speeds	
Sensorial properties	
Brightness	
Color	
Durability of color	
Scattering	
Smoothness	
Softness	
Texture	
Transparency	
Warmth	

Overview

Production

Costs

Related materials

Applications

Recycling

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