

BEHIND THE SCENES OF THE REVOLUTIONARY PHOTOCOPIER MACHINE

During the twentieth century, the information technology field spawned an epoch-making invention/technical reform that represented no less than an industrial revolution: the invention known as “xerography”.

Let us explore some of the fine points of xerography.

Until approximately 1963, the year that xerography was introduced in Japan by Fuji-Xerox Co., Ltd., reproduction was primarily accomplished through the use of a mimeograph, diazo copying machine, carbon copy, or less frequently, the Photostat photographic process.

However, reproduction using these methods required substantial time and money, as well as considerable manpower.

The mimeograph also required writing with a stylus on wax coated stencil paper, which was a very trying and time consuming process, and necessitated great skill and experience to operate.

Diazo copying used permeative light, but only copied one side of a manuscript at a time, and was a slow and terribly offensive smelling process. Only the Photostat process was capable of copying both sides of a manuscript—but the letters would often print out distorted and difficult to read, and this method was also very time consuming and expensive. In any case, copying of large quantities was almost impossible using any of these methods.

In 1938, a young inventor and patent attorney living in the United States named Chester Carlson successfully completed experiments, after enduring many hardships, and obtained the basic patents for what he termed “xerography” in the following year of 1939.

Following the arrival of xerography, reproduction tasks become extremely easy for anyone to accomplish. Reproduction of both sides of a manuscript was now straightforward, and large quantities could be reproduced simply and quickly. Preparing a written contract, for example, became child's play for the modern copier.

The xerography process was basically divided into the five following steps. First, an electrostatic charge, which can only be maintained in dark surroundings, was applied to a

particular surface that was photoconductive. Once exposed to light, the charge would disappear. Next, a printed page was placed in close proximity to this surface and light was shone on it so that an image of the printing would be projected onto the surface. The third step involved sprinkling powdered ink over the surface. This would adhere to the electronically charged portions, creating a reflected image of the printed page. Next, the image was transferred to a blank sheet of paper. Lastly, heat was applied to the image, which melted the ink and fused it permanently to the page.

Carlson tried to sell the patent rights to a number of major companies, including IBM, Remington Rand, and GE, but none of them were interested.

Finally, Carlson received help from Battelle Memorial Institute, and eventually the rights were sold to a small photographic paper company named Haloid in Rochester.

This purchase was a major decision by the president of Haloid, Joseph C. Wilson. He felt confident about the future of xerography, and carried his plan forward in the face of opposition in order to develop his work.

Haloid had wanted to go forward with in-house development of the product, but things were not going well, and efforts were made to sell the entire company to major companies such as IBM. That decision did not bear fruit either, and as a result, the company was now on the verge of bankruptcy. By 1960, the company had managed to recover, and its success was attributed to the in-house development of a technique they named xerography. By combining the ancient Greek words *xēros* (dry) and *graphein* (to write), the term “xerography” was created. In keeping, the company changed its name to Haloid/Xerox, and subsequently, again to simply Xerox, Ltd.

Xerox, Ltd. developed explosively, and by the 1970's it was one of the leading companies in the U.S.A. It had become a Fortune 500 company; a true Cinderella story of the 20th century.

Sales in 1959 were only 32 million dollars, but over the course of a few years, grew to 1,125 billion dollars by 1968, with the gross market percentage reaching 95% (2002, incidentally, saw sales top at 15,847 billion dollars).

However, in the 1970's the xerography basic patents expired, and several Japanese companies that had joined the market had been performing thorough research of the patents. In regards to history, the question of "if" is immaterial. However, "if" the patents had not been available for ten years to follow, the Japanese company's large growth into the present time, and the downfall and near bankruptcy of Xerox Ltd., would not have been possible. Their stock had been \$267 in 1966, but is currently around \$10 at it's lowest.

The main cause of this dire situation is due to a sizeable blunder on the part of management. They believed it was best to diversify, and also placed too much trust in the superiority of their own technology. Contempt for Japanese enterprise caused them to adopt a marketing approach that disregarded the balance between materials and price, and were also slow to adapt to digital technology.

This episode demonstrates the lack of foresight that delayed the development of the personal computer, and indicate that they perhaps gave up before realizing success. As a result of development project failings at the company's Palo Alto Research Institute, a number of technicians left to pursue outside interests, that included the establishment of companies like Apple Computer, Ltd., which is now very famous.

It is interesting to contemplate what kind of major progress the company might have experienced if it had chosen to expand into the fields of both photocopying and personal computing.

The following words from Chester Carlson seem to best compliment the conclusion of this article: "To obtain true happiness in life requires a great deal of sweat".