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# TECHNOLOGY & R&D MANAGEMENT

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# CHEMICALS INDUSTRY & TECHNOLOGY MANAGEMENT

- Chemicals industry has the distinction of being the first science based industry, and it pioneered the establishment of industrial research facilities
- Chemicals industry is innovative and has shifted -through the decades- its feedstocks depending on emerging availability
- It is among the most innovative industry in the introduction of new products and applications
- Accordingly, research & innovation and technology management are key and vital activities for the industry's survival and growth

# CHEMICALS INDUSTRY & TECHNOLOGY MANAGEMENT ...

- The history of the chemicals industry is full with many cases of successes or failures some times
- Aside from the commercial significance of those cases for the companies and/or individuals involved; these cases are important for enhancing our knowledge of this field in depth
- Among those cases the following examples are outlined from book “Science & Corporate Strategy” by Hounshell and Smith, which studied the history of R&D and technology management in DuPont for 80 years

# EXAMPLES OF THE CASES STUDIED

## THE CHALLENGES OF DYESTUFFS

- Germans were the leaders
- Finance committee: “we should proceed with the dyestuffs investment on the assumption that it will eventually be successful”
- Head of technical lab: “the truth is that it takes nearly as much effort to decipher the correlation between patent and commercial dye as it does to discover the color originally”

# EXAMPLES OF THE CASES STUDIED ...

## THE CHALLENGES OF DYESTUFFS ...

- “No matter how much we may dislike to be followers and not pioneers, we must in the first few years confine our efforts ... to the manufacture of colors that have already been produced by foreign manufactures”
- Some German chemists working in dye firms were offered 15 times (as much as) what they were earning in Germany.

# EXAMPLES OF THE CASES STUDIED ...

# THE CHALLENGES OF DYESTUFFS ...

- Early 1930s, the dyestuffs department sales surpassed those of all other departments and came along way from the shaky start a decade ago.
- That dye-manufacturing knowledge provided the knowhow for other organic chemicals and products including tetra-ethyl lead, freon, teflon.

# EXAMPLES OF THE CASES STUDIED ... R&D AND BUSINESS RELATIONSHIP

- "I do not believe that it would be possible ... to produce desired results if the department were actually divorced from the great mass of work which it now carries for the various industrial departments ... the intimate touch with the various industrial lines is to my mind absolutely indispensable"

# EXAMPLES OF THE CASES STUDIED ... DEVELOPMENT VS. TECHNOLOGY ACQUISITION

- By 1931 DuPont had ten industrial departments producing explosives, plastics, finishes, dyestuffs ... .
- Management put together this chemicals empire ... primarily through the acquisition of technology and companies. ... In this era commercialization not science or invention was the forte of DuPont R&D. . [With important exception of new process development in nitric acid based on new chemical engineering knowledge]

# EXAMPLES OF THE CASES STUDIED ...

## DEVELOPMENT VS. TECHNOLOGY ACQUISITION ...

- When faced with the options of developing its own process or buying the technology, DuPont management chose the latter as the most effective way of entering the business.
- Once the new technology had been assimilated within the company then the research organization could focus on particular aspects of it. That mode dominated between 1921 and early 1930s.

# EXAMPLES OF THE CASES STUDIED ... FUNDAMENTAL RESEARCH VS. APPLIED

- In 1927 chemical [or central research] director Stine began an experiment in pure science or fundamental research. One of the fields that he chose the study of polymers turned out to be a gold mine for new materials. Dupont captured the lead .... because of the pioneering work of Carothers. ...Discovered neoprene synthetic rubber and nylon.

# EXAMPLES OF THE CASES STUDIED ... FUNDAMENTAL RESEARCH VS. APPLIED ...

- 1930: within weeks of each other , chemists in Carothers' group produced neoprene synthetic rubber and the first laboratory synthesized fiber.
- These results were not the stated or implicit goals of Carothers' research but in retrospect the discovery of fiber was the more predictable outcome of experiments then in progress.

# EXAMPLES OF THE CASES STUDIED ... IS INVENTION THE BEGINNING OR END

- ... Neoprene, after the initial discovery ... spent nearly a decade undergoing simultaneous research and development as the product was constantly redefined and new production methods were explored.
- Nylon after first synthetic fiber spent five years in no-man land.
- Carothers: “... many of these events had no clearly defined dates: they were simply ideas first grasped as possibilities which by slow growth became firm convictions”.

# EXAMPLES OF THE CASES STUDIED ... THE NEW VENTURE ERA

- In the mid 1950s experiencing low growth and no repeat for high potential products like nylon, believed that there had not been a lack of potential new ventures ... ; it was just that the highly conservative general managers ... devoted to keeping their older businesses healthy instead of investing in new ones.

# EXAMPLES OF THE CASES STUDIED ... THE NEW VENTURE ERA ...

- In an industry in which DuPont had numerous and competent competitors, it became increasingly difficult for the company to find promising proprietary products that would find large markets.
- Nevertheless DuPont maintained a steadfast belief in its technological superiority and attempted to differentiate itself from its competitors by developing products that raised chemical technology to a new level of complexity.

# EXAMPLES OF THE CASES STUDIED ... THE NEW VENTURE ERA ...

- By 1970, DuPont's executives had concluded that its traditional high risk, high investment, high-reward innovation strategy no longer worked.
- Research shifted from offensive to defensive, to shore up the existing business against inroads by competition.

# CONCLUSION

- After this short tour in these fascinating examples; we may conclude that there is no one technology strategy (including R&D) which can be picked as the most successful all the time.
- Uncertainty is always there and what can be perceived as a high risk strategy; may succeed beyond imagination, and a more prudent well calculated strategy may not result in the desired ends.

# CONCLUSION ...

- So there is no one answer; however studying the experiences of our predecessors should teach us many lessons;
  - How to balance **ambitions** with **prudence**. Deep knowledge may give us better chances that we don't go for ventures which may risk our institutions
  - However **without taking calculated risks we go nowhere**.