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# Designing Strategies to Achieve Sustainable Growth for Biotechnology Companies

## Abstract

Most new companies are faced with the dual hurdle of developing their capabilities while dealing with financial constraints of not having an established revenue stream. This is especially true in the Biotechnology industry, where technological competence in research is a key success factor, but the benefits of research are often not realized for over a decade. This study uses a system dynamics framework to investigate viable growth strategies for a young biopharmaceutical research company in terms of the expansion of both its technology platform, as well as its proprietary programs.

## Investigating growth and potential decline with dynamic hypotheses

**Hypothesis 1:** Growth through success in research

The Growth and Success hypothesis is represented in the causal loop diagram shown in Figure 1. These loops are described below:

Competency Growth Loop: The company invests its financial resources in the existing area/s of technology, leading to increased competence in these areas. This results in more collaboration and in potential drug innovations. The expected royalties out of new drugs make the company more attractive for investment, which in turn increases the financial resources available to the company and allows it to further develop its competencies.

Technology Platform Growth Loop: The company invests its resources into new areas of technology, thereby broadening its technology platform. As a result, it is able to secure better contract terms with collaborators. This raises future royalty expectations and attracts more investment, which in turn increases the financial resources available to the company.

Royalty Payoff Loop: Eventually, the collaborators get the drugs to market which generates a revenue stream for the company. This effect is considerably delayed, due to the long time period needed for drug development. In addition, The company's proprietary projects are successful in

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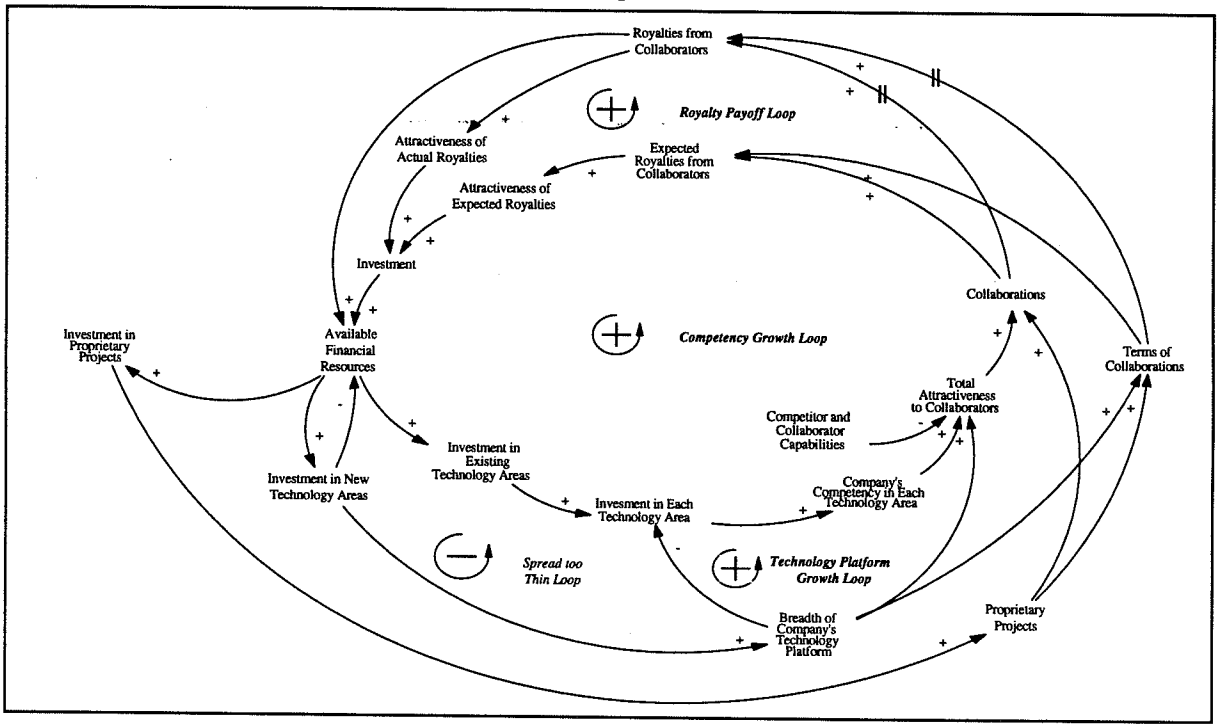
identifying promising drug candidates and in taking these compounds through the early development stages. The company is then able to secure collaborations to take these projects to market, which then results in a significant royalty stream. This is also a substantially delayed effect.

Figure 1. Growth through success in research

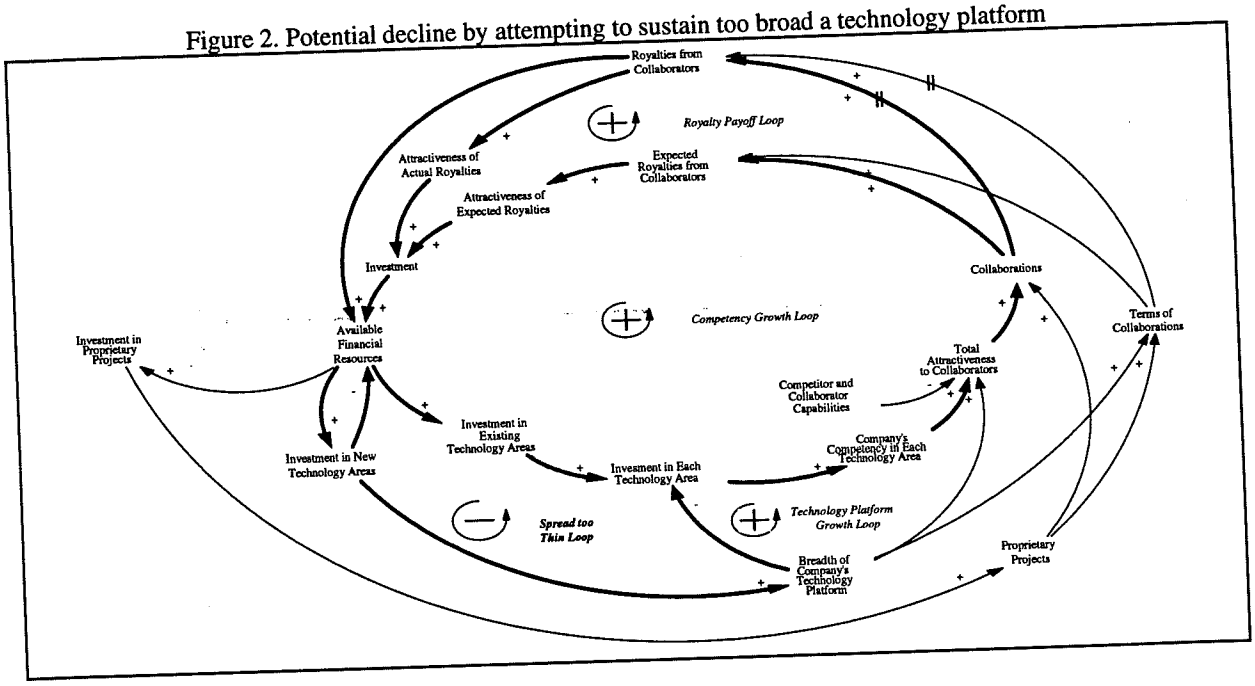



**Hypothesis 2:** Potential decline by attempting to sustain too broad a technology platform

Spread too Thin Loop: This possible scenario is represented in the causal loop diagram of Figure 2. The company invests in new technology areas in order to broaden its technology platform. This depletes the pool of resources available for investment into its existing areas of competence. In addition, a broader platform, once achieved, results in the company having to spread its resources over several areas, which makes it increasingly difficult for the company to maintain its competency in any given area.

This allows competitors and collaborators to "catch up" with respect to these technologies. The end result is that the company loses its collaborations, which eventually leads to the loss of investment in the company. When this happens, if the company's collaborative / proprietary projects have not had time to get a drug to market, or if its initial drugs have not been successful, the company will be unable to continue its activities.

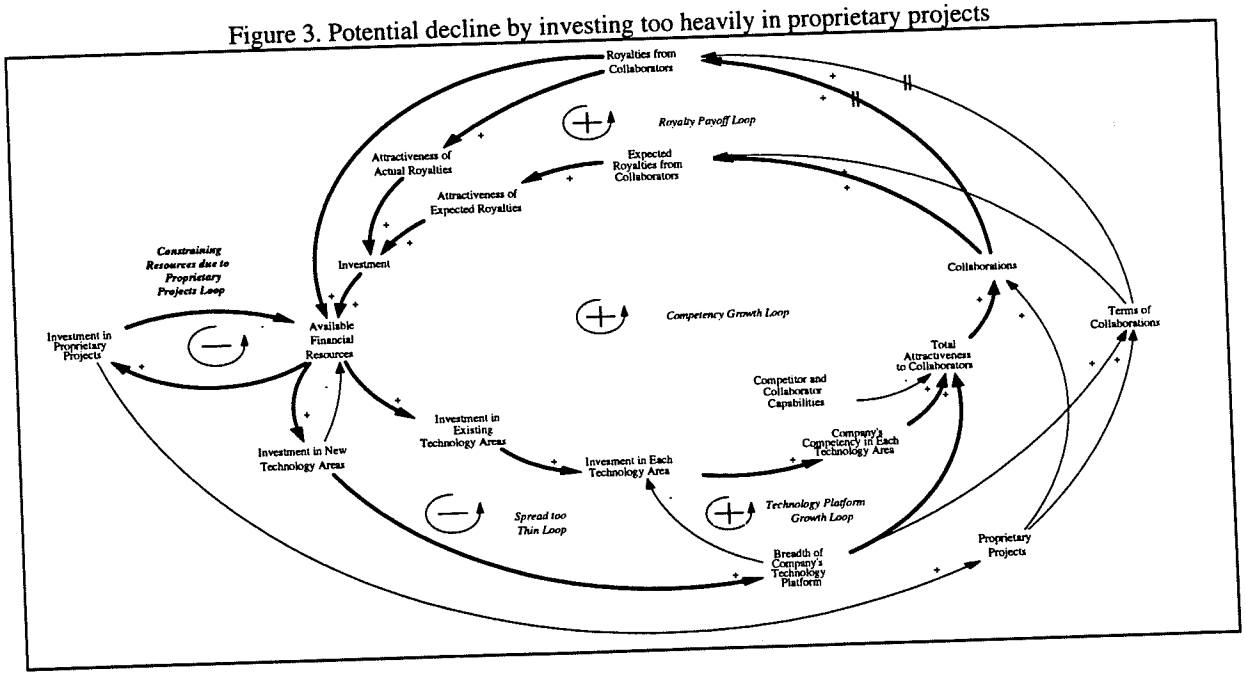
Figure 2. Potential decline by attempting to sustain too broad a technology platform




**Hypothesis 3:** Potential decline by investing too heavily in proprietary projects

Constraining Resources Due to Proprietary Projects Loop: This possible outcome is represented in the causal loop diagram in Figure 3. The company invests heavily in its proprietary projects, depleting the resources available for investment into new and existing technology areas. Thus, the company finds it difficult to expand or even maintain its competencies, leading to a similar outcome as described in the previous scenario.

Figure 3. Potential decline by investing too heavily in proprietary projects



## Exploring dynamic hypotheses by simulation

In order to explore the hypotheses stated above, several simulations were conducted using various growth strategies and environment conditions. The environment conditions tested represent constant and growing competition. The growth strategies tested represent the expansion into the next research technology called analoging and the expansion into proprietary projects. These expansions are categorized by their timing: early and late. Late means that expansion is conducted when the first drug innovation is launched. Early means that the company expands when a sufficient level of competency in existing research technologies is reached. The base case represents the company's current policy on expanding into analoging and into proprietary projects early. Simulation results under constant competition are shown in Figure 4.

Figure 4.

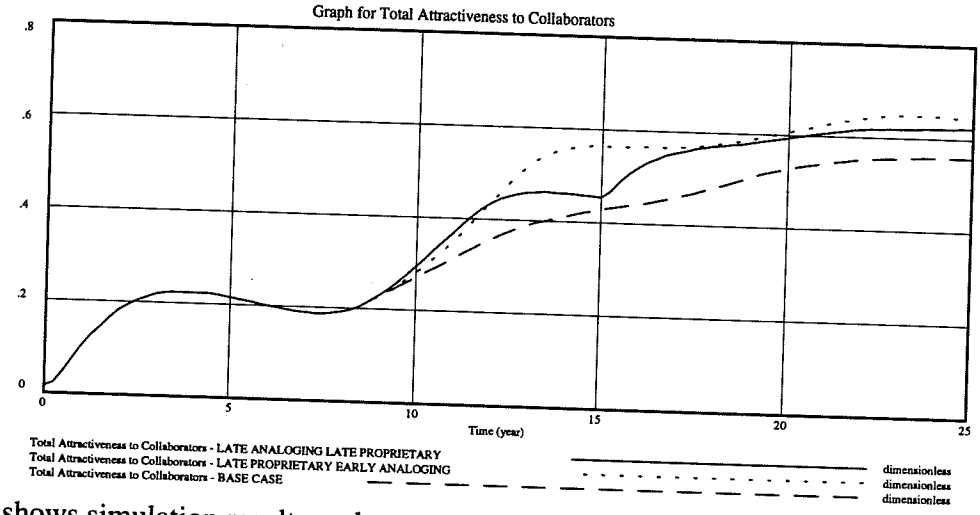
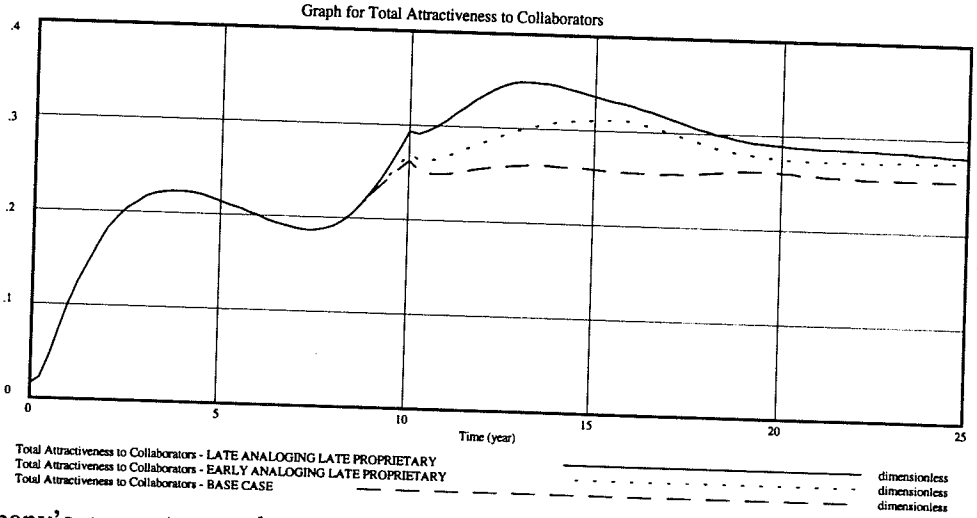



Figure 5 shows simulation results under strong growing competition.

Figure 5




The company's current growth strategy, the base case, performs worse under both competitive conditions compared to a strategy of late investment in proprietary projects.