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White Paper

The DevOps Disruption

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"We can represent the performance of a business model based on the money invested into the business and the revenue generated as a result."

Why invest in DevOps? Can a DevOps transformation lead to competitive advantage? Can it lead to market disruption? These are the questions we sought to answer by simulating DevOps transformation scenarios and comparing them to known business innovation patterns. By doing this, we can deliberately design strategies for the future we want.

Our key finding was that DevOps transformation can not only lead to competitive advantage, but under the right conditions, it can create market disruptions. In other words, when we can convert our systems of innovation into systems of disruption, the value of adopting DevOps may be far higher than we previously thought.

This report — part of ongoing research designed to make business innovation more of a (data) science — is based on the results of simulation modeling (Figure 1). We've published the model in the form of an interactive Web application to allow this report's audience to run their own simulations and provide us with feedback.

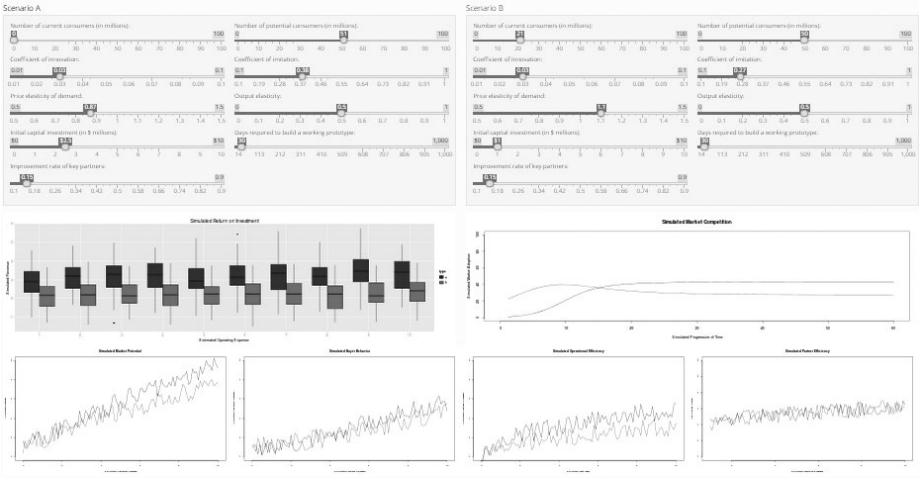

Figure 1. DXC Technology's prototype business model simulation app.

Firms announcing transformational IT investments tend to experience positive, abnormal changes in market value.[1] Simulation gives us a way to explore this pattern in more detail by simulating the specific effects of DevOps transformations. We can represent the performance of a business model based on the money invested into the business and the revenue generated as a result.

We modeled the influence of a handful of performance factors using a set of simple one-variable mathematical functions. We added random jitter to each function to represent uncertainty and chance within the simulation — unforeseen problems with suppliers, chance improvements in efficiency, unexpected jumps in buyer purchases, etc. The simulation predicts a final return on investment (ROI, revenue as a function of costs). Parameters allow us to tune the simulation so that it represents a specific business model. The simulation output can be thought of as theoretical propositions or hypotheses.

In this research report, we explain how the business model simulator leads us to the following hypothesis: Companies get a higher ROI and competitive advantage from their DevOps investment — but when the basis of competition is innovation, the effect tips from being an advantage to a disruption.

We start by simulating two business models, both under the same set of controlled conditions. The coefficient of innovation describes the importance customers place on new features when deciding whether to adopt a product: The higher the value, the more consumers are influenced to purchase. For example, Intel's 80486 PC released in 1991 had a coefficient of innovation of 0.0160 — nearly twice that of IBM's 1984 G4 mainframe, which had a coefficient of innovation of 0.0089.[2] Using a coefficient of innovation allows us to define innovation based on how product features drive adoption, rather than on any intrinsic property of the product features themselves. Sultan, Farley and Lehmann's analysis of 213 product diffusion models found the average coefficient of innovation to be 0.03 and the average coefficient of imitation to be 0.38.[3]

For most consumer goods and services, price elasticity tends to be between 0.5 and 1.5.[4] We assume a price elasticity of demand of 1.1, which makes our simulated business models approximately unitary elastic — every percentage decrease in price leads to a percentage decrease in demand. Our model assumes an output elasticity of 0.5, which is reasonable given that Guasch estimates the long-term output elasticity of the U.S. labor market to be 0.41.[5] The average improvement rate for a new product in the United States is 0.25.[6] For our control conditions, we assume a more conservative improvement rate of 0.15. Table 1 summarizes the parameters used to simulate the control conditions.

Parameter	Value
Number of current consumers (in millions)	0
Number of potential consumers (in millions)	50
Coeffcient of innovation	0.03
Coeffcient of imitation	0.38
Price elasticity of demand	11
Output elasticity	0.5
Initial capital investment ($M)	1
Days to build working prototype	30
Improvement rate of key partners	0.15

Table 1. Control parameters for the DevOps business model simulation.

Figure 2 shows the simulation of two business models both operating under the control conditions of Table 1. The simulated ROI and market performance of both models are similar but not identical. The simulations have a stochastic element to them that accounts for the small variations in performance.

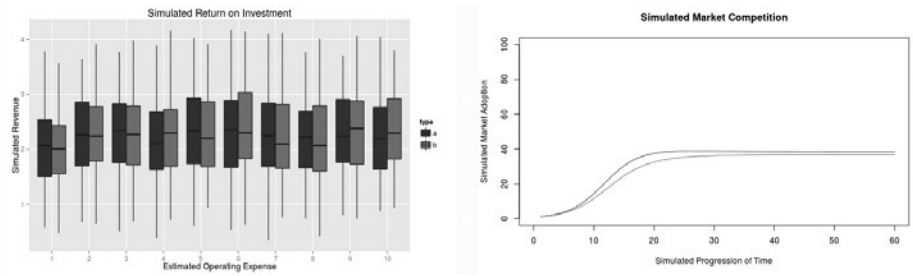

Figure 2. Simulation of two business models, the control shown in blue and the experimental in red.

What effect does a DevOps transformation have on the ability to compete in the marketplace? Companies that deploy IT automation generally do so to improve the efficiency of existing business processes.[7] The IT development benefit from DevOps means that the business experiences shorter development cycle times. In the model, partner efficiency is simulated using the microeconomics notion of a learning curve. Efficiency in execution is based on the time it takes to get through a production cycle and how much is learned in each cycle. The smaller the cycle times, the faster that learning occurs. This kind of execution efficiency is very important in scenarios like DevOps transformations where there are short development cycles and continuous learning feedback.

In 2009, John Allspaw and Paul Hammond described how Flickr's DevOps transformation led to a 10× decrease in development cycle time.[8] We will follow that example in our simulation and assume that the DevOps transformation in the experimental model reduces from 30 days to 3 days the time it takes to produce a working prototype. The operations benefit from DevOps means that the business is more productive at larger scales.

We model this in our simulation by increasing output elasticity (the change in output given a change in input). Suppose, then, that our DevOps deployment increased output elasticity by 10%, from 0.5 in the control to 0.6 in the experimental model. Figure 3 shows the simulated differences in ROI and market competition given the introduction of our DevOps transformation. The simulation predicts a slightly higher ROI at most levels of investment. It also predicts a stable, long-term advantage in market competition.

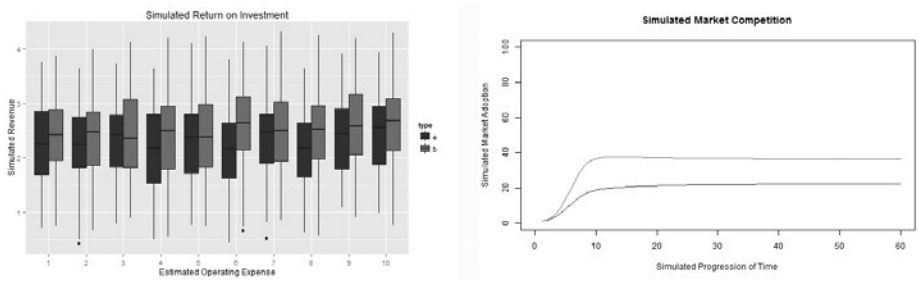

Figure 3. Simulated effect of DevOps, shown in red, in ROI and market competitiveness when compared to the control, shown in blue.

Companies that use IT transformation to execute strategic initiatives tend to introduce industry-disrupting practices like restructuring value chains or creating new market spaces.[9] Suppose we introduce a new, more innovative product into our simulation, where innovation is defined by an increased coefficient of innovation. For both business models, we increase the coefficient of innovation from 0.03 to 0.05. This is roughly equivalent to moving from a market that sells radios (0.027) to a market that sells CD players (0.055).[10]

Although we have made the same change to both business models, the shift to a more innovative market is disproportionately beneficial to the experimental model. The DevOps transformation has increased the experimental business model's ability to learn and produce new features. This makes a big difference in markets more sensitive to new features. In fact, the simulations tell us that, under these conditions, a successful DevOps transformation introduces a disruptive effect — a new competitive environment where the control model is unable to survive (Figure 4).

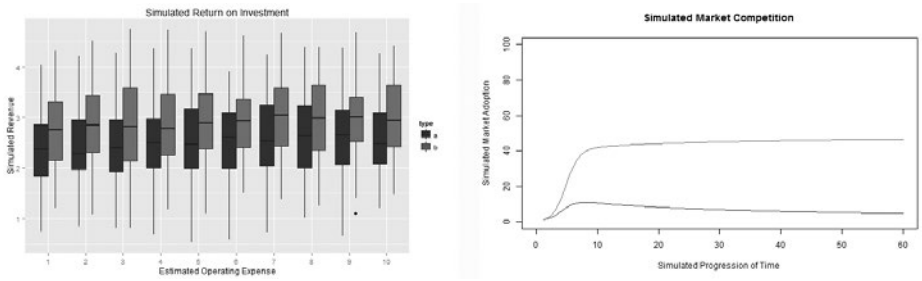

Figure 4. Simulated effect of using DevOps to compete in more innovative markets. The operational efficiency gains from DevOps lead to a substantial advantage when combined with a strategy of competing on greater innovation.

A successful DevOps transformation is expected to provide a competitive advantage. However, when the DevOps transformation is aligned with a strategy of market innovation, the result is a potential market disruption. A strategy of innovation changes buyer behavior, and customers place a premium on new features. Under those conditions, companies capable of learning fast and releasing new features quickly gain the ability to dominate their market.

Enterprise applications have different strategic value depending on how they are used and the rates at which they change. Systems of Record support core business transactions and change slowly, Systems of Differentiation support company-unique capabilities and change moderately, and Systems of Innovation open new business opportunities and change rapidly. [11] These simulations suggest another layer, Systems of Disruption: These systems disrupt the market and change continuously. A DevOps transformation allows an enterprise to produce features faster as the enterprise scales. When competing on innovation, new features have a strong effect on customer adoption. This increases the enterprise's ability to scale and creates a virtuous cycle where the winners win more.

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