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THE AXIOLOGICAL STRUCTURE OF A CONCEPT: INDUSTRIAL DESIGN AS AN EXAMPLE

Introduction. -

I will begin this presentation with a brief summary of the fundamental aspects of Formal Axiology, so we can put in its right context the tool that is the axiological structure of a concept. This tool that helped me structure Industrial Design in an integral manner should be applied to practically every human endeavor. The Axiological Sciences that Dr. Hartman presented in his work must be further developed and even go beyond to more practical applications. We must develop it in the same way as Physical Science is related to Engineering. We must create Axiological Engineering.

Originally, the purpose of this research was to find what constituted a good design and what was the best way to achieve it. This was fully accomplished. Today, 25 years later, my purpose is to take advantage of the experience I had using the Axiological Structure on Industrial Design and apply it to other fields of our daily life. How do we know we are taking the right decision in an economic problem? How do we value the work of a student? How do we understand the behavior of a social group? How can we explain the historic actions of a people? How can we define the political principles of a party? How can we define the particular leadership style for an organization? How can we design the right marketing strategy for a new product? How can we be sure we are choosing the right house for our home? How can we value an industrial made product?

For this exercise to be useful, I will ask from you to try to develop an Axiological Structure for a subject that you know well, at the same time that I present the Axiological Structure of Industrial Design.

Axiological Principles.

First of all let us review the basic axiom of Formal Axiology: "a thing has value in the degree in which it fulfills the concept of its class"¹ (From, Axiology as a Science, Robert S. Hartman). Something is good in the degree it fulfills the set of properties of its concept. Then, Axiology presents the three different ways we can have the set of properties. First, when we have a fixed and discreet number of properties, we are referring to the systemic dimension. Examples of this dimension are concepts created by the human mind, like the relativity theory or Formal Axiology. Second, when the set of properties can be between one and infinity, but they are still discreet, we have the extrinsic dimension. Every thing that occupies a space during a period of time, belongs to the extrinsic dimension, like your work or my pen. Third, when the set of properties are infinite but continuous, then you have the intrinsic dimension. We are talking about feelings and thus, the thing you are valuing becomes unique, like my daughter or my favorite concert.

The three Axiological dimensions, the systemic, the extrinsic and the intrinsic, are the fundamental instruments to value in a balanced manner the goodness of a thing. And this value measurement must be done in the three dimensions at the same time. If we want to know the real goodness of something, we have to value it in its three dimensions. I love my daughter, but I also want to know if she is healthy (systemic valuation), if she is doing well at school (extrinsic dimension), not to mention that for me she is unique and there is nobody like her (intrinsic dimension). And I can expand the valuation: I know my daughter is healthy (S), that her eye exam was fine (SS), but sometimes she has to wear glasses to watch a movie (SE) and that her mother thinks she has the most beautiful olive eyes she has ever seen (SI). In this last example we have applied the three dimensions to the systemic dimension. This means we can combine the three dimensions between themselves.

Dr. Hartman used to call the combinations of the three dimensions, compositions, when they were positive or transpositions, when they were negative. I will refer to them as positions, without considering their sign.

The three dimensions are the primary position. If we take each and every one of them and again combine them with the three dimensions, we will have nine secondary positions. The HVP test is simply a list of nine positive positions (compositions) and nine negative positions (transpositions).

But lets go back to the original definitions of the three dimensions. In the systemic dimension we are going to work with a set of properties that are finite and denumerable. A circle is a closed line equally distant to a point. We have two properties. Valuation is easy. I could almost consider myself a systemic expert in valuing circles. On the other hand, I also do not have much of a problem with intrinsic valuation: I adore my daughter, she is unique and irreplaceable. Even if we try we could not make another one like her. I also consider myself an expert in intrinsically valuing our children.

But it is in the extrinsic dimension where becoming an expert in extrinsic valuation is somehow a more difficult task. After all, working with an infinite set of properties, even though they are discreet, is not easy. Just the simple task of listing all of them can be complicated. What happens if we forget some of them? I think I have a good car, but my mechanic does not agree with me and he says that my tires are almost completely even, that the shock absorbers will not last long, that the brakes are still good, that the plugs are a little bit carbonized, etc. How can we make sure we are doing the correct thing when we value extrinsically? And furthermore, this dimension has the characteristic of changing with time and space. Six years ago, when I bought my car it was in perfect shape. And now, if I go to a remote and secluded town, where it is hard to find a car, the value of my car will be different. For the people in that place, the value of the car will be different than for my mechanic. I definitely do not consider myself an extrinsic expert in valuing cars.

Therefore, we need an instrument that will help us deal in a better way with the extrinsic valuations, so we will not forget any of the properties and will also be able to put them in their right perspective. This instrument is the Axiological Structure of a Concept.

The Axiological Structure of a Concept.

I would like you to always keep in mind, during this presentation, that we are talking about extrinsic concepts, and that they all have the space/ time connotation in common. We are not dealing with systemic concepts, like the Axiological Sciences that Dr. Hartman presented in his book. nor with intrinsic matters. We will deal with things, jobs, events, etc. It is the extrinsic world that surrounds us, with an infinite set of properties.

Formulating the Axiological Structure of a concept requires a profound knowledge of the subject and, of course, of Formal Axiology. When I presented my project to Dr. Hartman, about elaborating the Axiological Structure of Industrial Design, he told me: "This is easy, all you need is to know a lot about Industrial Design and a lot about Axiology." It was easier said than done. The final purpose of my project was to have a measurement instrument with which to be able to measure my designs.

So, let us begin. First of all, we have to accept the fact that we are dealing with something that occupies a space and a time and therefore it is extrinsic (E). Its concept can have up to an infinite but discreet set of properties, that we have to arrange in its three dimensions. We have to find out which is its systemic, its extrinsic and its intrinsic dimension. This is the first step towards establishing our Axiological Structure. If we make a mistake, our building will have bad foundations and it will eventually collapse.

The Axiological Structure of Industrial Design.

I will use Industrial Design to better understand how to formulate the Axiological Structure of a Concept. First of all, we have to define the concept of the subject we are studying. Industrial Design is the definition of the form of an object produced by industrial means and that affects man intrinsically. The chair that you are using to sit, the pen you have in your hands to write, those are examples of Industrial Design objects. How do we know we are sitting on a good chair? Or writing with a good pen? The Axiological Structure of Industrial Design will help us answer this question.

Finding what is the systemic (S), the extrinsic (E) and the intrinsic dimensions of Industrial Design will become the foundation for the Axiological Structure of Industrial Design.

First, the systemic dimension refers to those properties of Industrial Design that are relatively few and require almost perfect solutions. We are talking about the technological aspect of Industrial Design. This is a direct result of the requirement of being industrially produced.

Secondly, the extrinsic position refers to the economic aspects that have an impact on an object of Industrial Design. We are dealing with a dimension with a larger set of properties than the first one. And therefore its solution allows for a wider option of designs.

Third, if we recall the definition of Industrial Design, I mentioned that they were those objects that affect man intrinsically. Therefore, the strictly human properties configure the intrinsic dimension of the Axiological Structure of Industrial Design.

Summarizing, we can say that Industrial Design belongs to the extrinsic dimension, and that technology represent the systemic aspect, the economy, the extrinsic and the strictly human factors, the intrinsic aspects of our subject.

If we stop for a minute, we can recall the Axiological Sciences and we see that the application of the three dimensions to a thing will derive in the Sciences of Engineering (S), Economics (E) and Aesthetics (I). I therefore agree with the first two, but I believe that the intrinsic aspect of a thing should not be only a question of beauty, but also of comfort and usefulness.

Following, I will list the tertiary and some quaternary positions of the Structure of Industrial Design. Again, as a mental exercise, try to imagine which axiological positions you could think of, regarding a subject that you know well.

Technological Positions (S). -

SS.- Nature's laws. This position corresponds to the most systemic aspect of technology, which are Nature's laws, like the laws of Physics and other Natural Sciences. For example, to withstand the force of gravity is a property that your chair must have in order to be a good chair. That is why chairs have legs. If the chair that I am designing does not comply with the forces of gravity, most probably it will be such a bad chair, that you would fall to the floor. On the other hand, let us imagine the meaning of designing things that will be used in outer space, where gravity is weaker than on earth.

SE.- Materials. - The materials that we are going to use in the manufacture of our object are the extrinsic expression of technology.

SES.- Strength of Materials. The systemic part of the materials is defined by its resistance to different requirements, like mechanical resistance and chemical properties. It is our measure to know how much material we have to use so that the chair will be able to support the weight of a person. This position is so systemic that we have only two values: it resists or it does not.

SEE.- Manufacturing process.- This is the extrinsic factor of the materials. We have a great diversity of manufacturing processes. Just take for example, wood or metal.

SI.- Identification of the designer with technology.- This belongs to the way each individual designer understands technology and therefore how he solves the technological aspect of his design.

Economic Positions (E).-

ES.- Social and Economic Principles.- We are going to design for a specific society with certain rules and values. We are going to have a different design approach to a society that has a free market than one that does not.

EE. Market.- The way you are going to sell the product. It is common knowledge to talk about the four "P's" in marketing: the product itself, which we are designing, the price, the promotion and publicity and the distribution channels, or "Plaza", in Spanish.

EES- Cost. The systemic part of the marketing mixture is the cost- price of the product. How much can we spend to manufacture is a very systemic requirement.

EEE. Marketing.- To whom are we focusing our design, how are we going to promote and distribute it.

EI.- Identification of the designer with the economic aspects.- This belongs to the way each individual designer understands the economy and therefore how he solves the economic aspect of his design.

Strictly Human Positions (I).-

IS.- Human characteristics. The physical characteristics of the human being conform the systemic dimension of the strictly human aspects of Industrial Design.

ISS.- Anthropometrics.- The measurements of the human body so he will feel comfortable when using the object. This will tell us how wide a chair must be or the diameter of the pen.

ISE.- Ergonomics.- How the human body functions. How do we use our muscles, how much can we move or lift or hold. How we sit down or move our pen.

IE.- The use of the object. What and how do you use the object for.

IES.- Mechanisms.- What mechanism you need to put in your object to use it. It could be a motor, an electronic circuit, the ink cartridge for your pen or a spring for the chair.

IEE.- The use of the object.- You use the pen to write, the chair to sit or the spoon to eat.

II.- Identification of the designer with the strictly human aspect of design.- The beauty or aesthetics of the object.

IIS.-The beauty of the materials and its manufacturing process.- A new way of using a material or a process could define the aesthetics of a product.

IIE.-Style.- The aesthetic principles involved in a specific style, like Art Deco in the Twenties or Functionalism in the Seventies.

III.- The designer's creativity.

I have completed the basic positions of the Axiological Structure of Industrial Design. In our professional activities, when we are designing, we call them requirements. As we saw at the beginning, to design is to define the form of an object or product. And as designers we are not

free to design any form. We have requirements that we have to comply with and that have different origins. The Calculus of Value will help us organize the whole set of positions according to their origin.

The Calculus of Value.-

When we apply the Calculus of Value to the set of Axiological Positions of Industrial Design, we present them in a new and interesting order. Lets see how it looks:

N SS Nature's laws and principles.

Aleph 0 ES Social and economic principles.

Aleph 1 SE Materials.

EE Market.

IS Human characteristics.

IE Use.

Aleph 2 SI Identification of the designer with technology.

EI Identification of the designer with the economic aspects.

II Identification of the designer with the strictly human aspect of design

As you can see the requirements that a designer must satisfy were arranged in a different way. Instead of using the three dimensions, I have used the Calculus of Value and I have them arranged by origin and also by the different boundaries that we, as designers, cannot trespass.

The first of such boundaries is established by Nature's principles. We cannot design just any product. It has to comply with the laws of Physics and other Natural Sciences. The form of our object must comply with Nature's requirements. Nature is our first outer limit.

The second limitations come from the society for whom we are designing. Our form has to be in accordance with the social, economic and cultural values of the society for whom we are designing. Society marks the second of our limits.

The third circle is marked by the producer of our object. Somebody has to manufacture and sell the product. And we have to design it in a way that he will be able to do it. The producer is our third boundary.

The fourth circle is limited by the user of the product. The person who will use it will indicate his requirements that the designer must consider in the final form.

And the last circle is established by the designer himself. He is the one who will, at the end, decide the final form of the product. Depending on the project, the designer will have more or less space to move and define the form of the object.

Let us include in the previous chart, the different origins of our Axiological Positions:

NATURE

N SS Nature's laws and principles.

SOCIETY

Aleph 0 ES Social and economic principles.

PRODUCER

Aleph 1 SE Materials.

EE Market.

USER

IS Human characteristics.

IE Use.

DESIGNER

Alef2 SI Identification of the designer with technology.

EI Identification of the designer with the economic aspects.

II Identification of the designer with the strictly human aspect of design

Axiological Method for Industrial Design. -

I mentioned before, that the purposes of the Axiological Structure of Industrial Design were mainly two: to be able to measure the goodness of a product and to be able to find a better method of designing better products.

The first part is done by comparing every axiological position to a particular object. If I want to know if this chair is a good chair, I have to check if it complies with the requirements that nature, society, the producer and the user have established. And even though it is harder to do, we have to check the degree to which the designer identified himself with the product, up to the point that the object became unique to him. Creativity is the expression par excellence of an intrinsic relation.

The second part refers to the actual method of designing, which was a greater challenge: How to use the Axiological Structure to design better.

Those that have studied Design methodology, mostly agree that we have four main stages in the design process:

1.- Defining the object. It is not enough to mention what object we are talking about, like for example, chair. We also have to mention in a short way the use, the user, the producer and the merchandiser of the product.

2.- Analyzing the object.- We have to deeply understand the Axiological requirements of our design. What natural principles are important, what social and cultural aspects we have to take into account, what requirements of resistance, production, cost, marketing, ergonomics and use we have to satisfy. We have to take apart the product and understand the importance of each requirement.

3.- Synthesis.- After you have taken apart, you have to construct the object. This is where the real work of designing takes place. You have to design the form of the object.

4.-Evaluation.- It can be done with drawings, models or prototypes; you have to evaluate the design before you mass-produce it.

The Axiological Structure will help you deal with every stage of the Design process, underlining important aspects. In the first stage of defining the product, you have to mention the aleph 0 positions of the structure.

But the Axiological Structure is specially useful in the stage of analysis. First you have a complete checklist that you have to go through, studying and really knowing every requirement involved in your design. The Axiological Structure will be helpful in understanding the nature of each requirement. Systemic elements will have very few, but concrete and specific, requirements, like resistance, cost or anthropometrics. Extrinsic elements will have a larger amount of information, like the ones involved in marketing or manufacturing processes.

After we have concluded the individual study of every requirement, we proceed to the Axiological Pair Analysis. We take each one of the positions and we compare with the others, one by one, to understand how one affects the other. Here is an example:

--Product: auditorium chair made of sheet metal. Position: Strength of Materials (SM).

-SM and Manufacturing: The stamping process limits the thickness of the sheet metal we could use.

-SM and Cost: The cost limits the amount of material we could use.

-SM and Marketing: Distribution requires the chair be assembled on site.

- SM and Anthropometrics: Chair has to resist the weight of a heavy person. 250 lbs.
- SM and Ergonomics: The seat has to be supported in the rear part so people can stand up easier.
- SM and Mechanism: The seat will be attached to a folding up device.
- SM and Use: The seat must fold up so people can stand up to let others go by. No front legs allowed.

The Pair analysis must be done both ways: SM to cost and cost to SM.

After we have finished the Pair Analysis, we have to grade them. We take each pair, we know how one affects the other, and we decide what requirement is more important to comply with. We give that position a 1 and the other a 0. We do that with all of them and at the end we add each position's grades. We put on top the highest position and at the end, the lowest. The first two positions, let's say cost and resistance, will be our critical pair. This means that our design has to solve specially the requirements of the critical pair, and then the others. With this we have finished the analysis stage of the Design process.

In the third stage of the Design process, the one called Synthesis, the results of the Pair analysis is fundamental. You must approach the solution of your design project in different ways according to the position that came out first. If we have as a priority the manufacturing process, our proposal must solve this requirement first, and then the others.

In the fourth stage, Evaluation, we use the results of our analysis to evaluate our design. Then we can say if we solve adequately each position and we know at the end that we have designed an object according to the initial definition of the project.

Finally, let me just add that the we were able to apply the Axiological Structure of Industrial Design, not only to the Design process, but also to the contents of the curricula in the school of Industrial Design at UNAM and in the way of evaluating the projects done in the different Design workshops, among other things.

Applications of the Axiological Structure of a concept.

Let us put aside Industrial Design and see other possible applications of the Axiological Structure of a concept.

At the beginning of my conference, I asked some questions. How do we know we are taking the right decision in an economic problem? How do we value the work of a student? How do we understand the behavior of a social group? How can we explain the historic actions of a people? How can we define the political principles of a party? How can we define the particular leadership style for an organization? How can we design the right marketing strategy for a new product? How can we be sure we are choosing the right house for our home? How can we value an industrial made product?

The first thing all these questions have in common is the time and space aspect. The exchange rate of a currency is something that has a time and a place. A student is enrolled in a class in a specific school. An historic fact has a time and a place. So, if you want to develop an Axiological Structure you have to always consider you are dealing with space and time. It can be an object, a thing, an activity, a job, an event, etc. And as Dr. Hartman once told me, you must know a lot about it and about Formal Axiology.

While studying for my Masters' Degree, I developed a chart in relation to the leadership style of a manager. We had been bombarded with many different theories about styles of leadership, like the "x" and the "y" styles, and then the "z", and so on. I prepared an Axiological Structure of leadership style that included such systemic aspects as the federal labor laws, cultural and social considerations of the society, extrinsic things as the type of work, the types of employees, like workers, engineers or scientists and intrinsic aspects, such as the way the manager is and likes to lead. This structure could help us design a leadership style "made to order".

The complexity of the exchange rate of a currency must have an Axiological Structure. You have systemic aspects such as the difference in inflation rates, extrinsic aspects such as the situation of the world markets, and intrinsic matters such as the confidence of the public regarding its currency. Experts deal with them, but sometimes in a disconnected manner. The structure would connect everything and using the Pair Analysis, we could know in a certain situation what is the critical position.

To axiologically evaluate a student would be wonderful. What a difference it would make compared to our actual system of giving numeric grades. How much more would students and parents get from an Axiological evaluation. And teachers would be forced to know their students better.

History is a fascinating field of study. An ethnic group will act in a certain way in a given situation, because that was the best thing they could do in that moment. Reasons for those acts could be systemic, like a law or a decree, a change of weather, or a catastrophic event; extrinsic, such as changes in economic conditions; intrinsic, such as the love for their land or their own religious beliefs, these last ones, sometimes incomprehensible to other eyes. The Axiological Structure of an historic event would be a great tool for historians.

I constantly think about new applications. In the business world, there are so many. Starting with a general structure and going down to particular problems such as price fixing, market research or human resources management. The possibilities are endless.

Conclusion.

I have used Formal Axiology in my life for over thirty years. Since the first moment when Jaime Grabinsky gave me and interpreted the HVP test, I was overwhelmed by its potential uses. Many times Axiology threw its light onto confusing situations and made them clear again.

We have to spread its word to more people. We can no longer postpone its application to old problems. It must become the common language for humanists. And the Axiological Structure of a concept must become one of their tools of work.