

To the End of the Rainbow

--A Review on *An Introduction to Evolutionary Product Development*

“If you want to know where the rainbow ends. It’s you who’ve got to go there and find it my friend.” is quoted at the beginning of the book *An Introduction to Evolutionary Product Development* by Arthur Eger, which somehow reflects the spirit and structure of the book—go to the extreme far end to get the complete story about how product evolves in each aspect including the research on history and theory, detail description of the product phases based on case surveys, together with the research performed to verify the theory developed by the author. After this journey, the understanding about product design is not simply about the choice of color and material, or certain style but an evolutionary procedure inside an ecosystem including the influence of politics, economy, technology and social factors.

The author of the book, Arthur Eger, has a broad experience in industrial design engineering. He studied Industrial Design Engineering at Delft University of Technology and in 1979, he was the founder of the design bureau Van Dijk/Eger/Associates (now known as WeLL Design). In 1996, he left the bureau to become the director of Space Expo, a space museum and the official visitors centre of ESA, the European Space Agency. In 2003, he became professor at the University of Twente holding the Chair of Product Design with the research area: Evolutionary Product Development. Arthur Eger wrote and edited more than 15 books and published over 100 articles and papers on topics such as product design, graphic design, architecture and decorative art. The other two contributors of the book, Huub Ehlhardt and Ferry Vermeulen, both have Industrial Design Engineering background. Huub Ehlhardt is currently employed by Philips Electronics and since 2010 he has combined his work in industry with a part-time PhD, focusing on describing technical innovation as an evolutionary process. Ferry founded his own industrial design agency with a strong focus on industrial products and his PhD research is focused on developing low-risk innovation strategies to strengthen a company’s competitive position.

The experience and the structure of the knowledge of the author somehow explains the practical style of the book on this subject—starting from an existing problem to develop a solution based on historical research and the current practice, which involves director, marketing manager, product manager and designer, with the target to improve the insight into a product’s economical life cycle and to develop a means that can help a designer in the process of product development. As the author says “Industrial designers often take part in the team that develops new products. They can use a number of methods and techniques that are helpful for some of their tasks, while for others, such as form giving, designers still need qualities as experience and intuition.” This book tries to show that this seemingly intuitive way of working has regularities and patterns that can be reproduced.

An Introduction to Evolutionary Product Development has a clear structure, starting from an Introduction with definitions and the determination of the concept to avoid the misunderstanding about the terms used, including product development, innovation, design, styling etc. The second part of the book gives a short history of theories related to industrial design engineering describing research to help designers with the design and styling of products. These theories have been grouped according to the point of view of the researchers of the theory: Demographic Models, Measuring Instruments, Behaviouristic Explanations, Hierarchical Structures, and other relevant research, with the aim to find out to what extent these theories can contribute to the defining and understanding of the product phases and to the formulation of the product characteristics that best describe these product phases. The third part, also the core of the book, introduces the theory of Evolutionary Product Development. A theory that originated from the design practice of a major Dutch design company, founded in 1979, and called Van Dijk/Eger/Associates, by one of its founders Arthur Eger, also the author of the book. The introduction of the theory is followed by examples, showing how this works in real life. In Chapter Four, there are retrospective case surveys, helping the reader to get a clear understanding. Chapter Five “Technological Innovation as An Evolutionary Process” and Chapter Six “EPRO Tool (Evolutionary PROduct Development Tool)” are respectively written by Huub Ehlhardt and Ferry Vermeulen. In Chapter Five, Huub Ehlhardt provides an example of how the product family of Child Restraint Systems evolved, exploring the relationship between the evolving artifact and the ecosystem that co-evolved with it; while the following chapter describes the background and the operation of the “diagnosis tool”, transformed from the evolutionary development theory. Chapter 7, the last chapter, “Research Performed to Verify the Theory of Evolutionary Product Development” is a summary of the research undertaken to show the existence of the product phases, to see if they appear in the expected order and whether the product characteristics describe the product phases in the correct way.

In the Theory of Evolutionary Product Development, the dynamics of the role the products play in society or on the market are the starting point and here these dynamics are regarded as an evolutionary process. The two important reasons to come up with this theory are the limitations of the linear process which was generally considered to be the way products developed before the late 1980s; and the inadequate information about the position of the designer during the process of the product development. A product can survive in a market only if it has an improved performance and/or price

ratio, relative to its predecessors. In the past, successful new products were considered to be the next logical step in a continuous improvement of the product with regard to the price and performance. But at the end of the last century, this principle was challenged—development processes seemed not to be so predictable and unambiguous as the linear model suggested. This also happened in other areas where innovation processes are studied, for example, economics and technology studies. It was necessary to find new explanatory models focusing on the complicated way in which innovation progresses. The discovery that a number of economic phenomena such as partial path dependency, embeddedness and technological lock-in, which cannot be explained by the linear model, can be explained when an Evolutionary Product Development model is used as a framework. In most books about design and industrial design engineering, the created designs are usually discussed solely based on the career, the statements, ideas and theories of individual designers, without consideration of other influential factors, such as the wants and needs of the customer, the price of the product, the market segment the products were aimed at, etc. As a result, the creativity and the role of the designer were exaggerated, which can be misleading, since to launch a successful product onto the market, a lot more needs to be done than just to focus on design. So the author describes the role of the designer from an objective angle, through which helping designers and design students to get into the design procedure with rational orientation about themselves.

With this as background and target, the chapter introducing the theories and history related to industrial design engineering become an organic part, establishing a frame that includes nearly all the factors which have an influence on design such as politics, economics, technology and social factors. Take for example the Theory of the Leisure Class by Thorstein Veblen (1899/1994), one of the first researchers to describe groups based on demographic criteria; the Nine American Lifestyles: “who we are and where we are going” by Mitchell (1983) who distinguishes groups of consumers based on behaviour, activities, interests and values; David Foot (1996) who divided people into groups according to their age and who propounded that two thirds of everything that will happen in the near future (5 to 10 years) can be predicted on the basis of demographic shifts; together with Christensen (1997)’s “the Innovator’s Dilemma” and other relevant research. Thus, the author shaped an objective and realistic background for the introduction of the Evolutionary Product Development model, the core of the book.

The most important two elements of Evolutionary Product Development are the “product phases” and the “product characteristics”. There are 6 product phases: performance, optimization, itemization, segmentation, individualization and awareness. Each product phase can be described in terms of eight product characteristics, four of which apply to the product itself, and the others to its market, its production technology, the services that accompany it, and the ethical aspects of the product. As we know, when a product is new it often results from “technology push”, its performance is poor and product development is primarily aimed at improving performance. In this phase the design is unimportant and therefore product aesthetics are of minor concern. Ergonomic aspects and issues of reliability and safety are included in the second phase: optimization; while when the products satisfy generally accepted standards of functionality and reliability, the edge of competition will shift to convenience, to the itemization phase. In the segmentation phase, when the product enters the domain of some “dominant design”, product development is aimed at adding extra features and accessories, including special editions of the product for different trade channels and target groups. In this phase the design focus shifts from quite neutral form giving to expressive features with the aim to increase emotional benefits. The extrapolation of segmentation ultimately leads to a product attuned to one individual. The development in information- and product technology are factors that make this possible. Here the product development is geared to mass customization and co-creation. The customer can have an influence on the final result while at the same time the market starts to shift from a homogenous into a heterogeneous polypoly. Usually, in the later stages of the product development, design is focused on the enhancement of expressive features with the aim to increase emotional benefits while when the benefits start to include ethical concerns such as societal and environmental issues, this would lead to a sudden leap into ascetic and sober forms. This is the product phase awareness. The last three phases often exist simultaneously and sometimes one or two of these phases are not suitable for the product or product group.

The author did not stop by offering a model and a theory; instead, he moved on to explain the model with carefully chosen retrospective case surveys. This makes the model practice for use in the real business world, helping the entrepreneur to determine the product phase of a product. With the data collected he can formulate fresh and useful starting points for innovation strategies by adding the product characteristics of the next product phases; or to turn the model into a useful tool offering fresh starting points for innovation strategies. Also the comparison between the revolutionary innovation and evolutionary innovation courses one to think deeply—“it is easier to gain media attention with revolutionary innovations and the adventure and rewards seem more interesting and promising, evolutionary innovations are a much safer option.” This leads to the next step, to formulate step-by-step innovation strategies based on the theory of product phases to make overall prediction for the evolutionary development of products after market introduction. In the last part of the book, besides summarizing the research undertaken to show the existence of the product phases, the author shows the

results of the research done by experts, including professors of the industrial Design Engineering courses at the University of Delft and Twente, for the pilot study, together with test persons selected from experienced industrial designers, design managers and marketing managers for the main study to test if the product phases appear in the expected order and whether the product characteristics describe the product phases in the correct way.

The meaning of the book is way more than the introduction of Evolutionary Product Development. Take for example the number of samples selected and reason why they are chosen. Considering the number of aspects that have to be studied, the author chose a comparative (multiple) retrospective case survey, a method that lies between the survey and the case study. The shaver was chosen because it is an example of a durable product experiencing long period of product development; opposite to the shaver of low exposure, the mobile phone is a product developed very quickly in a short period of time; bicycle, as a product which might last for a long time, up to 10 years, shows the complete product development procedure, including the last two product phases; working class housing and traveling show the usage of product phases in architecture and services. Nothing is chosen by random but with reason supported by scientific thinking. And the use of tree-like diagram in the Chapter Five is a proper way to show the complicated development procedure during a long period of time. Besides, the book is also a system that can be put into practice by visiting the website offered in Chapter Six through filling in the questionnaire. What's more, the reading and thinking procedure is also a procedure to establish a healthy and realistic attitude to the product design, which is necessary for the design students and design practitioners and managers, especially those from the small and medium-sized enterprises (SMES), the generally considered important vehicle for new product development and innovation.

People see the rainbow after rain as a gift since it is beautiful and magic. To get close to find the story behind, requires far more than passing interest, it requires serious research, scientific methodology and attitude, plus persistence, while this procedure full of difficulties is rewarding because for those who got to the end of it the rainbow is not only an instant optical phenomenon but something strongly pressed deeply in their soul and heart.