

# **A THEORETICAL REVIEW OF NETWORK EFFECTS ON PLATFORM PRODUCTS**

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## **ABSTRACT**

Network effects appear to increase the benefits that consumers derive from a product as the user set expands. In platform products, they are known as one of key mechanisms of being successful on that business. This is mainly because they generate the incentives for users in choosing the platform. For examples, many business achievements, such as VHS video, Microsoft windows OS and NTT Docomo i-mode have exhibited network effects. The purpose of this study is to present a new elaborated concept of network effects and eight perspectives in platform products with layered structure which constructed by three players i.e. platform leaders, complementary products (complementors) and users.

Firstly, there have been many studies about network effects and almost all studies have argued the influence to end-users, based on the network scale (the number of subscribers). However, the study alludes the necessity of network effects with the significance of linkages between members i.e. access frequency and weight, as well as the number of linkages between members.

Secondary, the study classifies four categories and eight perspectives working between couples of layers among platform products, complementary products and users. Four categories are as follows,

1.Network effects between users, 2.Network effects between complementary products (complementors), 3.Network effects between a user and complementary products (complementors), 4.Network effects between a complementary product (complementor) and users.

Consequently, the study offers two suggestions. The First one is a new elaborated concept regarding network effects i.e. the significance of linkages between members. The other one is four categories between couples of layers among platform products, complementary products and users, compared with two conventionally categories between products and users typically by Katz & Shapiro (1985). In addition, an actual case is presented to each four category, which exhibits the theoretical difference concerning network effects between the study and that of Katz & Shapiro (1985).

**Keywords:** Network effects, Platform products, Complementary products, Complementors

## **INTRODUCTION**

Discussion about the diffusion of platform products is often based upon the theory of positive network effects. There have been many cases upon the theory, such as QWERTY vs. Dvorak's DSK, Microsoft Internet Explorer vs. Netscape Navigator, VHS vs. Beta. On the other hand, we have already obtained a common finding regarding the existence of network effects which prove the increasing value for users as the

number of its users increases. This study is focusing on so-called indirect network effects arising from the amount and variety of complementary products.

The purpose of the study is mainly three points,

- To review the concept of network effects in theory
- To classify network effects particularly on platform products with the layered structure on the study, which results in the quite different categories from those of Katz & Shapiro
- To prepare developing the strategic theory of platform product by adopting the classification framework

### **Definition of network effects and platform products**

Network effects are a characteristic that causes a product to have a value to a potential customer which depends on the network who owns the products. In other words, the network of prior adopters is a term in the value available to the next adopter.

The definition of network effects on this study is as follows,

Network effects are defined as the property of a network which influences the users' utility.

In general, the meaning of effects has positive and negative; however, as can be understood from above, positive network effects are principally mentioned in the study. From a theoretical point of view, many researchers argue network effects. For instance, Rohlfs (2001)<sup>1</sup> describes the meaning of network externalities. Network externalities: These apply to products and services that use telecommunications networks. As the set of users expands, each user benefits from being able to communicate with more persons (who have become users of the products or services).

On the other hand, the definition of platform products on the study is as follows, "Platform products are "core" products (hardware, software or services) which position inside complex products with layered structure."<sup>2</sup>

As a reference, the term of platform is explained by Cusumano, M.A<sup>3</sup> as follows, "The term "Platform" can refer to a foundation product that has the most value when it works as the core of a system of components made by one or more firms."

### **The definition of network effects by Katz and Shapiro (1985)<sup>4</sup>**

In the meantime, Katz and Shapiro (1985) classifies 2 categories on network effects as follows,

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<sup>1</sup> Rohlfs, J. H. (2001). "Bandwagon Effects in High-Technology Industries", The MIT Press, pp8.

<sup>2</sup> Negoro, T & Kato, K.(2006) "A Critical Development of the Four Levers Framework on Platform Leadership by M. A. Cusumano & A. Gawer :Through the Re-examination of Cases by M. A. Cusumano & A.Gawer and an Additional Case Study of Java", *Research Institute of Information Technology and Management, Waseda Univ. Working Papers*,No.18.2006.pp14. Partly Revised

<sup>3</sup> Cusumano, M. A.(2004). "The business of software", Free Press, pp74

<sup>4</sup> Katz, M. L & Shapiro, C.(1985) "Network Externalities, Competition, and Compatibility" *American Economic Review*, Vol.75, No.3, pp.424-440.

**Direct physical effects:** The consumption externalities may be generated through a direct physical effect of the number of purchasers on the quality of the product. The utility that a consumer derives from purchasing a telephone—clearly depends on the number of other households or businesses that have joined the telephone network. These network externalities are present for other communications technologies as well, including Telex data networks, and over-the-phone facsimile equipment.

**Indirect effects:** There may be indirect effects that give rise to consumption externalities. For example, an agent purchasing a personal computer will be concerned with the number of other agents purchasing similar hardware because the amount and variety of software that will be supplied for use with a given computer will be an increasing function of the number of hardware units that have been sold. This hardware-software paradigm also applies to video games, video players and recorders, and phonograph equipment.

## **A NEW ELABORATED CONCEPT OF NETWORK EFFECTS**

As a first proposition, this study demonstrates a new elaborated concept regarding network effects. One main historical point of view is that to what extent of network effects working the incentives in choosing the platform for users has depended on the number of network members. Nevertheless, as another essential concept, the significance of specific linkages is insisted in this study. In other words, the number of linkages is not necessarily automatically causing the incentives for platform users because the significance of specific linkages is important as well.

## **FOUR CATEGORIES OF NETWORK EFFECTS**

This study classifies four categories working between couples of layers among platform products, complementary products and users. Four categories are as follows,

1. Network effects between users—The increase of platform products' users causes network effects between users
2. Network effects between complementary products (complementors)—The increase of platform products' users causes network effects between complementary products (complementors).
3. Network effects between a user and complementary products (complementors)—The increase of complementary products and complementors caused by the increase of platform products' users generates network effects to a user.
4. Network effects between a complementary product (complementor) and users—The extension of users caused by the increase of platform products generates network effects to a complementor.

### **Comparison with the theory by Katz and Shapiro (1985)**

Upon four categories, this study examines conformity with the network effects theory by Katz and Shapiro (1985). They differentiated between direct network effects in terms of direct “physical” effects of being able to access and indirect network effects arising

from the amount and variety of the complementary products. The comparison with Katz and Shapiro (1985) is as follows,

1. Network effects between users >>> Direct physical effects by Katz and Shapiro
2. Network effects between complementary products (complementors) >>> Not Applicable
3. Network effects between a user and complementary products (complementors) >>> Indirect effects by Katz and Shapiro
4. Network effects between a complementary product (complementor) and users >>> Not Applicable

### **Classification of eight categories**

By combining two indications i.e. the proposed concept and four categories, total eight perspectives are made as an analytical framework. To distinguish each perspective, codes<sup>5</sup> are assigned below respectively in the study.

The number and diversity of linkages ÅH. UU-N 2. CC-N 3. UC-N 4. CU-N

The significance of linkages ÅH. UU-S 2. CC-S 3. UC-S 4. CU-S

*UU-N, CC-N, UC-N and CU-N*

UU-N explains that from platform users' point of view, the incentives in choosing platform depend on the number and diversity of other accessible users.

CC-N explains that from platform complementors' point of view, the incentives in choosing platform depend on the number and diversity of other accessible complementors.

UC-N explains that from platform users' point of view, the incentives in choosing platform depend on the number and diversity of other accessible complementary products (complementors).

CU-N explains that from platform complementors' point of view, the incentives in choosing platform depend on the number and diversity of other accessible users.

*UU-S, CC-S, UC-S and CU-S*

UU-S explains that from platform users' point of view, the incentives in choosing platform depend on the significance of other particular accessible users.

CC-S explains that from platform complementors' point of view, the incentives in choosing platform depend on the significance of other particular accessible complementors.

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<sup>5</sup> For example, UU-N stands for User to User in terms of Number. CU-S stands for a Complementor to Users in terms of Significance.

UC-S explains that from platform users' point of view, the incentives in choosing platform depend on the significance of other particular accessible complementary products (complementors).

CU-S explains that from platform complementors' point of view, the incentives in choosing platform depend on the significance of other particular accessible users.

## ACTUAL CASES

In the following, actual cases are illustrated in turn from eight perspectives.

### 1. Network effects between users

Actual case in the number of linkages (case UU-N): OS users choose OS type to share the information easily e.g. regarding trouble shooting with the large number of other same OS users.

Actual case in the significance of linkages (case UU-S): OS users choose OS type to exchange files consistently with the significant other same OS users. e.g. Linux users.

### 2. Network effects between complementary products (complementors)

Actual case in the number of linkages (case CC-N): Complementors developing statistics software choose to adopt the spreadsheet software on the OS that is already diffused widely.

Actual case in the significance of linkages (case CC-S): Complementors providing a training for particular application software choose OS for the significant segment users' demand. e.g. Unix training outsourcers

### 3. Network effects between a user and complementary products (complementors)

Actual case in the number of linkages (case UC-N): Game users choose the platform i.e. game hardware brand, because of the diversity of application software.

Actual case in the significance of linkages (case UC-S): A user chooses the platform for getting killer game application software. e.g. Sony Play station user/ Final Fantasy X

### 4. Network effects between a complementary product (complementor) and users

Actual case in the number of linkages (case CU-N): A complementor developing game contents application chooses the platform game maker due to the large number of game users.

Actual case in the significance of linkages (case CU-S): A complementor manufacturing a cable connecting PC to the portable game chooses the platform game maker with targeting the segment of heavy music listeners over the portable game. e.g. Manufacturer of USB cable for Play Station Portable by Sony/GAMETECH CO.,LTD

## CONCLUSION

To sum up, there have been many studies about network effects and almost all studies argue the influence to end-users, based on the network scale (the number of

subscribers). However, this study alludes the necessity of network effects with the significance of linkages between members i.e. access frequency and weight, as well as the number of linkages between members.

Platform product is defined as the product with collateral complementary products. The study develops the concept of network effects on platform products.

Consequently, the study classified four categories between couples of layers among platform products, complementary products and users, compared with two categories between products and users mainly by Katz & Shapiro (1985). In addition, an actual case is presented to each four category, which exhibits the theoretical difference concerning network effects between the study and that of Katz & Shapiro (1985).

As a future assignment, the study is still open to question about main levers i.e. strategic schemes for the growth of ecosystem made up of platform leaders and complementors, by leveraging network effects on the platform strategy on a theoretical basis. Further investigations shall be provided.

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