

IMPROVEMENTS IN ZOO DESIGN  
BY INTERNET-BASED EXCHANGE OF EXPERTISE

by

MONIKA EBENHÖH

Diplom-Ingenieur, University of Agricultural Sciences,  
Austria, 1992

A Thesis Submitted to the Graduate Faculty  
of the University of Georgia in Partial Fulfillment  
of the  
Requirements for the Degree

MASTER OF LANDSCAPE ARCHITECTURE

Athens, Georgia

2000

## ACKNOWLEDGEMENTS

This thesis is the result of a project completed within my two years of graduate studies. My thanks go to the Austrian Ministry of Science and Traffic for making these studies possible by a grant.

Many people deserve recognition for their roles in the project:

I thank my reading committee for their interest and time: my major professor Dr. Mary Anne Alabanza Akers, reading committee chair Marianne Cramer, Robert Warren, Dr. Terry Maple and Nevin Lash.

The faculty deserves appreciation for supporting my project by being flexible and helpful.

Thanks also go to my fellow students and to my roommate Amy for correcting my wording and for editing my writing. I owe you for my command of the English language.

I would also like to acknowledge everybody who helped me to develop the project by giving time, insight, ideas and criticism: Zoo directors, zoo employees, zoo designers and interested academics all over the world contributed significantly to the outcome of this project. I thank you for your enthusiasm and valuable input.

Additional thanks go to those who participated in my pilot project. You devoted both, your time and valuable materials, relying on my responsibility. Thank you for trusting me.

Special thanks go to Jon Coe who has become a source of inspiration and endurance for me for many years. Thank you for being my mentor.

Finally I wish to thank Hans Fiby warmly. I feel grateful for your generosity in supporting this undertaking for two years. You were stayed close to me in spite of 5000 miles distance. I appreciated your countless calls and emails. They gave me great encouragement. I have enjoyed sharing the excitements and challenges of this project with you. With your help it has become my pride and joy. Thanks for your love and companionship.

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# 1. Introduction

„A good rating system would stimulate healthy competition  
and give every zoo a relevant target.“  
(Maple, 1995)

Hoping to find the criteria for a good rating system, I enrolled at the University of Georgia in 1998. The motivation to work on this topic came from an observation that I made very often since I got interested in zoo design:

When designing new zoo exhibits, zoo directors and their professionals often do not profit from experiences others have already gained with similar or even the same type of exhibit. This happens because the information on strengths and weaknesses of existing exhibits is either hard to find and to evaluate or not available at all. This results in unnecessary experiments, ‘reinventing the wheel’ again and again or copying what was done elsewhere. The consequences of these approaches often are:

Poor conditions for animals,  
poor educational performance,  
poor conservation results and  
poor use of resources (animals, efforts and money).

I started my research by writing a proposal and sending it to zoo directors and zoo designers in Europe, Australia and the United States. My suggestions were to

1. develop criteria for the assessment of zoo exhibits that are already built,
2. create suitable instruments to publish assessments of zoo exhibits,
3. publish updated and standardized information on zoo exhibits, such as assessments, costs, and information on skilled professionals,
4. improve public awareness on appropriate zoo design, and thus
5. create competition among zoos to accomplish assessment criteria.

The feedback I got from several experienced professionals first was not very encouraging:

There were doubts that any given set of criteria could deal with the rapidly changing trends and the relationship between exhibit design and operation. Also, criteria for assessments are always based on a specific philosophy. But, there is no one right philosophy of zoo design. Furthermore, there was the fear from designers that information on top quality exhibits would encourage copycats who may not have the skill or experience to use the information properly. Finally, some zoo directors were not very interested in having their exhibits assessed.

However, most respondents found assessments of zoo exhibits and their publication useful.

I therefore changed my concept and the focus of my research. I decided to develop a standard for describing animal exhibits and to have others judge them, based on these standardized descriptions. In order to test my concept I designed a pilot project. The medium best suited for my approach seemed to be the internet. Communication by email is cheap and fast. A survey can be conducted on the internet within a relatively short time. A website is illustrative but

cheap to create and disseminate relative to any other medium. Thus, I created a website as my pilot project.

The results of these efforts proved to be much more promising. The following chapters describe the background to and the development of the pilot project, give an evaluation and discuss future options.

## 2. Review of Contemporary Practice

### 2.1. The Recent History of Zoo Design

Only a few zoo visitors may be aware that zoos are designed. However, when comparing different zoos, it becomes obvious that they have evolved, based on human attitudes towards nature and wildlife and the development of science and technology.

Some zoos in Europe still remind of the time of menageries which began in the thirteenth century. Zoo Schönbrunn in Vienna for example, has preserved its original architecture. This zoo was opened to the public in 1779 and kept its name menagerie until 1926 (Kunze, 2000). The idea of displaying exotic animals in strictly geometric barren enclosures comes from the desire to celebrate control over nature. The organization of animal collections at this time was mostly taxonomic, reflecting the contemporary state of scientific research in zoology.

Carl Hagenbeck greatly influenced the design of zoos in 1907, when he opened a new zoo in Stellingen, outside of Hamburg. He introduced large open dry moats and steep overhanging artificial rockwork, to show animals in panoramas without the visual obstruction of bars. Hagenbeck also broke from the taxonomic organization and arranged animals for dramatic effects. (L. Hagenbeck, 1956). These enclosures were inspired by romantic landscape paintings, but mostly inadequate for the animals contained. The technique of dry moats and artificial rockwork became very popular and can be found in many European and North American zoos today.

Because the value of exotic animals increases with their endangerment, zoos have tried to keep their animals alive by improving hygienic standards. Ceramic tiles, steel and glass have become the prevailing materials of enclosures and their furnishings, reflecting the increasing knowledge about microbiology.

While most animal enclosures look very alike in their sterility on the inside, the outside of zoo buildings has been changing with the styles in art and architecture. Many of these exhibits tragically reflect human dominance and ignorance for animal needs of their creators.

With his book “Wild Animals in Captivity”, Hediger set a bench-mark in the theory of zoo design in 1950. He pointed to the relationship between deficiencies of animal behavior and inadequacies of zoo facilities. Unfortunately, behavioral problems of zoo animals are still acceptable in most places.

In 1976, Jones, Coe and Paulson (Jones et. al., 1976) introduced the concept of landscape immersion with their Long-Range Plan for Woodland Park Zoo. The idea of landscape immersion is, to replicate the species' natural environment and to place the viewer within the animal's habitat. The concept reflects the increasing awareness of the interdependence of living creatures and their environment. The organization of the animal exhibits relates to zoo-geography and takes the ecology of the site into account. Since advances in prophylaxis and medication allow the use of natural materials in animal enclosures, plants have become the major feature in this type of animal exhibit.

Additionally, synthetic fibers have become popular in zoo design. Molds taken from natural forms are turned into naturalistic copies of rocks, plants or anything found in nature. Both, natural and artificial materials can be used to replicate the natural habitat of the displayed

animal as convincing as possible. Lately, designers have been emphasizing the relationship between traditional people and wildlife and arranging sequences of stories about it.

Because animals might be hard to see in spacious natural exhibits, design techniques have been developed to provide positive incentives for the animal to stay in view. Furthermore, audio-visual technology is used to provide memorable experiences for zoo visitors.

Today, the pace of evolution in zoo design is uneven. Some institutions are experimenting with more subtle barriers such as thin steel nets and light barriers. Others are stuck with the tradition of menageries. Concern for animal welfare and captive breeding of endangered species will probably be the driving force for zoo design in the future.

## **2.2. The Present Access to Information on Zoo Design**

Individual zoos are often owned by private societies or depend on such organizations for funding. Many of these societies have a regular publication for members of the society, informing on plans and construction of the zoo. The zoos of a region collaborate in regional organizations, such as the VDZ (Verband Deutscher Zoodirektoren), ADZG (Association of Danish Zoological Gardens), CAZG (Chinese Association of Zoological Gardens) and Northern American regional organizations. The regional organizations are gathered in continental organizations, such as the AZA (American Zoo Association), LAAZGA (Latin American Association of Zoological Gardens and Aquariums), EAZA (European Association of Zoos and Aquaria) and ARAZPA (Australasian Regional Association of Zoological Parks and Aquaria). Worldwide, zoos and zoo organizations are organized in the WZO (World Zoo Organization) since its foundation in 1946. Most of these organizations hold regular conferences and publish conference minutes, scientific proceedings and newsletters.

The AZA is probably the best organized and most active of all zoo organizations. It has much impact on trends and standards worldwide. The AZA conferences provide the opportunity for commercial members to exhibit their products and services to other AZA members. Sometimes, there are special workshops on design topics. The association's website provides members with a resource center. This is an expanding database on zoo relevant documents, including design related sections. The AZA also fosters the SSP (Species Survival Plan) program. By the SSPs' husbandry manuals the AZA intends to set standards in husbandry practices for animal species included in the program. The manuals ideally also indicate design requirements for these species.

Furthermore, the AZA awards excellent exhibits at their annual conference. The AZA exhibit award was initiated in 1974 to recognize accomplishments in the area of animal display and exhibit design. Recently, an additional award (The Munson Aquatic Exhibitory Award) was introduced at the AZA conference for exhibits containing piscine species.

Another design award was introduced by UFAW (Universities Federation for Animal Welfare) in 1986. Each year, the best new or improved zoo animal accommodation and the best innovation (e.g. piece of equipment or innovative husbandry technique) in Great Britain are awarded by the UFAW.

The Zoo-AG is an ambitious project run by biology students in Germany with an interest in zoological gardens. They hold regular excursions to zoos and publish reports about these trips on their website.

The IZE (International Association of Zoo Educators) and the recently formed International Association of Zoo Keepers deal with interpretation and husbandry from their perspective as zoo employees with specific tasks. In fact, these organizations can give important input to zoo design assessments.

The AZFA (Aquarium and Zoo Facility Association) was founded to serve people responsible for the maintenance of animal exhibits. AZFA is developing a notebook as a reference for design and construction of animal enclosures and support facilities.

The AZH (Association of Zoological Horticulture) was formed in 1980 to facilitate information on horticultural ideas and practices relating to the zoo experience. Through member surveys, seed exchange, regular newsletters and annual conferences, members keep up to date on horticulture practices in zoos. The AZH actually is the most zoo design oriented organization. Data on use of plants in existing exhibits are gradually collected and standardized to improve accessibility to this highly specific information. Horticulture is just one aspect of zoo design but probably the most important. However, the AZH is a forum for horticultural, not general, exhibit design issues.

Other reference sources on zoo design are the *International Zoo Yearbook*, the journals *Zoo Biology*, *Curator*, *Architecture*, *Landscape Architecture*, the journal *Environmental Psychology*, the series *Environment and Behavior*, *Animals and Architecture*, and publications by the Smithsonian Institution; but none of them is exclusively dedicated to zoo design. Just a few books deal with zoo design. Assessments and evaluations are spread across various journals and series and last but not least academic theses.

Perhaps, because the search for information on zoo design issues is difficult and maybe, because the topic is good for chatter, much information on zoo design is exchanged on personal visits and in personal communication.

## **2.3. The Role of Landscape Architects in Zoo Design**

### **2.3.1. Credentials of Landscape Architects**

Although the American Society of Landscape Architects celebrated 100 years of service in 1999, there are still misconceptions about the profession. Landscaping means to arrange where plants should grow in a park, yard, or garden. Thus, landscape architects are often believed to be aesthetic designers. In fact, the credentials of landscape architects go far beyond this concept.

In their academic training, landscape architects gain knowledge of:

- the forming features and dynamics in natural landscapes
- plant societies and the composition of their different layers
- plant species' demands, such as light, water, and nutrients
- plants' appearances, such as size, form and colors of the whole plant at different ages; its bark, foliage, blossoms, fruits; the density, texture and reflectivity of foliage
- spatial requirements of people.

They are also trained to

- create different solutions for design problems,
- think innovatively and
- communicate.

To be certified, landscape architects must take an exam to ensure that they have the knowledge, skills and abilities required to perform their tasks. This exam generally includes:

- legal and administrative aspects of practice,
- analytical and technical aspects of practice,
- planning and site design,
- structural considerations and materials and methods of construction,
- grading, drainage and storm water management.

Landscape architects are trained to design spaces in which people live, work and recreate. They often work multi-disciplinary and most of their projects are commercial and recreational.

### **2.3.2. Today's Tasks of Landscape Architects in Zoos**

The zoo environment is especially complex because the same setting has to accommodate the needs of multiple audiences, i.e. animals, visitors, keepers, curators and sponsors.

Today, plants in zoos are used outdoors and indoors, in animal enclosures and visitor areas. The following list gives more details:

#### Functions of plants in zoos:

- defining spaces
- creating microclimates
- screening
- decorating
- feeding
- supplementing food
- occupying animals
- building nests
- recreating animals and visitors
- educating visitors

#### Restrictions to the use of plants in zoos:

regarding the plant species:

- demand for light, temperature, water, soil
- adaptability
- resistance to destruction
- pest resistance
- recovering abilities

regarding the animals demands:

- toxicity
- nutritional value
- nesting value
- structural value

regarding design issues:

- aesthetic value
- seasonal appearance
- compatibility with other plant forms

regarding management issues:

- times of availability
- costs
- compatibility with other plants (dominance, spreading)
- productivity
- maintenance requirements

The evolution of zoos may shift towards zoological-botanical gardens as the interdisciplinary approach is thriving. „The total value of plants in many zoos far exceeds the total value of the animal collection. The success of elaborate plantings in zoo exhibits can be attributed to two things – improved technology in plant support systems (irrigation, drainage, supplemental lighting. etc.) and staffs of trained horticulturists.“ (Coe, 1988)

The extensive use of plants and other natural materials has multiple advantages. It is

- aesthetically pleasing,
- educating about habitats and
- enriching the animals‘ zoo life.

Even zoos that are restricted by existing structures and limited budgets, nowadays put much emphasis on the use of plants and try to create naturalistic environments for their animals. But, „while the creation of an exhibit is more art than science, the maintenance of it is more craft than art.“ (Halpern, 1995).

The following list shows the scope of tasks of landscape architects working for zoos:

Administration:

- Recording and updating site plans, mains and plant inventories
- Recording soil and water analyses
- Recording tree surveys to decide protection and maintenance measures
- Contracting for planning and construction
- Coordinating planning and construction
- Controlling and documenting works
- Tracking sources for browse and decoration material (plants, branches, trunks, stones etc.)
- Ordering materials for landscaping
- Recording browse preferences and problems
- Recording pest control successes and problems

Maintenance:

- Cleaning, repairing and renewing grounds
- Repairing and renewing plant protection
- Checking the irrigation systems
- Checking for pests and diseases on plants

- Fertilizing, cutting, trimming plants
- Taking soil and water samples for analyses

#### Planning:

- Conceptual planning for the development and management of enclosures, public and maintenance areas
- Designing individual animal enclosures and public spaces
- Scheduling planning and construction

#### Consulting:

- Recommending maintenance measures for the grounds
- Recommending trimming, protection and maintenance measures for plants
- Recommending irrigation systems
- Recommending soil and water protection measures
- Consulting on appropriateness of materials and toxicity of plants

#### Realization:

- Modeling, building, constructing
- Planting
- Creating plant protection
- Getting materials for browse and decoration

The actual activities of a landscape architect mainly depend on his contract with the zoo. Zoo employees of course are more involved in maintenance than contractors from planning and landscaping firms.

Zoos often have a grounds department. The grounds department is mainly responsible for the maintenance of the outdoor surfaces, such as walkways, green space, and the grounds in animal enclosures, on playgrounds, picnic areas, etc. The staff is mostly horticulturists and craftsmen, sometimes with a landscape architect as the head of the department. Here, the landscape architect has to manage the tasks and the people. This does not allow much time for designing. They may do designs on a small scale. But for complex designs, they contract firms. The grounds department is usually involved in all planning procedures.

Some zoos, such as the Bronx Zoo in New York, have their own planning department. Here, landscape architects do the designs, and then contract firms for construction.

Most zoos, however, have no landscape architects employed. Some of these zoos contract professionals for specific design purposes. More often, zoos just hire the local landscape architect for their design problems. But many zoos try to get by without consulting landscape architects. To these, the landscape architect is just another expensive planner in addition to the architect they need to get a building permit.

Ideally, for zoo design, the contracted landscape architect responsible for design and construction works together with the employed landscape architect responsible for maintenance. While the permanently present landscape architect knows the characteristics of the place, the contracted landscape architect may better know and introduce new concepts.

### 3. Thesis Project

#### 3.1. Objectives

This is a project to create media for efficient communication about appropriate animal exhibit design. Publishing assessments of animal exhibits that are already built should identify desirable exhibit design. The research is on criteria for the assessment of animal exhibits and the media to publish this information. Both objectives have to be accomplished simultaneously to be complementary.

Usually, institutions are reluctant to criticism, especially when it is going to be published. In general, it is more acceptable to compare exhibits within one institution than between different institutions. Thus, one has to be very careful, when launching exhibit assessments to the public. Institutions need to rely on their information not being used adversely to their interests. As a consequence of these problems, only a few exhibit evaluations have been published so far. They are usually found in scientific series. Also, the methods vary, so that it is hard to make comparisons regarding qualitative and quantitative results.

I chose a different approach for this project in order to have an impact on a larger scale. I decided not to make any judgements, but describe exhibits in a comparable way that would allow everybody to make his or her own judgement.

The assessments envisioned in my project, should enable zoo professionals to make reasoned design decisions and should support them in finding specialized firms, suitable building materials, plants and interpretation.

As the market for a manual on zoo design is too small for publishers, but zoo exhibits get more and more expensive, it is useful to create a new medium dedicated to zoo design. This medium should help zoo professionals with their tasks. The medium should therefore provide the following information:

<b>Topics:</b>	<b>Details:</b>
Exhibits that are actually planned	Client, planners, location, type and intentions of exhibit, site and project plans dates of construction and opening
Exhibits that are already built	Client, planners, contractors, location, type and intentions of exhibit, site and project plans, pictures of exhibit (overview and details), costs, standardized descriptions of features
Addresses of specialized firms	Planners, designers, artists, contractors for construction and maintenance
References for special sources	Plants, building materials, technologies
Special events	Conferences, fairs, demonstrations
Special literature	Books, articles
Discussion forum	Special section for members

The technology best suited to provide this information is the internet. A website can

link new sites with existing ones and is easy to update. Because there are many decision-makers without internet access or who are reluctant to use it, the website should be complemented by some paper publications.

In order to operate this special website economically, it should target the general audience and attract sponsors.

## **3.2. Methodology**

### **3.2.1. Empirical Research**

In order to gear my project to professionals I sent out a first proposal and discussed it with zoo professionals. The first proposal suggested “research on instruments for zoo design assessment and the media to publish this information in order to propagate appropriate zoo design”.

The feedback from zoo professionals on the feasibility and the usefulness of my proposal resulted in changing the focus and approach:

- Instead of evaluating the qualities of animal exhibits, my further research focused on finding useful standards for describing them.
- Instead of relying on subscription fees from zoo professionals, the website should target a wider audience with attractive pictures, discussions, and contests and, by doing so, attract sponsors too.

I developed the criteria for the assessment of animal exhibits based on these findings.

### **3.2.2. Development of Criteria for the Assessment of Zoo Exhibits**

#### **3.2.2.1. The American Zoo Association’s Criteria**

As a starting point, I analyzed the criteria that the AZA Honors and Awards Committee has used for its contests since the award was initiated in 1974. The set for the 1999 award was:

- suitability and safety of exhibit for specimens,
- spatial allotments, personnel utilization, and safety,
- suitability and safety of exhibit for visitors,
- educational value,
- aesthetics,
- husbandry management and
- conservation.

Unfortunately, the judging is not documented. The only publication is a press release with a few paragraphs describing the winning exhibits. According to the Chairman of the AZA Honors & Awards Committee (Chapo, 1998), the AZA has changed its criteria several times according to the feedback received.

#### **3.2.2.2. Systems for Assessment Criteria for Animal Exhibits**

Meaningful systems to organize assessment criteria for zoo exhibits are:

- features of the exhibit - such as suitability, safety, aesthetics, etc.;
- purpose of the exhibit - such as education, recreation, conservation, etc.;

- participants' perspective of the exhibit - participants being animals, keepers, curators, educators, directors, sponsors, veterinarians, visitors, local residents and the ecosystem's residents (in a very broad ecological sense).

The criteria used by the AZA are part of all three systems. They are not systematic in this respect which might be the result of practical considerations or might come from compiling more detailed criteria.

Using features of an exhibit as the organizational system makes it necessary for judges to switch between different participants' perspectives. For example, suitability will be judged differently from the concerned animal's perspective, the keeper's perspective and the visitor's perspective. This is a fact that the AZA criteria take into account by repeating, for example, the safety criterion (suitability and safety of exhibit for specimen; spatial allotments, personnel utilization, and safety; suitability and safety of exhibit for visitors).

If not repeated for different participants' perspectives, then one criterion results in just one judgement that is influenced by the judge's perspective. Consciously or unconsciously, this perspective implies values and the weight that the judge attributes to the criterion, relative to other criteria. For example, when considering the conservation value of a given exhibit, the conservation issue may not have the same importance for a zoo exhibit from different persons' perspectives. These aspects can result in very inconsistent judgements from different people using the same criteria.

Considering the disadvantages of using features or purposes for the organization of assessment criteria, I chose the participants' perspective as the main ordering principle.

While the reasoning on perspectives comes from a theoretical framework, useful criteria also have to comply with constraints in time, money and the availability of information. They also need to be appropriate for publishing: What may interest the general public? What do institutions want the general public to know; and what do they allow the general public to know? Some otherwise interesting assessment criteria may be of no practical relevance for these reasons.

First, the media envisioned in my proposal have to serve a broad audience. Thus, information that is of interest for this audience is provided, regardless of its value for an evaluation, for example awards and firms involved in design and construction.

Second, the local and the ecosystem's residents are imaginary participants who may ask, "what does this zoo exhibit do to me?" The relevant issues are categorized by the terms "local resources" and "conservation" because these terms are more common and less abstract than local residents' and perspectives of ecosystem's residents.

Third, the criteria are theoretically supposed to be used by neutral and objective observers with access to all necessary information. In reality, one or two knowledgeable persons supply the requested information on animal exhibits. They supply, whatever they remember and have at hand at the time of the request. Usually, the printed material available is designed to advertise the exhibit. Exhibit information therefore is strongly limited by the availability of documents and the efforts of the informant. Describing an exhibit from different participants' perspectives, such as curators, educators, directors, sponsors, or veterinarians, is hardly feasible from the information commonly available.

The relevant criteria therefore were narrowed down to the three main user groups: animals, keepers and visitors. Other participants' perspectives are covered by less specific criteria: The educators' perspective is mainly covered by the criterion on interpretation, the curators' and director's mainly by the criterion on research. The sponsors' perspectives are too diverse to be used as a specific criterion. They can be business people, local residents, members of a society, or the city government owning the zoo. The criteria relevant to sponsors might be included in the animals', visitors', educators', and curators' perspectives. Finally, the veterinarians' interest should be that the animal's confinement and husbandry is not adverse to its health. To some extent, this is ensured by the compliance of an exhibit with the relevant husbandry manuals and motivated keepers.

The overall attempt is to use criteria that are highly comparable and easily understandable for the intended audience. The resulting exhibit assessments are a compromise between rigid exhibit evaluations and subjective exhibit descriptions. Their format is very open. Still, the design philosophies should be revealed to a degree that helps to understand the design objectives. This should be accomplished by the descriptions of features dedicated to the three main user groups and the descriptions of efforts, undertaken for interpretation, management and research related to a given exhibit.

### **3.2.2.3. Description of Assessment Criteria for Animal Exhibits**

The criteria to be defined for standardized descriptions of animal exhibits need to remain topical, even when trends in zoo design change. This is particularly important for an international approach, as the pace of the evolution in zoo design is very uneven.

The ordering system proposed for describing animal exhibits consists of three sets of criteria. The first set of criteria is serving as background information for the description. The second set includes animal issues and human participants' perspectives. The third set pertains to ecological issues.

The list hereunder gives an overview of the criteria proposed. A detailed explanation of each of them follows the list.

#### **Background information:**

1. LOCATION (of the zoo)
2. KEYWORDS (for search in a database)
3. ANIMALS (exhibited)
4. AWARDS (that the exhibit earned)
5. DESCRIPTION (of the exhibit)
6. SIZE (of the exhibit)
7. COSTS (of the exhibit)
8. OPENING DATE (of the exhibit)
9. DESIGN (involved firms)
10. CONSTRUCTION (involved firms)
11. LOCAL CONDITIONS (of the area)
12. PLANTS (used in the exhibit)

#### **Participants' perspectives:**

13. FEATURES DEDICATED TO ANIMALS (the individual animal's perspective)
14. FEATURES DEDICATED TO KEEPERS (the keepers' perspective)
15. FEATURES DEDICATED TO VISITORS (the visitors' perspective)

16. INTERPRETATION (the educator's perspective)  
 17. MANAGEMENT (relating to the operation of the exhibit; the veterinarian's perspective)  
 18. RESEARCH (relating to the exhibit; the curators' and director's perspectives)

**Ecological issues:**

19. CONSERVATION (measures taken by the institution relating to the exhibit)  
 20. LOCAL RESOURCES (used for the exhibit)

1. LOCATION:

The location of the zoo is given by its mailing address, the phone and fax number and a link to its website.

2. KEYWORDS:

The keywords given relate to the type of animal exhibit described. The keywords are saved in a database and help to retrieve the descriptions by searching for them on the ZooLex "Find" page.

3. ANIMALS:

The scientific family and species names of the animals exhibited as well as their common names are saved in a database as keywords. Numbers and specifications of animals in an exhibit might change over time. To provide consistent information, all specifications on one exhibit should be given for the time of the documentation. Accompanying pictures ideally document the status at the same time, thus supporting the text. The date of the documentation is given at the end of each exhibit presentation. Additional text and pictures may illustrate stages of introduction or other management techniques and events accounting for changes over time.

5. DESCRIPTION:

A short description of the exhibit gives a background to its creation and purpose. The layout and major features of the exhibit are explained. Links from the text to the relevant pictures help the reader to visualize the spacial characteristics.

6. SIZE:

Ideally, figures should be given for indoors and outdoors, on exhibit and off-view, accessible and designated areas, animal, keeper and visitor area. Accessible areas also should be given in  $m^3$  if the vertical dimension is relevant to the species confined. The numbers given for accessible areas should exclude planting beds, moats etc. Areas not accessible to animals or visitors should be included in the designated areas and in the total.

Sizes should be given in square meter ( $m^2$ ). The size of an exhibit given in square meter ( $m^2$ ) can be converted into square feet ( $ft^2$ ) by a division by 0.09. For example:  $150 m^2$  divided by 0.09 equates  $1666.67 ft^2$ .

7. COSTS:

Ideally, costs should be given separately for design and construction. Work that was done in-house, additional staff that was hired for design or construction and contracted work should be

included. Estimates of yearly costs for an exhibit would help to get a realistic picture of the allocation of means. These costs are caused by resources, equipment, an manpower necessary for animal care and for the maintenance and operation of exhibit structures and features.

Costs are usually quoted in the currency of the institution's country. For comparison, costs may also be given as a factor of the mean annual per capita income of the country at the time of opening of the exhibit.

#### 8. OPENING DATE:

The opening date of an exhibit is important for estimating the duration of design and construction. Beginning of design and construction is usually defined in the contracts and mentioned under DESIGN and CONSTRUCTION. The end of design often is not clear, as design overlaps with construction. The duration of planning and construction can be calculated from the defined beginning and end (opening date) of these operations.

For interpretation of the duration, the context of design and construction should be mentioned in the exhibit DESCRIPTION. Was the design a defined stage of an existing master plan? Was the construction done on a site separated from or surrounded by the visiting public? Was it a renovation of an existing building? And so on.

#### 9. DESIGN:

First, the date of beginning of design is mentioned. Then, firms involved in the design of an exhibit are listed with their location. Links may be offered to the ZooLex page "Firms" where the contacts to the firms are provided.

#### 10. CONSTRUCTION:

First, the date of beginning of construction is mentioned. Then firms involved in the construction of an exhibit are listed with their location. Links may be offered to the ZooLex page "Firms" where the contacts to the firms are provided.

#### 11. LOCAL CONDITIONS:

A standardized diagram illustrates the local climatic conditions of the place where the exhibit is located. This information is useful when considering the use of plants or construction features in a different location. Walter and Lieth developed this type of diagram. A separate page linked to the diagrams explains how to use them.

#### 12. PLANTS:

Numbers and specifications of plants in and around an exhibit might change over time. To provide consistent information, all specifications on one exhibit should be given for the time of the documentation. Accompanying pictures ideally document the status at the same time, thus supporting the text. The date of the documentation is given at the end of each exhibit presentation. Additional text and pictures may illustrate stages of introduction or other management techniques and events accounting for changes over time.

#### 13. FEATURES DEDICATED TO ANIMALS:

The desirable quality of an exhibit for the individual animal enclosed should be described in a husbandry manual for this species. An exhibit assessment might consider compliance of the physical structures with the husbandry manual or with similar sources.

Unfortunately, these manuals only exist for some dozens of species so far. They are mostly compiled for species included in the Species Survival Plans (SSP) or similar programs in Europe and Australia. However, there is no database on existing manuals. Individuals administer them all over the world. Thus, it is not easy to determine which manuals are available and from what source. As long as there are no international standards for husbandry, only descriptions of features dedicated to animals can be given.

Furthermore, the interdependence of design, operation and maintenance of an exhibit is very critical to the animals' health, but hardly known or documented at this point. The description of FEATURES DEDICATED TO ANIMALS and FEATURES DEDICATED TO KEEPERS may include some relevant issues. An additional criterion on MAINTENANCE issues may cover more of this topic at some point.

#### 14. FEATURES DEDICATED TO KEEPERS:

The living quality of a zoo animal very much depends on the motivation of its keepers. Keepers first can observe symptoms of health and sickness. Methods of behavior and environment enrichment for zoo animals mostly rely on keepers.

Security, convenience and responsibility seem to be the criteria contributing to a keeper's motivation. Lack of security results in stress and discomfort to work in an area. If a service area is inconvenient, keepers will stay there only for the absolute necessary amount of time. A safe and pleasant environment and adequate responsibility are important prerequisites for keepers' commitments.

Useful elements of security, convenience and responsibility vary, depending on the type of exhibit, its operation and other factors. Checklists help to remember some of the elements during planning and have been developed by designers and institutions.

For assessing this complex area on a level that is suitable for publication, the description of FEATURES DEDICATED TO KEEPERS seems to be an adequate approach.

#### 15. FEATURES DEDICATED TO VISITORS:

People have specific expectations when visiting a zoo exhibit; some of them are conscious, some unconscious. Basically, the zoo visitor desires a safe, enjoyable and entertaining experience (Ebenhöh, 1992).

Safety from the visitor's perspective is ensured when the environment feels safe, protection from hazards is obvious, accessibility and orientation are easy. Provisions also should respect the different abilities of zoo visitors.

An enjoyable exhibit is one that is aesthetically pleasant, inviting to stay, and interesting to experience. Coherence, complexity, legibility and mystery were found to contribute to peoples' preference of environments (Kaplan, 1989). Convenient places to stay and enjoy are just as important as the exhibit itself.

The entertaining part of an exhibit relates to features attracting the visitors' interest. The most obvious is the animal itself, provoking observation and discussions among visitors. As inactive animals are not always sufficient stimulus for visitors, design features can help out. They can range from interpretive signs to games. Everything that can be actively explored and involves several senses is entertaining to visitors. Obviously, arousal often comes from

features working against safety issues. But a balance can be found by incorporating arousal effects to defined areas and/or times that can be actively chosen or avoided by visitors.

#### 16. INTERPRETATION:

The zoos' mission to educate their visitors is backed up by visitor studies. These studies help to understand the zoo visitors' entering knowledge and motivation. They help to understand what people can possibly and actually do learn at the zoo. Finally, they help to evaluate education efforts undertaken by a zoo (Ebenhöh, 1992).

The design assessment criteria from an educator's perspective might be: provisions taken on the site to support visitors' concentration on the exhibit message; provisions taken on the site to support visitors' motivation to grasp information going beyond the obvious; documented efforts of the institution to develop learning devices by using tools of evaluation.

Planning and testing of educational devices are desirable, but rarely done. Devices for interpretation and their evaluation can be documented under INTERPRETATION, RESEARCH and CONSERVATION.

#### 17. MANAGEMENT:

How to shift animals between indoors and outdoors, special procedures for maintenance of the exhibit, and animal behavior enrichment are examples for issues pertaining to the management of an exhibit. The descriptions of management practices will vary depending on the novelty of the activities for a zoo.

#### 18. RESEARCH:

A zoo exhibit that a curator or director would rate positively, might be one fulfilling the needs of the animal enclosed, the visitor viewing and the sponsor paying. Continuity is an important key to successfully serve these three interest groups.

For the long-term operation of an exhibit a master plan is very helpful. Stating the purpose of the exhibit design explicitly and describing the features serving this purpose, helps with decisions when changes or repairs are to be made. Systematic documentation and evaluation can ensure, that these decisions are based on objective criteria rather than personal preferences. The documentation includes the animals' health status, the plants' condition, visitation and other information relevant to an exhibit's performance. The evaluation process should include a preliminary evaluation during planning, a formative evaluation during development and a summative evaluation after implementation.

But, these documentation and evaluations are rarely done. If worth publishing, they may be mentioned under RESEARCH.

#### 19. CONSERVATION:

Keeping and breeding of a species should not only serve the zoos' animal population, but ultimately the wild population of the species. The relating section considers zoos' efforts to support survival of exhibited species (not individual animals) in their natural habitat. The zoo's efforts should be documented, communicated to the public, and show that the confined animal is part of this effort. This can be done, for example, by explaining that the offspring will be reintroduced to its native habitat when the habitat's suitability is restored.

An animal exhibit can be part of a story, presenting the animals' relationship to a specific habitat. Additionally, an animal exhibit can present several aspects of a habitat in order to give the interested visitor an image of this habitat. An institution might also be involved in habitat protection and present issues relevant to this effort.

These are desirable concepts, yet rarely attempted. If such efforts are documented they can be described as pertaining to INTERPRETATION, RESEARCH and CONSERVATION.

## 20. LOCAL RESOURCES:

The local residents might be involved in the design process or produce special parts for an exhibit. These efforts are mentioned under LOCAL RESOURCES. They often volunteer for educational programs. Criteria relevant to this perspective may be covered under FEATURES DEDICATED TO KEEPERS or INTERPRETATION or MANAGEMENT of an exhibit. The flexibility of this approach seems adequate, considering the variety of possible involvement of local resources.

The local residents' interest should be the careful use of local resources, such as soil, plants, energy and water. The closer the character of the existing site is to the envisioned character of the planned habitat, the fewer efforts are necessary for its construction and maintenance. The more remote the desired microclimatic conditions in an exhibit are from those inherent to its site, the more energy and effort are required to maintain the desired artificial conditions. Other aspects influencing energy consumption in exhibit design are the selection of materials and technologies, exposure to the sun, use of plants, waste treatment, etc.

The criteria to judge a new structure for its ecosystem appropriateness are therefore: documented considerations for the integration of exhibit topic, construction site and exhibit layout; documented efforts to save resources within construction; and documented efforts to save resources within operation and maintenance.

There is a permanent discussion on what is appropriate use of resources in a zoo (Norton et al., 1995). The views change rapidly and relatively with the availability of technologies and changing policies. In order to illustrate this rapid development, the assessments include special sections on CONSERVATION and LOCAL RESOURCES for zoos to communicate their philosophies and approaches.

### 3.3. Potential Users of a Website on Zoo Design

The World Zoo Organization estimates a number of 600 million zoo visitors worldwide which is about 10% of the world's total population (source: <http://www.wzo.org>). Global Reach estimates 243 million internet users worldwide, which is about 4% of the world's total population. About 60% of these users are using the English language on the internet (source: <http://www.euromktg.com>).

When assuming that zoo visitors are representing the global population, there would be 24 million (4% of 600 million) internet users among them, 14.4 million (60% of 24 million) of them using English websites. However, zoo visitors are more likely to live in cities of industrialized countries. Besides, internet use is rapidly increasing. Thus, 50 million of zoo visitors can eventually be expected to use English websites. These 50 million of zoo visitors are potential visitors to the ZooLex website.

The World Zoo Organization has about 550 institutional members in 54 countries. If ZooLex can reach about 1,000 interested users per institution by support from these institutions, about

550,000 ZooLex visitors can be expected in a medium-term. These figures are low estimates since internet use is still rare in many countries. However, projections show yearly doubling of internet usage (source: <http://www.euromktg.com>).

The following is an estimation of professional ZooLex users who might be ZooLex members: an average of three internet users per member institution of the WZO and the same number of commercial users per member institution adds up to 3,300 professionals that might use ZooLex within a short-term. Assuming that animal keepers will willingly use the ZooLex website, too, I expect a substantial higher number of professional ZooLex users within a medium-term.

The costs for the reservation of a web domain and for server space are not substantial. What really counts for the cost of a website is the labor for creating and maintaining it and its marketing. These estimates show that a website can reach far more individuals at a relatively low price than any other medium.

I therefore designed my pilot project based on the criteria developed for the assessment of animal exhibits and my knowledge about the potential of a website on zoo design. The goal of the pilot projects was to explore the level of interest of the target audience in the information provided.

## 4. Pilot Project

A pilot project was designed to test the following hypotheses:

The criteria chosen for describing animal exhibits are appropriate, because

- the necessary information is easily available, and
- the criteria are consistent regardless of when and where the exhibit was created.

The proposed standard is appropriate for describing animal exhibits, because the descriptions

- can be created within a reasonable time,
- are easy to read and to understand for an international audience,
- attractive for zoos' public relations,
- valuable for zoo professionals, and
- appealing to everybody with an interest in animals.

The format of a website is appropriate for reaching an international audience.

The organization and layout of the sample website are appropriate for the target audience, because

- navigation is easy,
- pictures are attractive, and
- topics are of interest.

A sample website called ZooLex was designed, in order to do the testing on an international scale and within a reasonable time. The name ZooLex was created by using the Greek stems "zoo" for animals and "lex" for dictionary. The website and an accompanying questionnaire were launched in September 1999. The survey was done from September to December 1999. Interviews and presentations done within the same period of time provided additional feedback to the pilot project.

### 4.1. The Sample Website

ZooLex is an internet site, offering standardized descriptions of animal exhibits, along with specifications on the involved firms, a discussion forum, and contests, as well as links, publications, and events related to animal exhibit design.

Most of the website was created with Netscape Composer. Some parts were programmed, and some parts include open source programs. The programming was done by Hans Fiby, a professional in computer sciences.

#### 4.1.1. Objectives of the Sample Website

**ZooLex** targets a professional audience. This audience is estimated to be considerably small; about 1000 persons worldwide are working in the field of zoo design. Therefore, the website also needs to be geared to the general public in order to be cost effective.

The purpose of **ZooLex** is to

- Present animal exhibits worldwide to an international audience;
- Offer relevant information to professionals;
- Provide a platform for exchange of expertise;
- Publish people's opinions on animal exhibits in discussions and contests.

The sample website was created to find out if the design chosen is appropriate for the two different target audiences. On one hand, professionals should be able to find useful information easily. On the other hand, simple text and an abundance of pictures should attract the general public. Both groups should find attractions and possibly get involved.

#### **4.1.2. Rationale for Choosing Zoo Exhibits for the Pilot Study**

Zoos, which received awards from the AZA's Honor and Award Committee for some of their exhibits, were asked to make site plans, pictures and descriptions of these exhibits available for publication. European zoos with outstanding exhibits were asked to contribute in the same way. Woodland Park Zoo in Seattle, Washington and Zoo Zürich in Switzerland agreed to participate in the pilot study.

Both zoos are very well known institutions within the zoo world. Woodland Park Zoo received most awards for exhibit design so far and was the first to implement immersion type exhibits. Zoo Zürich was managed for a long time by Heini Hediger, the founder of zoo biology.

Both zoos have excellent bear exhibits of the immersion type. They were chosen to compare the consistency of the criteria used for **ZooLex** exhibit descriptions.

Zoo Schönbrunn, located in Vienna, Austria, is the oldest zoo in the world open to the public without interruption. The newly built Elephant Park seemed to be suitable for a comparison with the two bear exhibits from which it is quite different.

The prominence of these zoos is believed to be helpful in creating interest in my study and getting useful feedback in a survey.

All three zoos were visited to obtain the material for the descriptions. This gave an insight in the necessary time and effort to search for and choose this material.

#### **4.1.3. Description of Topics and Links**

The sample website of **ZooLex** features 12 topics and 4 exhibit presentations to choose from:

1. Home
2. Survey
3. Find
4. Firms
  
5. Opening Soon (one exhibit presentation)
6. Recently Opened (one exhibit presentation)
7. Exhibit Gallery (two exhibit presentations)
8. Contests
  
9. Forum
10. Links
11. Publications
12. Events

#### **4.1.3.1. Home**

The homepage is the entrance to the site. It shows the logo of **ZooLex**, its title, and the topics covered.

For the pilot project, it gives an introduction to the site presenting the designer of **ZooLex**, the purpose of the site, instructions on how to use it, and a recognition to those who made **ZooLex** possible. This information may be shifted from the homepage in favor of something more captivating after the evaluation is done. As an attractive feature, the homepage may present the winners of **ZooLex** contests.

#### **4.1.3.2. Survey**

For the pilot project a survey was included to the website which will be replaced later by a different topic. This page explains the objectives of the site and invites visitors to complete and submit a questionnaire which is linked to the button „SURVEY NOW“. The questionnaire has sections on the data of the respondent, the performance and usefulness of **ZooLex**, and the respondents' anticipated participation in **ZooLex**. Multiple choice questions are complemented by a space for comments to each section. The questionnaire was programmed from my draft by Hans Fiby.

#### **4.1.3.3. Find**

This page offers three different modes to search for a **ZooLex** entry: word, index, and lists. A search engine in **ZooLex** can be used either for free search or for index search. It is an open source program that was adapted for this purpose by Hans Fiby. The index contains terms that I added as key words to each exhibit description. The lists help to find exhibits by zoo, location, animal, designer, and opening date. In the sample website, they are simple enumerations with links. For further expansion, they would require programming of a database.

#### **4.1.3.4. Firms**

This page gives an alphabetical list of firms for design or construction, with their addresses and links to their homepages if available. Each of the exhibit presentations in **ZooLex** provides references to the firms that contributed to its design and construction.

#### **4.1.3.5. Opening Soon**

In the section “Opening Soon”, the future Tropic House at Zoo Schönbrunn in Vienna is presented as an example for a zoo exhibit that is going to be built.

#### **4.1.3.6. Recently Opened**

In the section “Recently Opened”, the Elephant Park at Zoo Schönbrunn in Vienna is presented as an example for a zoo exhibit that was recently opened.

#### **4.1.3.7. Exhibit Gallery**

The “Exhibit Gallery” features the Spectacled Bears' Exhibit at Zoo Zürich and the Northern Trail's bears' exhibit at Woodland Park Zoo in Seattle, as examples of standardized descriptions of animal exhibits. These include location, size and costs of the exhibit, animal species shown, opening date, names of design and construction firms, plant lists, and descriptions of the exhibit features. Also, a site plan and up to 25 pictures with specified viewpoints are part of the presentations.

#### 4.1.3.8. Contests

The idea of these contests is to have the general public assess animal exhibit. They will be invited to judge the exhibits presented in **ZooLex** and give reasons for their rating. Obviously, this page can be developed only after a sufficient number of exhibits have been presented. Therefore, the sample website did not show, how the contests will work.

#### 4.1.3.9. Forum

The discussion forum is an open source program adapted for the purposes of **ZooLex** by Hans Fiby.

Many people working in the environment of zoos and similar institutions have the desire to express their needs and experiences. This is, for example, shown in conferences and in the activities of association. Follow up on exhibit design is very valuable for designers, but might offend institutions. **ZooLex** therefore should offer a forum for this kind of communication, but restrict access. Access might be limited to members of organizations that could communicate by other means too. But, their members will profit from the technologies that **ZooLex** can offer on the internet.

#### 4.1.3.10. Links

The listed links, related to animal exhibitry, were found on the internet and tested for usage.

#### 4.1.3.11. Publications

Relevant publications are listed in the alphabetical order of the authors' names. Subjects will be marked for entry into a database for research. Some documents may be available for downloading.

#### 4.1.3.12. Events

Dates of events are announced by several organizations. **ZooLex** offers the links to their relevant webpages.

### 4.1.4. Organization of the Site

In order to avoid confusion, the information is presented on only a few levels. Their hierarchy and names are the ones common to other publications in this field, with the AZA website serving as a model.

At the top of each page are the **ZooLex** logo and the name of a given topic. All topic pages have a navigation bar with links to all other topic pages. These pages form a sequence that can be browsed by using the arrows at the bottom of the pages. For the pilot project, the four exhibit presentations are part of the sequence. Later, exhibit presentations will only be accessible by links to be retrieved like books in a library. As such, they have a different layout without the navigation bar. The "back button" and the arrows at the bottom are for handling these pages.

The sections "Opening Soon", "Recently Opened", and "Exhibit Gallery" were organized identically for the sample website. The first page of each section gives an introduction and instructions on how to browse that section and how to submit an entry. In the middle of the page **ZooLex** advertises the "Latest Entry" to the section, giving the name of the respective exhibit, a link to its page, and a picture. The next page gives an alphabetical list of exhibits in the relevant section. Then the exhibit presentations follow.

All exhibit presentations start with the name of the zoo and the exhibit presented. There is no navigation bar at the top of these pages, considering that they may be printed frequently. Next comes the location of the zoo with a link to its website if applicable, some key words for research, the animal families and species exhibited, the size and costs of the exhibit, the opening date, the designers, and a description. The right margin shows thumbnails of plans and pictures with titles, references to their sources, and numbers. The numbers refer to picture viewpoints that can be found on a corresponding map.

These sections will be reorganized according to the findings from the evaluation of the pilot project.

#### 4.1.5. Features for Orientation

All pages have the same top line, featuring the logo, the title, and a horizontal bar. This is the only type of horizontal bar that is used for structuring the text throughout all pages.

The navigation bar on top of all topic pages highlights the actual topic by leaving out the background color.

All exhibit presentations have the same layout that differs from other pages by having a right column with pictures. These small pictures are “thumbnails” enhancing interest to the page, without delaying its downloading. By clicking on the thumbnail, the picture opens to its full resolution on a separate page.

All buttons have a distinctive layout relating to their purpose. Their use is explained on the homepage.

Type of button	Location on page	Layout
ZooLex topic link	Top	Peach-colored square with name of topic
ZooLex page link	Bottom	Peach-colored textured raised squares with arrow left/home/arrow right
Thumbnail pictures	Right margin, bottom	Light yellow background with raised pictures
Navigation on same page	Left	Peach-colored raised squares with arrow up/down

#### 4.1.6. Layout

For an international audience it is important that the features are common and the layout is simple, to ensure that the pages are readable with different browsers. For handicapped users it is especially important that the layout is simple, also that the text does not rely on pictures, and that the tables are simple to read.

Times New Roman is the only font used, as it is the most common and readable. Headers are bold or capitalized. Underlined words are links, and Italics is used for references.

Graphics and pictures are not part of the text but are complementary. They are represented by thumbnails and can be downloaded.

### 4.1.7. Evaluation Procedure

The questionnaire is part of the sample website. Selected zoo professionals were contacted by email and asked to visit the sample **ZooLex** website on the internet and to complete the accompanying questionnaire.

## 4.2. Evaluation

### 4.2.1. Tools for Evaluation

Four methods were used to evaluate the pilot project:

- A comparison of the criteria which were used for assessing zoo exhibits for **ZooLex**,
- a formal research by a survey,
- an indirect observation of the visitors to the website, and
- an informal research by interviews.

The results of the survey and the interviews help to better focus **ZooLex** and to improve its organization and layout. The answers of all respondents are discussed and compared with the answers of selected key respondents and complemented by answers from interviews.

The website was not linked to any search engines for two reasons: First, it is a pilot project for scientific research. There was no funding for additional work. Second, I did not want to frustrate random visitors by not regularly offering new attractions. This would probably spoil potential future success of the website. As a consequence, only users actively invited by me and by invited users account for the total number of visitors to the sample website of **ZooLex**.

### 4.2.2. Comparison of Assessment Criteria Used in ZooLex

The following table gives a comparison of the information obtained for describing three animal exhibits in the pilot project. It shows where problems with the consistency and quality of information may arise.

This comparison of information shows that figures for the size and costs of exhibits are hardly comparable. It also shows that the information on plants used in exhibits is inconsistent because it was provided for different states of the exhibits. The exhibit description needs to specify whether the plants listed were planned for use or actually planted. Finally the comparison shows that considerable time is necessary to get suitable plans and pictures and digitally reproduce them.

Criteria	Woodland Park Zoo's Brown Bears	Zoo Zürich's Spectacled Bears	Zoo Schönbrunn's Elephants
LOCATION	No problem.		
KEY WORDS	Extracted from descriptions. (Input from professionals is useful as to what they would search for.)		
ANIMALS (Species, Number)	Specified numbers and species may change over time. (Date of revision is stated on each <b>ZooLex</b> page.)		
DESCRIPTION	Compiled from AZA exhibit award application.	Compiled from various publications.	

SIZE	Figures only available for the whole Northern Trail, as exhibit was designed a part of this entity.	Only figure for whole site available.	Separate figures for indoors, outdoors, single pens, barn, and pools available.
COSTS	Figures only available for the whole Northern Trail, as exhibit was designed a part of this entity.	Total costs available, costs for design only as estimated percentage of total costs.	
OPENING DATE	No problem.		
DESIGN, CONSTRUCTION	Usually well documented, some request for details were necessary.		
LOCAL CONDITIONS	Added from Walter and Lieth's <i>Atlas of Climatic Diagrams</i> .		
PLANTS	List of planted species was available from Zoo's horticulturists with no distinction between animal and exhibit space.	List of planned species was available, separate for animal and visitor space. Actual species might be different.	Not provided. Existing live trees should be added.
FEATURES DEDICATED TO ANIMALS, KEEPERS, AND VISITORS, INTERPRETATION, MANAGEMENT, RESEARCH, CONSERVATION, AND LOCAL RESOURCES	Compiled from AZA exhibit award application.	Compiled from various publications.	
	Compilation from several sources results in various degrees of detail for each criterion, depending on the purpose of the original publication.		
Overview Plan	No problem to use the official zoo map.		
<b>Site Plan</b>	Only earthwork plan available, which is hard to read.	Only poor-quality slides or copies of plan available.	Only picture in journal available.
	Zoos had no appropriate illustrative plans at hand and referred to planners' copyrights. Planners were careful about having site plans published. Illustrative plans are usually suitable for publication, but planners did not make the effort of sending a copy.		
<b>Pictures</b>	Slides were available, but no slide scanner. Hard to get scans without being present.	Slides were available, but no slide scanner. I borrowed slides for scanning.	Pictures were available, but no scanner. I borrowed pictures for scanning.
	Pictures available mainly show animals. Pictures of holding facilities and interpretive devices were scarce. I used mostly my own pictures.		

### 4.2.3. Survey

A questionnaire was added to the website and is announced on the **ZooLex** homepage. The questionnaire has four sections:

- Section A relates to the particulars of the respondent to be filled in voluntarily.
  - Section B relates to the performance of the website, dealing with its organization and layout.
  - Section C relates to the usefulness of the website as pertaining to its topics and features, information and links.
  - Section D relates to the respondents' anticipated active participation in **ZooLex**.
- Multiple choice questions are complemented by a space for comments.

The questionnaire was tested for clearness with some German and English speaking persons before adding the final version to the website. A print of the pages is provided in the appendix to this paper.

On August 30, a range of zoo professionals and non-specialists was contacted by email and mail and asked to visit the **ZooLex** website on the internet and to fill in the questionnaire. The sample included professionals from Australia, Austria, Germany, South Africa, Switzerland and the United States:

10 zoo directors,  
 10 zoo employees,  
 9 zoo designers (architects and landscape architects),  
 5 animal conservation related organizations, and  
 12 persons not related to zoos.

On November 11, I sent out emails to remind some key respondents to submit the questionnaire and invited an additional 3 zoo directors, 2 zoo employees and 6 zoo designers.

All in all, 57 persons, including 40 zoo professionals were invited to visit the **ZooLex** website:

Contacts	Zoo Professionals			Others		
	Directors	Employees	Designers	Organizations	Students	Others
Emails on August 30	3	10	8	4	2	9
Letters on August 30	7	0	1	1	0	1
Emails on November 11	3	2	6	0	0	0
Contacts to Groups	40			17		
Total Contacts	57					
<b>Potential Visitors</b>	<b>About 40</b>					

Among the 57 persons I invited to visit ZooLex, there 15 to 20 persons that I had invited as good protocol, not because I expected them to answer the questionnaire. I did not expect organizations to answer the questionnaire. I also estimate that several persons contacted are not likely to use a computer or the internet at all. Out of 57 persons that I had invited, an estimated 40 were potential visitors of **ZooLex**.

More than 500 persons from all over the world visited **ZooLex** from October to December 1999. Since the address of the website was not added to any search engines, no random visitors can be expected to have visited. All visitors must have been actively invited by me and my contacts respectively.

The survey produced 39 valid responses as of January 2000. Among the total 39 respondents, there are 17 that I know personally. These are persons that have been dealing with zoos for some time and may become regular visitors of **ZooLex**. They are my key respondents regarding the qualitative evaluation of the sample website.

This means that my 17 key respondents make up 30 % of those people that I had invited (57) or 40 %, of the estimated potential visitors (40), considering the calculated non-respondents. 39 total respondents is about 8 % of total visitors (about 500) to **ZooLex**.

Responses by Dec. 1999 Groups	Zoo Professionals			Others		Total
	Directors	Employees	Designers	Students	Others	
Key Respondents	3	4	6	3	1	17
Non-Key Respondents	1	5	4	3	9	22
All Respondents	4	9	10	6	10	39

#### 4.2.4. Webalizer

A program documents the number and time of visitation to the **ZooLex** website.

The following table shows the visitation of the **ZooLex** website from September 1, 1999 to December 31, 1999.

Time Period	Sites	Hits
September 1999	29	2597
October 1999	183	6432
November 1999	173	4107
December 1999	199	6050
<b>September 1 to December 31, 1999</b>	<b>584</b>	<b>19186</b>

The number of sites is assumed to refer to individual persons visiting **ZooLex**, for purposes of this analysis. They are called visitors in this report.

The number of 584 total visitors probably includes repeat visitors. On the other hand, webalizer only recognizes proxy servers, thus missing visitors using the same proxy.

Hits are the common count for analyzing visitation of a website. They relate to the hits of buttons made on a website, but do not give an exact count of anything referable. To some extent, they may reflect the time that people spend on a website. Thus, they help to compare interest levels between different websites.

Highest daily usage was on October 7 and 8 with 39 and 51 visitors, following the AZA conference and on November 15 and 16 (Monday and Tuesday) with 37 and 14 visitors respectively, following my reminder emails of November 12 (Friday).

Visitors to **ZooLex** came from the countries listed below by the end of January 2000. The Webalizer may not have recognized additional countries, as many addresses could not be resolved to country names.

<b>Countries</b>	<b>invited Persovs</b>	<b>Visiting Persons</b>
Australia	2	1
Austria	5	66
Canada		24
Colombia		5
Finland		7
Germany	2	34
Great Britain	1	1
Israel		2
Japan		5
Malaysia		1
Netherlands		1
Spain		1
Singapore		3
South Africa	1	5
Switzerland	2	22
Trinidad		8
United States	27	242
others/unknown	17	333
<b>Total</b>	<b>57</b>	<b>761</b>

#### **4.2.5. Interviews**

A poster presentation at the annual conference of the American Zoo Association from September 24 to 28, 1999, offered an excellent opportunity to talk to zoo professionals about their needs and expectations related to **ZooLex**. Moreover, some interviews with zoo professionals were conducted by email, as a follow up to my invitations to visit the website.

#### **4.2.6. Analysis and Discussion**

In my survey, data generated by 17 key respondents show no tendencies related to user groups. Responses seem to be influenced by personal preference and interest rather than by profession. Also, data generated by 17 key respondents show the same tendencies as those generated by 22 non-key respondents. Preferences among key respondents, however, are more distinct than those of non-key respondents. This might be due to the fact that the share of non-professionals is much higher among non-key respondents. Also, I cannot be sure about appropriate and honest answers from non-key respondents, since I do not know most of them personally. But, the consistency of tendencies in key and non-key responses allows considering all 39 responses as valid.

Since the total number of respondents is quite small, the data may be biased by non-respondents. However, the survey helps to get a first impression of the performance and usefulness of the website.

##### **4.2.6.1. Content and Layout of the Website**

The three pages “Opening Soon”, “Recently Opened” and “Exhibit Gallery” are expected to have the most regular visitation of all **ZooLex** pages according to the survey. In the interviews, professionals expressed a need for standardized descriptions of zoo exhibits. Some respondents are ready to get their exhibits in **ZooLex** and are willing to pay for this service.

From the survey and the interviews, it also became clear that the interest in a discussion forum is high. Key respondents' answers indicate that professionals can be expected to visit regularly. Interviews, however, revealed the problems with such a forum. To be useful for zoo professionals, criticism is important. Especially, critical reviews written by professionals are valuable and desirable. However, zoos will not willingly have their exhibits serve as focus for public criticism. Restrictions to the forum will be the solution to this problem. Critical reviews might be accessible only for members of zoo organizations. The submitter may decide whether he wants everybody to read the statement, or he may lock it in favor of the "zoo audience".

Interestingly, the survey indicates that users like the free and the index search. The search modus by lists offered in the sample website therefore will not be further developed.

The page "Firms" gives an alphabetical list of firms for design or construction, with their addresses and links to their homepages, if available. Each of the exhibit presentations in **ZooLex** provides references to the firms, that contributed to its design and construction. Visitation to this page cannot be expected to be high. Most respondents intend to visit this page seldom or maybe monthly. Professionals are of course more likely to visit than are others. This part of **ZooLex** might only be expanded if paying members support the service.

The popularity of contests remains unclear. Because it is hard to imagine how the contests will work without having an example, the respondents were vague in their answers. Interest of the general public seems slightly higher than that of the key respondents. The interviews supported professionals' skepticism towards contests. They may be done mainly for the enjoyment of the general audience and to attract regular visitors to the site. Finding a sponsor, especially for this part of **ZooLex**, is worth considering.

The survey results indicate more interest in links, publications and events than expected. These pages seem to offer a desirable service. In the long run, firms should be asked to pay for having a link from **ZooLex** to their website. A database of publications needs regular funding to be administered. The services "Links", "Publications" and "Events" might be offered to paying members only.

The attractiveness of the pages may be improved graphically. Criticism has been mostly expressed about the loading time of images and the readability of site plans. The first is a problem inherent to high-resolution pictures and confirms the strategy of having thumbnail pictures on the main page. The readability of site plans depends heavily on the material provided. North arrow and scale are considered useful additions.

#### **4.2.6.1. Standardized Descriptions Used in ZooLex**

The format of the exhibit presentation finds approval by both the general and the professional audience. The information provided is for the most part considered useful. The vast majority of respondents rates the text and images as interesting.

The criteria used for standardized descriptions in **ZooLex** resulted from a compromise between two diverging needs of institutions exhibiting live animals. On one hand, there is their need for credibility and trust. On the other hand, there is their need for critical exhibit evaluations.

**ZooLex** can comply with both needs by controlling communication flows. Standardized descriptions of animal exhibits are promoting institutions and supporting their credibility. They are also a good basis for any kind of evaluation. Critical reviews and evaluations can be discussed in the **ZooLex** forum. Those statements that do not seem appropriate for the general public can be restricted to members of a zoo organization. This way, the dissemination will not differ much from papers given at a conference. However, the information will reach more people faster, is related to other topics by key words in a database, and thus easier to retrieve.

The survey results indicate that the following features are considered to be very useful besides the basic description: site plans, size and cost of an exhibit, plant lists and some text on the management of an exhibit. Key respondents also value statements on research and conservation efforts undertaken by the zoo as well as images of holding facilities and interpretive elements. A North arrow and scale should be added to site plans.

It seems that figures of an exhibit's costs most of the times cannot give a clear picture of the total expenditures related to an exhibit. Even for contracted work, total costs of planning and construction are not always available. An interpretation of the figures given is necessary to get an idea of the allocation of means. Especially, work that was done in house and additional staff that was hired to accomplish design or construction tasks, needs to be mentioned.

There is not much incentive for institutions to find out exact figures or make estimates for publishing purposes. One has to be happy to get approximate indications when asking. Yearly maintenance costs for structures, animal care and personnel cannot easily be estimated and obtained.

A similar problem arose regarding the size of exhibits. Unfortunately, figures differentiating between indoors and outdoors, on exhibit and off-view, accessible and designated areas, animal, keeper and visitor area are seldom available. In general, one figure for the total size of the animal enclosure, including indoors and outdoors, on exhibit and off-view is documented.

Color-coded and scaled copies of site plans would improve the consistency of information. They would also help to visualize space allocation and to estimate the sizes of different areas. Experiments with color-coding are necessary to ensure readability of such plans.

According to the respondents, I need not bother much about making different measures comparable. Figures for size and costs without further visualization or reference are just fine for most respondents.

### **4.3. How to Use the ZooLex Website**

Considering that ZooLex targets different audiences, usage of the website will vary, too. This chapter is an analysis of the potential benefits of the ZooLex website for the intended user groups.

#### **4.3.1. For Work**

Zoo design involves professionals from several disciplines such as curators, animal keepers, educators, horticulturists, landscape architects and architects. Depending on the stage of a task and their involvement in zoo design, they will look for inspiration or for specific information.

On the ZooLex website professionals can shop ideas for changing or creating an animal exhibit. They may go to the ZooLex "Find" page and search for an animal species to find a range of exhibits for this specific species. They may also search for a certain type of habitat or

a geographic region to retrieve ZooLex exhibits displaying animals from this habitat or region. Or they may just have heard about specific exhibits that they may want to see. The ZooLex database offers a search engine for retrieving descriptions of animal exhibits by key words. Plans, images and descriptions of an existing exhibit help to get an impression of the exhibit's layout and operation. Described efforts in interpretation, conservation, research and use of local resources may challenge the reader to try something new. Figures of the size and costs as well as of the duration of design and construction give a general idea of the commitment and resource allocation that is necessary for a certain type of exhibit.

During the design process professionals might want to ask experts specific questions about the suitability of certain plants or how to combine certain animal species in one exhibit. They might need specifications for construction such as the width of a moat or the height of a fence for an animal species. By using the ZooLex search engine and retrieving comparable exhibits for this animal species, they find the contacts to the experts they need under LOCATION of the exhibit descriptions.

Before considering using plants and construction features that also have been used elsewhere, the climatic diagrams of these places should be compared with one's own. This helps to understand similarities and differences in local climatic conditions that might affect the use of certain features.

When looking for a specialized firm for design or construction, the ZooLex "Firms" page is a resource to find references and contacts. Finally, the ZooLex pages "Links", "Publications", "Events" and the "Forum" will help professionals to keep up to date in the rapidly changing field of zoo design. The "Contests" will give hints about visitor expectations and how to focus marketing efforts.

Academics will use ZooLex as a resource on the topic of zoo design. Standardized descriptions of animal exhibits are a valuable base for further research or evaluation. ZooLex gives a picture of the state of the art in zoo design and offers contacts to experts.

#### **4.3.2. For Leisure**

An increasing number of people interested in zoos and similar institutions is using the internet to find information on zoos. ZooLex standardized descriptions of animal exhibits offer additional information to that offered by zoos' websites.

Before visiting a city and deciding on a visit to the local zoo, an interested person nowadays is likely to go to the internet. From the city's website he or she will probably find a link to the zoo's website. There, the potential zoo visitor will find the common information on opening hours, entrance fees and how to get to the zoo, probably some information on special services, the number of species exhibited, new arrivals and press releases about recent and upcoming events. Some zoos feature pictures and descriptions of popular animal species they exhibit. A small but growing number of zoos link this information to a site plan where you can click on exhibit symbols to find these pictures. Sometimes they also offer a picture of the exhibit and a short description.

The potential zoo visitor will find enough information on a zoo's website to plan a visit but usually will not be able to decide if the visit is worthwhile. He or she will be able to estimate the time to spend in the zoo but not the likely experience. So hopefully, the zoo's website will provide a link to the ZooLex website, telling that this is where to go for more specific information on some of its exhibits.

The ZooLex standardized description of animal exhibits gives a relatively objective view of an exhibit and the zoo's approach to it. It also implies an image of the zoo in general. From reading the descriptions of FEATURES DEDICATED TO ANIMALS, KEEPERS and VISITORS, the reader can infer how much thought was given to each of these important user groups when designing the exhibit. The descriptions's section on INTERPRETATION, describing the signs and interactive devices related to the exhibit, shows a zoo's effort to use an exhibit for education purposes. RESEARCH and CONSERVATION efforts of a zoo are reflected in the related descriptions. The use of LOCAL RESOURCES is an indication of a zoo management's awareness of ecological issues. If any of the sections is not included in the standardized description of an animal exhibit, the reader will probably infer that the zoo is ignorant about the issue. Innovative approaches described in ZooLex on the other side might trigger a potential visitor's curiosity and affect his or her decision to really take the time for the visit. This means that ZooLex can stimulate visitation, help to orient and to form realistic expectations of a zoo visit.

Visitors to the ZooLex website will probably start browsing the pages to compare exhibits they know with others they have not seen. They might plan to see other zoos to actually visit interesting zoo exhibits. They also might want to express their opinion on what they have seen. ZooLex visitors can do so by sharing their opinion in the ZooLex "Forum" and by voting in ZooLex "Contests".

#### **4.3.3. For Marketing**

ZooLex standardized descriptions of animal exhibits are an efficient but cheap marketing tool for zoos and similar institutions. Zoos cannot only promote single exhibits but at the same time their image and philosophy. The format of the description is flexible enough to allow emphasizing certain issues.

For example one zoo might want to stress its conservation effort by describing its in-situ program of reintroducing an endangered species to its original habitat. The zoo might tell about the breeding program in the descriptions's section on CONSERVATION and provide a link to its own special website showing how the animals are raised, prepared for release, how the local rangers are trained for their tasks, maybe even linking to webcams showing the animals before their release, etc. Another zoo might show its conservation efforts as pertaining to ecologically sound construction, describing the energy, water and waste management and illustrating how resources are saved by these measurements. FEATURES DEDICATED TO ANIMALS is a section to show innovations in the field of environment enrichment to peers and visitors. Under INTERPRETATION zoos can show their creativity in producing interpretive devices, etc.

ZooLex standardized descriptions of animal exhibits are also a marketing tool for suppliers of products, technologies and services for zoos. Firms get worldwide exposure by presenting examples of their work without additional effort. The presentation of best practices also promotes the contracting of qualified professionals for planning, construction and maintenance of animal exhibits. Finally, sponsors supporting ZooLex will reach an international audience when they are advertised in ZooLex.

## 4.4. Conclusions

The evaluation of the pilot project suggests that the following objectives of **ZooLex** can be met:

- Describe animal exhibits in a comparable way;
- offer relevant information to zoo professionals;
- provide a platform for exchange of expertise;
- reach an international audience;
- publish people's opinions on animal exhibits in discussions and contests; and
- run a website on zoo design economically.

The problems that arise, when evaluating animal exhibits on a comparable basis are of a theoretical and of a practical kind:

Animal exhibit designs reflect peculiarities of the hosting institution: The philosophy of the actual management, design trends and individual preferences, the heritage of the place, constraints in budget, staff, qualification, time, climate, and so on. Some of these strongly influence the design but hard to measure or even to pinpoint. In order to be able to compare exhibits from different places and from different times, the criteria need to be general enough to allow describing all design relevant issues but steady enough to remain comparable.

Therefore, it seems appropriate to have more or less subjective descriptions but define the topics to be covered. The criteria used for standardized descriptions have proven to be useful.

The disadvantage of these relatively informal descriptions is that they vary with standards: What is common practice in one place and needs not be mentioned in an exhibit description might be emphasized by another institution in their exhibit description as a new achievement. This bias will be obvious to insiders, but may be misleading for other people. Comments in a discussion forum will hopefully correct the image for those interested in depth.

Zoo professionals from Australia, Austria, Germany, Great Britain, South Africa, Switzerland and the United States were contacted and have visited **ZooLex**. Additional visitation to **ZooLex** came from countries where I had no contacts, such as Canada, Colombia, Finland, Israel, Japan, Malaysia, Netherlands, Spain, Singapore, and Trinidad. This shows that **ZooLex** is already reaching the international zoo community.

The total number of different individuals visiting **ZooLex** was more than 500 from September 1 to December 31, 1999. I invited an estimated 40 of these. Total visitation then is about 12 times higher than the number of persons invited. This suggests a great effect of word of mouth within the zoo world. It also suggests that **ZooLex** offers information relevant to the professional audience and can provide a platform for exchange of expertise.

Results of the survey and the interviews confirm the high interest in exhibit presentations and a discussion forum.

A very specialized site (<http://www.worldzoo.org>) was able to draw 23,000 visitors with 72,000 hits in January 2000. This website is operated by ISIS, an international non-profit membership organization which serves 550 zoological institutional members, from 54 countries, worldwide. The International Species Information System (ISIS) supports conservation and preservation of species, by helping member facilities manage their living collections. It was launched in June 1995 and is geared to a professional audience. In 1999

ten employees and volunteers were working for the organization. Information is available on 250,000 living specimens of 6,000 species, along with an additional 750,000 of their ancestors, most of which were bred in member facilities.

Visitor readership often relates to the number of hits counted. The number of sites gives an estimate of individual persons visiting. **ZooLex** pages in comparison had a visitation of about 6000 hits and 160 sites per months without being linked to any search engine. The numbers can be expected to be considerably higher when websites with affinities and search engines help to find **ZooLex**. A high frequency of visitation is the main prerequisite for running a website economically. The survey results also indicate some readiness from professionals to pay a fee for subscription.

More specifically, the evaluation of the sample website has shown that:

- the design chosen is mostly appropriate for the target audiences and what kind of adaptations should be made;
- professionals are able to find useful information easily;
- in general, the audience has no difficulty with the text, but translations would be helpful for non-English native speakers.
- The pictures are the main attraction, but loading times may be a problem.

First of all, the focus of **ZooLex** will be the Exhibit Gallery. This will help to expand the site rapidly. The discussion forum will be a second focus of **ZooLex**. It needs to be developed with support from international zoo organizations to become as useful as many desire.

Feedback from interviews and comments from the survey indicate the importance of having very soon a range of exhibits to explore. Considering the problems with obtaining the material for a complete exhibit description, it seems useful to introduce a new section: "At A Glimpse" will feature exhibits in a more superficial format than the Exhibit Gallery. This section may serve as a preliminary station for exhibit presentations awaiting completion.

The section "Opening Soon" cannot be updated regularly in this format. It is just too time consuming. Exhibits recently opened will be presented in "At A Glimpse" too. They can have a special feature indicating their novelty.

Overall, the survey gives some indications for the further development of **ZooLex**. Interpretation was done very carefully, as the total number of respondents is quite small and answers were vague. This is, because questions about the future use of **ZooLex** are hard to answer with having only a sample of **ZooLex** so far.

Another survey of **ZooLex** at a later stage of development will be useful. It should be printed and distributed by mail to reach a wider audience. Zoo directors are important disseminators, even when they do not use **ZooLex** themselves. Questions for the frequency of use should include the option "Maybe never", in order not to be confounded with the answer "seldom". Questions for agreement should include the option "I don't know", in order not to be confounded with the answer "I partly agree". For reaching a representative audience, support of the survey by the World Zoo Organization is desirable.

## 5. Recommendations for Implementation

### 5.1. ZooLex Web

The collection of information on zoo exhibits and its preparation for **ZooLex** is very time consuming. A concept for the procedures is therefore critical. A form to be filled in by zoos will help to get more consistent information, as the AZA award applications show. Ideally, zoos will require their planners to provide information suitable for publication in **ZooLex**. Later, zoos can easily use the same information for other purposes, such as promotion or contests, for example for exhibit award applications. The form will also help with processing the exhibit presentations and the relevant database.

Text of up to 1500 words and up to 25 pictures for one exhibit presentation seem to be appropriate information for the intended purpose. More details may be confusing or boring for the general audience.

Additional databases, e.g. on plant use, maintenance, publications etc., will be valuable tools for zoo professionals. A database in **ZooLex** for retrieving husbandry manuals that are already available may also help to improve minimum standards for animal enclosures.

As mentioned before, the quality of information on an exhibit depends on the institution's interest in publishing this information. There are zoos, which are willing to pay for having their exhibits advertised. There are also those who do not need this kind of promotion because they are already well-known. Having their exhibits in **ZooLex** might be more important to other members of zoo organizations than to themselves.

Therefore, support from zoo organizations is critical to the success of **ZooLex** as a scientific database on zoo design.

The European Communication Council (EEC) published a study (<http://www.mgmuc.de>) on the effects of the internet on the working place. They state that most successful providers first offer their services for free to get as many clients as possible. Then the service pays off by advertisements and additional service. Thus, the concept for the **ZooLex** website is drafted in several stages:

An online form for automatic processing of information on animal exhibits should facilitate expanding the site. Zoos will be asked to pay for inclusion of their exhibit presentation in **ZooLex** or compensate by advertising for **ZooLex**. Information on existing animal exhibits is the core of the site and should be free for all users.

Increasing popularity of the site should attract sponsorship for its maintenance. Firms advertising in the section on specialized suppliers will be asked to pay a yearly fee for their presence in **ZooLex**.

Next, a discussion forum is to be developed and tested. Here, zoo professionals may discuss the follow-up of new exhibits. Obviously, there is some risk of destructive people misusing the assessments or the forum for harassment. Membership will be introduced to limit this risk. This will ensure that information can be restricted to a certain audience by the submitter or the content manager. Otherwise, the discussion forum should be open to everybody. Everybody interested in the development of planning theory and methodology should be able to contribute by participating in the discussions.

As soon as about 50 animal exhibit presentations are published on the internet, a call for the first contest will be made. Contests hopefully will attract users to visit more often and thus attract sponsors.

Further funding should enable investments in the expansion of the database relevant to zoo design. The provision of useful information in a database requires the introduction of membership fees. These fees should allow up-dating and maintaining the database.

## **5.2. ZooLex File**

**ZooLex File** is a loose-leaf-collection for everybody with an interest in zoos and similar institutions. Complementary to the website, the main part will be a collection of pages describing animal exhibits in the world. Color pictures of animals and attractive exhibit features as well as a map with the location of the zoo should attract the same audience that buys zoo books and watches TV programs on zoos. Furthermore, it should serve as a reference book for zoo professionals. Customers can collect the pages as they do with gardening tips, cooking recipes, and so on. The ordering system of the file allows one to add, find and take out certain pages easily.

ZooLex File should be launched when about 100 exhibits are ready for publication. The pages should correspond with the website and be available by subscription.

## **5.3. ZooLex News**

A journal should complement the website, reaching professionals who do not use the internet. The journal informs about additions to the website and news on animal exhibitry. The target audience are members of ZooLex. The journal may include the most recent pages of the loose-leaf-collection.

Since ZooLex News should reach zoo professionals worldwide, it is an excellent public relations opportunity. Each issue may be sponsored by another supplier. This firm may include a page exclusively for their advertising. These pages can be collected separately in a reference file.

## **5.4. Continuing Vocational Training**

Training manuals should be developed with input from professional and scientific experts including findings generated from the operation of the website. Expenditures should be covered by sale revenues.

The organization of vocational training courses will be facilitated by using the ZooLex website and journal.

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American Zoo Association: <http://www.aza.org>

Association of Zoological Horticulture: <http://www.azh.org>

Australasian Regional Association of Zoological Parks and Aquaria:  
<http://www.arazpa.org.au>

European Association of Zoos and Aquariums: <http://www.eaza.net>

European Communication Council (EEC): <http://www.mgmuc.de>

Global Reach: <http://www.euromktg.com>

Universities Federation for Animal Welfare: <http://www.ufaw3.dircon.co.uk>

World Zoo Organization: <http://www.wzo.org>

Zoo-AG: <http://www.zoo-ag.de>

ZooLex: <http://www.zoolex.org>

### **6.4. Personal Communication**

Jon Charles Coe, Landscape Architect, Philadelphia. Letter of October 20, 1998.

Dr. Terry Maple, Director of Zoo Atlanta. Meeting on October 25, 1998.

John Chapo, Chairman of the AZA Honors & Awards Committee, Lincoln. Phone on December 3, 1998

Dr. Alex Ruebel, Director of Zoo Zuerich. Letter of February 2, 1999.

John Gwynne, Director for Design at Bronx Zoo, New York. Email of April 2, 1999.

Dr. William Conway, President of the Wildlife Conservation Society, New York. Letter of April 13, 1999.

John Bierlein, Manager of Exhibits and Interpretation at Woodland Park Zoo, Seattle. Meeting on April 15, 1999.

Kent Scott, landscape architect with Jones and Jones, Seattle. Meeting on April 16, 1999.

Lee Werle, Curator of Mammals at Woodland Park Zoo, Seattle. Meeting on April 19, 1999.

Nevin Lash, Landscape Architect, Atlanta. Meeting on September 27, 1999.

David Hancocks, Director of Werribee's Open Range Zoo. Emails of December 1999.

## 7. Appendices

### 7.1. Questionnaire for the Survey

#### Surveyform

##### Section A: Your Data

Your voluntary identification facilitates my analysis and will not be used for any other purpose.

My name:

My (email)address:

**Please let me know your profession:** I am

zoo director

zoo keeper

other zoo employee

architect / landscape architect

student

none of the above

##### Section B: Performance of ZooLex

Organization	Yes, I agree	I partly agree	No, I don't agree
ZooLex hierarchy of topics and pages is easy to understand and navigate.			
The order of topics and pages makes sense.			
The links in the text are useful.			
Layout	Yes, I agree	I partly agree	No, I don't agree
The pages are attractive to look at.			
The text and tables are easy to read.			
Text	Yes, I agree	I partly agree	No, I don't agree
The content is easy to understand.			
The text is interesting to read.			
Images	Yes, I agree	I partly agree	No, I don't agree
The images are loading in a short time.			
The images are interesting to look at.			
The site plans are easy to read.			

**Your additional comments are welcome:**

### Section C: Usefulness of ZooLex

What do you think about the information presented? Which information would you like to see added?	very useful	interesting	I don't care
Site plans			
North arrows and scale in site plans (add.)			
Plan with picture views			
Size of exhibit			
Visualization of exhibit size in a table (add.)			
Visualization of exhibit size in a site plan (add.)			
Costs of exhibit			
Conversion of costs in USD (add.)			
Quotation of countries' annual per capita income (add.)			
Local conditions (altitude, precipitation, temperature)			
Climatic diagrams by Walter and Lieth			
Plant lists			
Special management of exhibit			
Research undertaken by the zoo			
Conservation efforts undertaken by the zoo			
Images of holding facilities off-view			
Images of signs and interactive elements			

#### Which search modus do you prefer? (You may check more than one box.)

- get a list of matches when typing a word
- get a list of matches by choosing from an index
- specify choice by selecting from lists

How often do you think you will visit the following ZooLex pages?	maybe weekly	maybe monthly	seldom
Firms for Design or Construction			
Animal Exhibits Opening Soon			
Animal Exhibits Recently Opened			
Exhibit Gallery			
Exhibit Contest			
Discussion Forum			
Links			
Publications			
Events			

**Your additional comments are welcome:**

## Section D: Your Participation

<b>Subscription</b>	Yes	Maybe	No
ZooLex should be open to everybody.			
Some ZooLex parts (Gallery, Contest, Forum) should only be open to registered members.			
Some ZooLex parts (Gallery, Contest, Forum) should only be open to paying members.			
<b>Funding</b>	Yes	Maybe	No
I don't mind banner advertisements in ZooLex.			
I would subscribe ZooLex and pay a moderate annual fee.			
ZooLex should be financed by foundations/institutions.			
<b>Contests</b>	Yes	Maybe	No
I am looking forward to ZooLex exhibit contests and will vote.			
I am curious to see the results of exhibit contests in ZooLex.			
<b>Forum</b>	Yes	Maybe	No
I am looking forward to discussing exhibit features in ZooLex Forum.			
I am waiting to ask and answer questions regarding animal exhibits to the ZooLex community.			
<b>Exhibit Gallery</b>	Yes	Maybe	No
I have been planning or maintaining animal exhibits.			
<i>Skip the following questions if not applicable.</i>			
I am interested to see our exhibits in ZooLex.			
I am ready to submit appropriate material for publication in ZooLex.			
I am willing to pay for necessary preparations of the material for ZooLex (translating, scanning of images, editing).			
<b>Recommendation</b>	Yes	Maybe	No
I will recommend visiting ZooLex to other people.			

**Your additional comments are welcome:**

**Please note: If you fill in another questionnaire it will replace your previous one.**

## 7.2. Results of the Survey

### Survey results by December 1999 - Key Respondents (17):

#### Section B: Performance of Zoolex

<b>Organisation</b>	Yes, I agree	I partly agree	No, I don't agree
The order of topics and pages makes sense.	14	3	0
The links in the text are useful.	16	1	0
<b>Layout</b>	Yes, I agree	I partly agree	No, I don't agree
The pages are attractive to look at.	14	3	0
The text and tables are easy to read.	15	2	0
<b>Text</b>	Yes, I agree	I partly agree	No, I don't agree
The content is easy to understand.	16	1	0
The text is interesting to read.	14	3	0
<b>Images</b>	Yes, I agree	I partly agree	No, I don't agree
The images are loading in a short time.	9	7	1
The images are interesting to look at.	14	3	0
The site plans are easy to read.	6	9	1

#### Section C: Usefulness of Zoolex

<b>What do you think about the information presented? Which information would you like to see added?</b>	Very useful	interesting	I don't care
Site plans	13	4	0
North arrows and scale in site plans (add.)	13	4	0
Plan with picture views	15	1	1
Size of exhibit	16	1	0
Visualization of exhibit size in a table (add.)	6	7	3
Visualization of exhibit size in a site plan (add.)	10	3	3
Costs of exhibit	11	5	1
Conversion of costs in USD (add.)	9	6	2
Quotation of countries' annual per capita income (add.)	4	6	6
Local conditions (altitude, precipitation, temperature)	11	6	0
Climatic diagrams by Walter and Lieth	6	7	3
Plant lists	16	1	0
Special management of exhibit	16	1	0
Research undertaken by the zoo	14	3	0
Conservation efforts undertaken by the zoo	12	5	0
Images of holding facilities off-view	13	4	0
Images of signs and interactive elements	12	5	0

<b>Which search modus do you prefer?</b>	word	index	lists
Which search modus do you prefer?	4	4	2

<b>How often do you think you will visit the following ZooLex pages?</b>	maybe weekly	maybe monthly	seldom
Firms for Design or Construction	0	9	8
Animal Exhibits Opening Soon	3	11	2
Animal Exhibits Recently Opened	4	12	0
Exhibit Gallery	1	14	2
Exhibit Contest	0	6	10
Discussion Forum	4	8	4
Links	3	13	1
Publications	2	11	4
Events	0	11	6

## Section D: Your Participation

<b>Subscription</b>	Yes	Maybe	No
ZooLex should be open to everybody.	14	2	1
Some ZooLex parts should only be open to registered members.	7	6	4
Some ZooLex parts should only be open to paying members.	2	8	6
<b>Funding</b>	Yes	Maybe	No
I don't mind banner advertisements in ZooLex.	10	6	1
I would subscribe ZooLex and pay a moderate annual fee.	4	8	5
ZooLex should be financed by foundations/institutions.	5	11	1
<b>Contests</b>	Yes	Maybe	No
I am looking forward to ZooLex exhibit contests and will vote.	3	12	2
I am curious to see the results of exhibit contests in ZooLex.	5	10	2
<b>Forum</b>	Yes	Maybe	No
I am looking forward to discussing exhibit features in ZooLex Forum.	11	2	3
I am waiting to ask and answer questions to the ZooLex community.	7	5	4
<b>Exhibit Gallery</b>	Yes	Maybe	No
I have been planning or maintaining animal exhibits.	13	0	4
I am interested to see our exhibits in ZooLex	5	5	1
I am ready to submit appropriate material for publication in ZooLex.	7	3	2
I am willing to pay for necessary preparations of the material for ZooLex.	1	6	5
<b>Recommendation</b>	Yes	Maybe	No
I will recommend visiting ZooLex to other people.	15	2	0

## Survey results by December 1999 – Non-Key Respondents (22):

### Section B: Performance of Zoolex

<b>Organisation</b>	Yes, I agree	I partly agree	No, I don't agree
The order of topics and pages makes sense.	14	7	1
The links in the text are useful.	15	7	0
<b>Layout</b>	Yes, I agree	I partly agree	No, I don't agree
The pages are attractive to look at.	17	3	2
The text and tables are easy to read.	18	4	0
<b>Text</b>	Yes, I agree	I partly agree	No, I don't agree
The content is easy to understand.	19	2	1
The text is interesting to read.	16	4	1
<b>Images</b>	Yes, I agree	I partly agree	No, I don't agree
The images are loading in a short time.	13	6	2
The images are interesting to look at.	17	4	1
The site plans are easy to read.	9	10	2

### Section C: Usefulness of Zoolex

<b>What do you think about the information presented? Which information would you like to see added?</b>	very useful	interesting	I don't care
Site plans	12	9	1
North arrows and scale in site plans (add.)	16	4	2
Plan with picture views	16	4	1
Size of exhibit	16	3	1
Visualization of exhibit size in a table (add.)	9	5	5
Visualization of exhibit size in a site plan (add.)	11	4	4
Costs of exhibit	14	5	2
Conversion of costs in USD (add.)	7	8	5
Quotation of countries' annual per capita income (add.)	1	9	11
Local conditions (altitude, precipitation, temperature)	11	7	2
Climatic diagrams by Walter and Lieth	6	7	3
Plant lists	17	3	0
Special management of exhibit	17	2	1
Research undertaken by the zoo	11	9	1
Conservation efforts undertaken by the zoo	11	8	2
Images of holding facilities off-view	14	4	3
Images of signs and interactive elements	13	5	2

<b>Which search modus do you prefer?</b>	word	index	lists
Which search modus do you prefer?	4	8	3

<b>How often do you think you will visit the following ZooLex pages?</b>	maybe weekly	maybe monthly	seldom
Firms for Design or Construction	3	6	12
Animal Exhibits Opening Soon	4	15	3
Animal Exhibits Recently Opened	4	13	5
Exhibit Gallery	3	11	7
Exhibit Contest	2	9	11
Discussion Forum	6	9	7
Links	4	11	7
Publications	4	8	10
Events	2	14	6

## Section D: Your Participation

<b>Subscription</b>	Yes	Maybe	No
Zoolex should be open to everybody.	20	2	0
Some ZooLex parts should only be open to registered members.	4	7	11
Some ZooLex parts should only be open to paying members.	2	7	13
<b>Funding</b>	Yes	Maybe	No
I don't mind banner advertisements in ZooLex.	11	6	4
I would subscribe ZooLex and pay a moderate annual fee.	1	8	3
ZooLex should be financed by foundations/institutions.	13	6	2
<b>Contests</b>	Yes	Maybe	No
I am looking forward to ZooLex exhibit contests and will vote.	6	13	3
I am curious to see the results of exhibit contests in ZooLex.	11	8	3
<b>Forum</b>	Yes	Maybe	No
I am looking forward to discussing exhibit features in ZooLex Forum.	8	6	8
I am waiting to ask and answer questions to the ZooLex community.	9	3	10
<b>Exhibit Gallery</b>	Yes	Maybe	No
I have been planning or maintaining animal exhibits.	11	0	11
I am interested to see our exhibits in ZooLex	1	7	3
I am ready to submit appropriate material for publication in ZooLex.	0	3	9
I am willing to pay for necessary preparations of the material for ZooLex.	0	7	5
<b>Recommendation</b>	Yes	Maybe	No
I will recommend visiting ZooLex to other people.	17	5	0