

## Analyzing the Trade-offs between Functionality-rich and Minimalist Design of Two-sided Platforms\*

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Communication platforms from the Internet to social networks (e.g., Facebook, Twitter), as well as a plethora of computing platforms from personal computing (e.g., Windows, Apple OSX, Linux), to mobile devices (e.g., Android, iOS, Symbian), to cloud computing solutions (e.g., Google, Amazon, Microsoft Azure), are emerging as the main drivers of our digital economy. Together with this emergence often comes a period of transformation during which platforms face major design decisions that affect their future success and eventual survival. The most fundamental of these design decisions is the question whether a new platform should target a functionality-rich but complex and expensive design or instead opt for a bare-bone but cheaper one? In general, a platform's success depends on its ability to connect consumers of applications and services to developers of those applications and services. The platform entices developers to join by providing access to functionality through built-in APIs, modules, tools, etc., which make it easier to innovate new applications and services of interest to consumers. The platform provider's (development) costs, however, grow with the richness of the functionality it offers. The main question faced by a platform provider is, therefore, to decide what level of functionality to offer, or in other words how many "features" or "functionalities" to include in the platform so as to maximize its own profit. A minimalist platform has a low cost but makes developing services and applications more complex, which limits the number of application developed for it. This makes the platform less attractive to consumers and lowers revenues. Conversely, a functionality-rich platform is expensive to build, but this cost may be offset by facilitating the development of more applications, therefore attracting more consumers. Hence, developing tools to explore this trade-off is of particular interest to a wide range of network platform providers.

In this work, we introduce an approach based on models from economics to demonstrate how a two-sided market formulation can be used to investigate the problem. A generic model with the platform as the 'market' and consumers and developers as its 'two sides' is introduced, and key interactions between platform stakeholders are incorporated as a three-stage sequential decision process. The investigation illustrates how a two-sided market model can capture the decision problem of a platform provider in choosing the optimal functionality level of a platform. It also confirms a number of properties traditionally present in two-sided markets, e.g., the benefits of asymmetric pricing, and the effect that cross-externalities have in shaping the outcome. More importantly, it demonstrates how the platform's design decision is highly dependent on the relative rate of change of its own cost structure (how cost increases with the number of features it offers) and that of application developers (how they benefit from new features). We review some real-world scenarios (e.g., Amazon Web Services) for which such estimation may be feasible, and for each broadly characterize the shape of the cost functions as the number of features that the platform offers varies. In summary, this work explores the potential of such a cross-disciplinary approach in providing qualitative insights and quantitative tools to analyze the complex question of platform design.

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