premsela
.org/ document/

Subject:	**Lecture Redesigning (Open) Design**
Date:	**First adressed at PICNIC '10, 24 September, Amsterdam**
Author:	**Prof. Dr Jos de Mul - Faculty of Philosophy, Erasmus University Rotterdam**
Premsela/People's Republic	**This Lecture was part of the programme (Un)limited Design @ PICNIC**

Redesigning open Design

Lecture by Jos de Mul

The title of my talk today is "Redesigning (open) design" and the subtitle reads "Applying database ontology". Let me start explaining this title, the question I want to address this afternoon and the answer I'm going to defend. One of the themes of Picnic 2010 is Redesigning design, of which (Un)limited Words and the (Un)limited Design Awards Ceremony are also part. In the program of Picnic 2010 the theme Redesigning Design is introduced as follows: "The design industry is going through fundamental changes. Open design, downloadable design and distributed design democratize the design industry, and imply that anyone can be a designer or a producer". The subtext of this message seems to be that open design - for reasons of brevity I will use this term as an umbrella for the aforementioned developments, thus including downloadable design and distributed design – is something intrinsically good, so that we should promote it. Though my general attitude towards open design is a positive one, I think we should keep an open eye for the obstacles and pitfalls, in order to avoid that we would throw out the (designed) baby along with the bath water.

My talk consists of three parts. First I will present a short sketch of open design. I realize that most of you will be familiar with open design, probably even more familiar than I am, but as this concept has quite some different connotations and for that reason is prone to conceptual confusion, it might be useful to illuminate this tag cloud of connotations. In this first part, I will also summarize the main objections that can be (and has been) directed against open design.

Just like the other members of the 'open movement', such as open source software, open science, and open technology (as we will see, especially the open biology movement is an interesting example within this context), open design is strongly connected with the development of the computer and the Internet. For that reason, in order to gain a deeper insight in both the chances and the pitfalls of open design, we should study the

fundamental characteristics of the digital domain. In the second part of my talk I will give a sketch of the database ontology, the ABCD of computing, that underlies the digital domain. And finally, in the third part of my talk I will investigate some of the implications of this database ontology for the world of design. I will argue that in order to develop the positive aspects of open design without falling into the pitfalls, the designer should not so much give up his activities as a designer, but rather should redesign these activities. The designer of the future has to become a database designer, a meta-designer, who does not design objects, but rather a design space in which unskilled users are able to design their objects in a user-friendly way.
Let me start in a traditional linear way with the first part of my talk.

1 Open design

1.1 Openness

Openness, just like its opposite – closeness - can be regarded as fundamental categories of life. Although organisms have to close themselves off from their environment in order to retain their identity, they also need to open themselves up to their environment in order to nourish themselves and to get rid of their excreta. However, whereas the openness of other animals is limited in the sense that they are locked up in their specific environment (niche or Umwelt), human beings are characterized by a much more radical openness. Their world is unlimited in the sense that it is open to ever new-environments and ever-new experiences. This makes human life incredibly varied and rich, compared to the life of other animals, but at the same time it is also a burden. Whereas other animals are thrown in an environment that is just given to them (which does not exclude, of course, that their environment sometimes undergo radical changes due to natural or technical forces), humans have to design their own world. Dasein, as Heidegger characterizes the life of human beings, is always design. Not only in the sense that he has to give form to an already existing world, but in the more radical sense that human beings have to establish their world. In that sense human beings always live in an artificial world. Human beings are, to quote the German philosopher Helmuth Plessner, artificial by nature. This is a never-ending process. Since a couple of decades, together with the development of the computer and the internet, we are witnessing the exploration and establishment of a whole new realm of human experience that leaves hardly any aspect of our lives untouched, including the world of design.

1.2 What is open design?

Although human beings from the very dawn of humanity have been characterized by a fundamental openness, the concept 'openess' has become especially popular in the last couple of decades. If we look up Wikipaedia – one of the most successful examples of an open movement

project – we find the following definition: "Openness is a very general philosophical position from which some individuals and organizations operate, often highlighted by a decision-making process recognizing communal management by distributed stakeholders (users/producers/ contributors), rather than a centralized authority (owners, experts, boards of directors, etc.)" In the global information society, openness has become an international buzzword. Nowadays we have open software, from operating systems to a variety of applications. However, the demand for open access not only concerns software, but also every possible cultural content, ranging from music and movies to books. All information, enslaved by copyrights, wants to be free. Moreover, open access is not limited to the digital world. An increasing number of scientists is pleading for open science and open technology. They cooperate with the public and demand open access for their publications and databases. The Open Dinosaur project, for example, that advertises itself on its website as "crowd-sourcing dinosaur science", involves scientists and the public alike in developing a comprehensive database of dinosaur limb bone measurements, to investigate questions of dinosaur function and evolution. However, the demand for open access is not only directed to the results of their research, but to their objects as well. The Openwetware Organization not only promotes the sharing of information, know-how, and wisdom among researchers and groups who are working in biology & biological engineering, it also tries to prevent the taking out of patents on living matter such as DNA. I could list many more examples of the open movement, from open gaming to open love. We seem to be open to everything.

So it is not a surprise that, a bit later than in many other domains, we also are witnessing the development of an open design movement. It seems to be part form a shift within the world of design from form via content to context, or from syntax via semantics to pragmatics, as my colleague Henk Oosterling expressed it in his Premsela Lecture last year. But what does 'open design' actually mean? In his article "The Emergence of Open Design and Open Manufacturing", Michel Bauwens distinguishes three different dimensions of open design:

On the input side, we have voluntary contributors, who do not have to ask permission to participate, and use 'open and free raw material that is free of restrictive copyright so that it can be freely improved and modified. If no open and free raw material is available, as long as the option exists to create new one, then peer production is a possibility.

On the process side, it is based on design for inclusion, low thresholds for participation, freely available modular tasks rather than functional jobs, and communal validation of the quality and excellence of the alternatives (peer governance).

On the output side, it creates a commons, using licenses that insure that the resulting value is available to all, again without permission. This common output in turn recreates a new layer of open and free material that can be used for a next iteration.

The fab labs, founded by Neil Gershenfeld at MIT's Center for Bits and Atoms and by now spreading out all over the planet, are a good example. They provide access for individuals to tools for digital fabrication. The users can use the fab lab, I quote the Fab Charter, 'to make almost anything' – I will come back to this claim in a while - you must learn to do it yourself, and you must share use of the lab with other uses and users.

1.3 Problems

This sounds exciting and indeed it is. However, there are also some serious problems connected with open design. Three of them are connected to the open source movement in general; the first problem mentioned in the list is particularly connected with open source movements that deal with the production of physical objects, such as the open design movement and the BioBricks Foundation:

For any immaterial project, as long as there is a general infrastructure for the cooperation, and open and free in-put that is available or can be created, then knowledge workers can work together on a common project. However, to produce physical goods, there are inevitable costs of getting the capital together, and there needs at least to be cost recovery. Indeed such goods are by definition rival, i.e. if they are in possession of one individual, they are more difficult to share, and also, once used up, they have to be replenished.

Thanks to the 3D printer and the DNA-printer this problem seems to become less urgent every month. Though the first consumer 3D printer, announced for this fall by Hewlett-Packard will still cost about 5000 euro, it is expected that the price will soon drop below 1000 euro. And at this moment, it is already possible to buy a second hand DNA-synthesizer for less than $ 1000. Together with a laptop and some biobricks, which can be ordered online for a few dollars per brick, one can start producing one's own organisms. So, if you are not satisfied with the possibility to design your own pet food, soon you will be able to design your own pet. If you consider this to be sheer science fiction, remember that the Brazilian artist Erduardo Kac already in 2000 with the help of genetic modification designed and built a fluo rabit. Nevertheless, the laws of physical economy will remain a serious constraint, compared to open source activities in the digital domain.

A second problem for the open design movement is that many people are not able or willing to join the open design movement. Human life is an eternal oscillation between openness and closeness, and this also applies

for design. Many people do not have the skills, the time or the interest to design their own clothes, furniture, software, pets, or weapons (more about weapons soon).

Third, we should not automatically trust those who think that they are able to design. As long as the individual is happy with the result, this does not seem a big problem. But as soon as the crowd starts sourcing, this might affect the reliability, functionality or the beauty of the design. Unfortunately, crowd sourcing not always results in wisdom but quite often in the folly of the crowds. In You are not a gadget Jeron Lanier argues convincingly that design by committee often does not result in the best product, and that the new collectivist ethos — embodied by everything from Wikipedia to "American Idol" to Google searches — diminishes the importance and uniqueness of the individual voice, and that the "hive mind" can easily lead to mob rule, digital maoism and "cybernetic totalism".

Fourth, I want to address an additional problem. We should not forget that the 3D and DNA-printers in the Fab Labs and homes of the future probably will not only be used for the design of beautiful vases and flowers, but also, for example, of lethal viruses. This is not a doom scenario about a distant future. In 2002 molecular biologist Eckhard Wimmer designed a functional polio virus on his computer with the help of biobricks and printed it with the help of a DNA-synthesizer, and in 2005 researchers of the US Armed Forces Institute in Washington reconstructed the Spanish flue, that caused the death of between 50 and 100 million people in the second decade of last, roughly 3% of the world's population at that time.

Although we have to take these problems serious, they should not lead to the conclusion that we should avoid further development of open design. It should urge us not to ignore or underestimate the dangerous pitfalls of open design, and to invent new strategies to face up to them. A preliminary task would be to investigate the database ontology that underlies our information society, including the world of design.

2 Database ontology

2.1 The ABCD of computing

Although computer programs may differ from each other in many different respects, on a fundamental level they all share the four basic operations of persistent storage, an integral part of almost all computer software. This ABCD of computing consists of the operations Add, Browse, Change, and Destroy. Together these four operations – which correspond to the structured query language (SLQ) commands <insert>, <select>, <update> and <delete> – constitute the dynamic elements of what we might call Database ontology.

In a basic sense the word 'database' might refer to any collection of items that is ordered in one way or another. In computing, a database can be defined as a structured collection of data records that is stored in a computer, so that a software program can consult it to answer queries.7 With the help of the four basic operations view, navigate, and search in principle all possible combinations of records can be created. Database ontology is dynamic, because the growing number of elements are constantly combined, decombined, and recombined.

2.2 From flat to relational databases

In reality, not all databases are that flexible. The traditional 'flat' paper database, a phone book for example, is rather inflexible. The alphabetic order of the names is fixed and to update the list you have to reprint the entire book. A card-index box, consisting of cards with a limited number of fields for the input of information (for example Name, Address, and Phone Number) would already be more flexible regarding updating. However, there would be no structural relationships that could easily be explored, and to sort the database differently – for example to group the records per country for a mailing – would be possible, but it would also consume a lot of time. Although an electronic version of a flat database – a spreadsheet - could speed up the sorting of the data according to different categories substantially, it remains inflexible with regard to the creation and exploration of structural relationships between the data.

From the 1950s on, new types of electronic databases have been developed, respectively the hierarchical model in the 50s, the network model in the 60s and the relational model in the 70s. The last model, which is based on predicate logic and set theory, contains multiple tables, each equalling one 'flat' database. The relational database as a whole is multidimensional, and for that reason its complexity cannot be represented on a flat plane and often not even in a three dimensional model. One of the strengths of the relational model is that, in principle, any value occurring in two different records (belonging to the same table or to different tables), implies a relationship among those two records. Relational database are extremely flexible, because they enable the users to define queries that were not anticipated by the database designers. From the 80s on, object-oriented programming has also been used to create a new database model, so-called object database systems. However, the relational model – sometimes in combination with object-oriented paradigm – remains the dominant model.

Each of the database models can be regarded as an interface that represents, structures and produces a collection of data in a specific way. What is important in the present context is that the development of database models shows a tendency to even more flexibility and a rapidly growing range of applications. Database applications span virtually the

entire range of computer software, ranging from mainframe databases for administrative purposes and multimedia encyclopaedias on cd-roms to search engines, wiki's and other web 2.0 applications on the Internet.

2.3 The database as metaphor

However, the impact of databases is not restricted to the world of computing. Databases often function as material or conceptual metaphors. They function as material metaphors when they evoke acts in the material world. Examples of this are databases implemented in industrial robots, enabling mass customization (e.g. 'build to order' cars) and biotechnological databases used for genetic engineering. They function as conceptual metaphors if conceptual metaphors if they express a surplus of meaning on top of their material (e.g. when we consider evolution as 'path through the gene pool'; or memory as 'recombination of neuropsychological memory bricks'). The psychologist Maslov once noticed that for those who only have a hammer, everything appears to be a nail. In a world in which the computer has become the dominant technology – worldwide more then 50 billion processors are doing their job – everything is becoming a material or conceptual database.

Databases have become, to quote Lev Manovich, the dominant cultural form of the computer age. They are 'ontological machines' that shape both our world and our worldview. In the age of digital recombination everything – nature and culture alike - becomes an object for manipulation.

Take the aforementioned example of genetic engineering. The evolution of life on earth is no longer regarded as a natural history determined by the struggle for life and the survival of the fittest (as in classical Darwinism), but rather as one possible (contingent) trajectory through the gene pool. Actually this biological database contains an infinite number of virtual organisms and life forms (trajectories), which in principle can be actualized. Although not yet as spectacular as in Spielberg's Jurassic Park, our world is increasingly being populated with life forms created with database technologies. Eduardo Kac's aforementioned Fluo rabit is a paradigmatic example.

3 Database design

3.1 Combinatorial explosion

Database ontology enables the database user to create a virtually unlimited number of possible (re)combinations. In we want to try to imagine how many, Jorge Luis Borges' short story 'The library of Babel' gives us a dazzling clue. In this story Borges imagines a library –the narrator also informs the reader that the inhabitants call 'the universe'- that contains a series of books of which each consists of one possible combination of 25

symbols (the 22 letters of the Spanish alphabet, plus space, comma and full stop). Each book, the narrator explains, contains 410 pages; each page 40 lines; each line, about 80 black letters. That implies that each book consists of (410 x 40 x 80) 1,312,000 characters. Given that each character can have 25 different values (the aforementioned 25 orthographic symbols) the Library contains no less than 25 to the power of one million, three hundred and twelve thousand (251,312,000) books. That is an almost unimaginable big number. Mathematicians not without reason call phenomena such as the Library of Babel a combinatorial explosion. The very simple algorithm to build Borges library results in what we could call a hyper astronomical number of books. If we take into account that physicists estimate that the total number of atoms in the universe is roughly 1080, we realize that the universe can only contain a very small part of the total number of books. Even when we take a single book with all the variants containing only a handful of misprints, the universe could only contain a tiny fraction of this tiny fraction of the library.

One thing is certain: the library of Babel is a tough read. Of course, Borges' library is only a thought experiment. Given the size of our known universe the library simply cannot be constructed in reality. However, with the help of a simple database – you can find several of them on the Internet – they can be made virtually present. That means that each of the books in principle can be generated. That is a fascinating idea, as the library also contains, the book that contains the ultimate truth about everything and a reliable documentation of our life, including our future death. However, given the hyper astronomical number of books in the library the depressing conclusion of Borges' story is that it will take an almost infinite number of centuries to find that book, not to mention to find a method to assure that you have found the right book!

3.2 (Un)Limited design

Borges's story about the Library of Babel with its hyper astronomical number of books conveys an important message for open design. At first sight the situation of open design is not comparable with Borges' Library. However, we already run into trouble when we talk about modest combinational tasks. Suppose we want to design a simple bracelet of 15 elements, and we have. For our problem, there are 15 variables, each taking one of 15 possible values: this means there are 15 to the power 15 (15^15 = 437.893.890.380.859.375) possible bracelets. Let's be optimistic and suppose we have a fast computer able to check ten to the power nine (10^9) combinations per second to decide whether the combination is satisfactory: checking all possibilities would still take approximately 14 years. Even the most enthusiastic openness aficionado will soon desperately longing for some form of closure.

3.3 Design as metadesign

This brings me to the conclusion of my talk. The almost unlimited number of combinations that databases offer us, urges to some form of limitation of the possibilities. In the case of open, database-mediated design this calls for a new role for the designer. The designer should not give up his role as a designer (or restrict himself to his traditional role as designer of material or immaterial objects), but he should instead become a metadesigner who will design a multidimensional design space that provides a user-friendly interface which enables the user to become a co-designer, even when this user has no designer experience or no time to gain this experience by trial and error. The task of the metadesigner is to create a pathway through design space, to combine design bricks into a meaningful design. In this respect the metadesigner resembles the scientist who no longer creates a linear argument, but a model or simulation that enables the user to explore and analyze a specific domain of reality, or a game designer who designs a game space where, if he is successful, meaningful play can take place.

This implies that the designer's task is to limit the virtually unlimited combinational space in order to create order from disorder (after all, just like in the case of the Library of Babel most of the (re)combinations of design bricks will have no or limited value. Partly the designer will create these design bricks himself; partly they will be added by the co-designer. The recombination of the elements will also have the form of an interaction between the possible paths within the design space on the one hand, and the choices of the co-designer on the other. And of course data mining and profiling algorithms will also play there by suggesting or autonomously adding design bricks (depending on the metadesign).

You might ask yourselves what makes the metadesign presented here actually differs from already existing forms of mass customization, as we find it, for example, on the Nike website. The answer is that mass customization is part of the project of metadesign, but only part of it. In the second part of my talk, I referred to the three dimensions of open design. In the case of mass customization, as with Nike, the openness only exists in the output dimension, and even their the openness is rather limited: one can choose out of a small range of available colours.

Of course it is not possible to give a blue print of how such metadesigns exactly will look like. I only reflect – or *preflect*, if you like – on them. Creating them will be the task of the metadesigners of the future.

Some time ago Kevin Kelly –in an article called 'Better than free" pleaded for a new business model, based on free copies in almost every domain – from music, books and films to your DNA – which should be supplemented by added value. He lists eight values that might enhance the value of the free copies, and for which people will be prepared to pay: immediacy,

personalization, interpretation, authenticity, accessibility, embodiment, patronage, and 'findability'. I think we should add one more value: 'designability.' In fact this value will encompass all the others. That must be a great challenge for the metadesigner!

Jos de Mul addressed this lecture at PICNIC '10, on the 24th of September in Amsterdam. It was part of the (Un)limited Design @ PICNIC, which was initiated by Premsela Dutch Platform for Design and Fashion, Waag Society and Creative Commons. With our (Un)limited Design activities, we seek to show and investigate the possibilities presented by knowledge-sharing in combination with new production and distribution techniques. In addition, we seek to offer everyone the opportunity to share his or her creativity through open-source methods. See also: http://www.premsela.org/en/peoples-republic_1/unlimited-design_1