

## A theoretical review of network effects on platform products

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### Introduction

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- **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 and so on.
- **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 paper** is focusing on so-called indirect network effects arising from the amount and variety of complementary products.

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Contents :	
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The purpose of this paper	
• <b>To review</b> the concept of network effects in theory. For example, it presents 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.	
• <b>To classify</b> network effects particularly on platform products with the layered structure on this paper, which demonstrates in a quite different categories from those of Katz & Shapiro (1985)	
• <b>To prepare</b> developing the platform strategic theory by adopting the classification. For example, it explains how to address main strategic 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.	

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## Past Literatures and the definition of network effects on platform products

### Direct and indirect effects by Katz and Shapiro (1985)

Katz and Shapiro (1985) classified 2 categories on network effects as follows,

● **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, for example, dearly 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.

Source: Network Externalities, Competition, and Compatibility Michael L. Katz; Carl Shapiro (1985)

## Network effects in this paper

- The definition of network effects on this paper is as follows,
  - The utility of users caused by the network as increasing of users adopting products
    - The network means the relationship between a user and other users
- As a reference, Rohlfs(2001) described 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)

Source: Rohlfs, J.H. (2003). "Bandwagon Effects in High-Technology Industries", The MIT Press. p8

## Definition of platform products

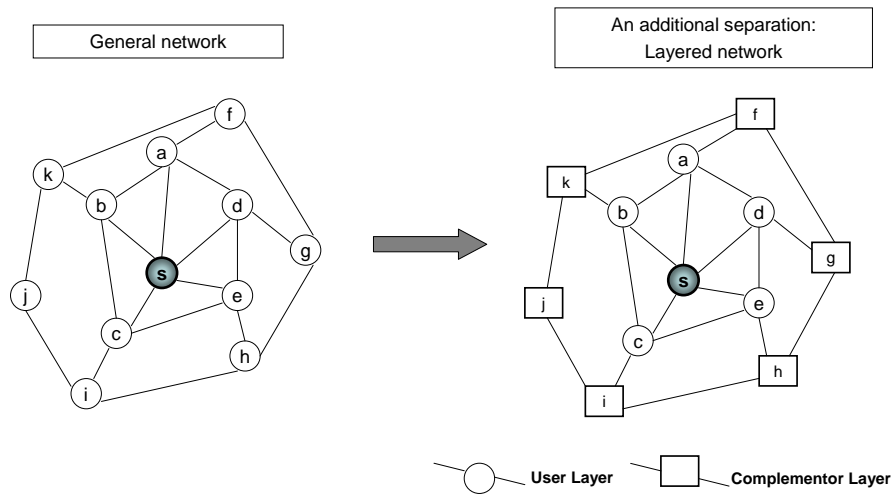
- The definition of platform product on this paper is as follows,
  - "Platform product is a "core" product (hardware, software or services) which positions inside complex products with layered structure."  
Negoro, T. & Kato, K. (2006) partly revised.
- As another reference, the term of platform is explained by Cusumano, M.A 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.

Source: Cusumano, M.A. (2004). "The business of software", Free Press, p.74

### The concept of network effects on platform products

### An additional separation : Layer of network

Outlined picture of network



### New elaborated concept: The significance of specific linkages

Concept of network effects

A) The number of network members

**The number of linkages**

The incentives for platform users are caused by the number of linkages because it generates network effects.

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**Bold lines show more significant than normal lines.**

This study points out as another concept

B) Linkage between specific members

**The significance of specific linkages**

The number of linkages is not necessarily causing the incentives for platform users because of the significance of specific linkages.

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### Classification of network effects between layers

4 types of network effects between layers

<p><b>1) Network effects between users</b></p>	<p>1) Network effects between users: The increase of platform products' users causes network effects between users</p>
<p><b>2) Network effects between complementary products (complementors)</b></p>	<p>2) Network effects between complementary products (complementors) : The increase of platform products' users causes network effects between complementary products (complementors).</p>
<p><b>3) Network effects between a user and complementary products (complementors)</b></p>	<p>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 users.</p>
<p><b>4) Network effects between a complementary product (complementor) and users</b></p>	<p>4) Network effects between a complementary product (complementor) and users : The spread of users caused by the increase of platform products generates network effects to complementors.</p>

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### Perspective 8 codes on this paper

Perspective 8 codes on this study	Views/models	The number and diversity of linkages	The significance of linkages	
	1	<b>UU-N</b>	<b>UU-S</b>	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.
	2	<b>CC-N</b>	<b>CC-S</b>	
	3	<b>UC-N</b>	<b>UC-S</b>	
	4	<b>CU-N</b>	<b>CU-S</b>	

**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.

**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.

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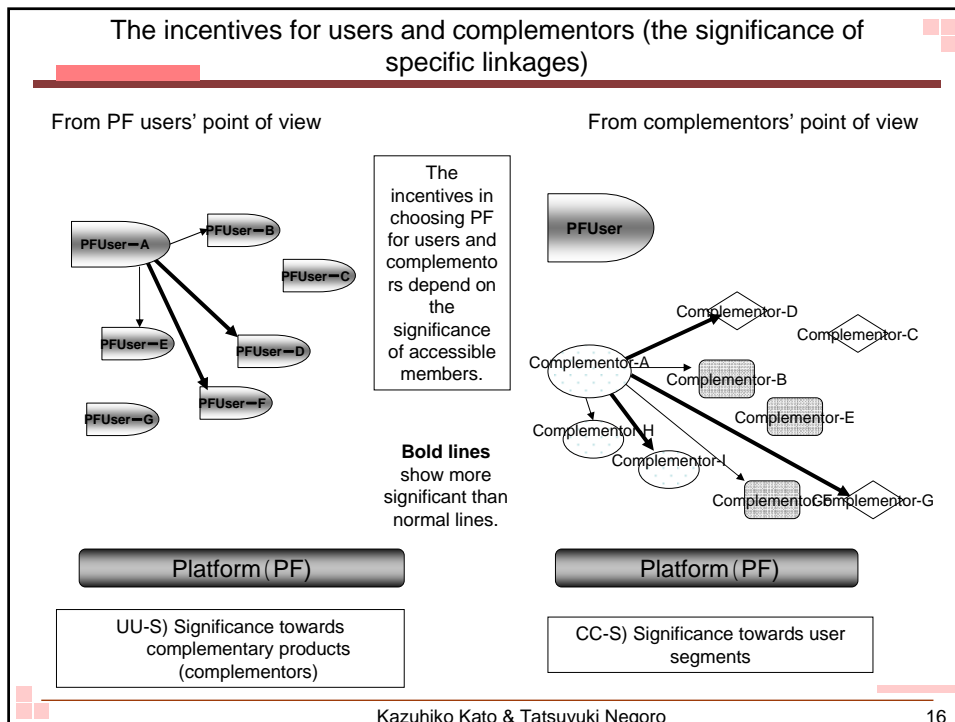
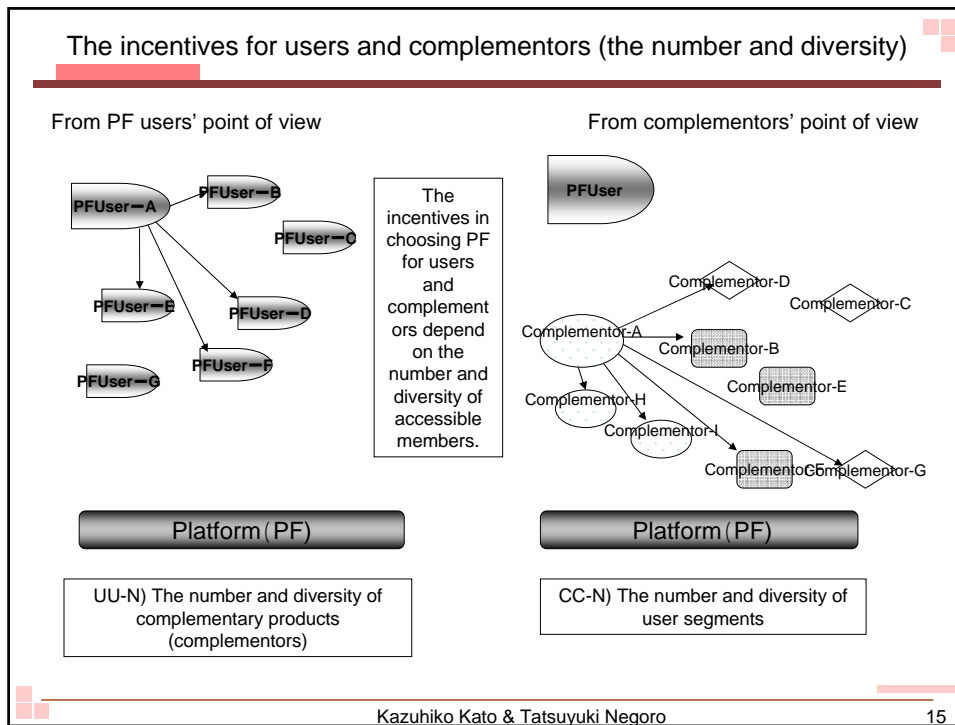
### Layered structure of platform products and complimentary products

To explain the relationship among Platform products, Complementary Products and Users, this paper uses concise pictures below,

C.P: Complementary Products

Layered structure: this picture shows that there are many complementary products on the platform

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### Corresponding actual cases 1),2)

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1) Network effects between users  
 Actual case in the number of linkages (case UU-N): OS users chose 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 chose 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 chose 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 chose OS for the **significant** segment users' demand. e.g. Unix training outsourcers

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### The incentives for users and complementors (the number and diversity)

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From PF users' point of view

C.P.: Complementary Products

Platform (PF)

UC-N) The number and diversity of complementary products (complementors)

From complementors' point of view

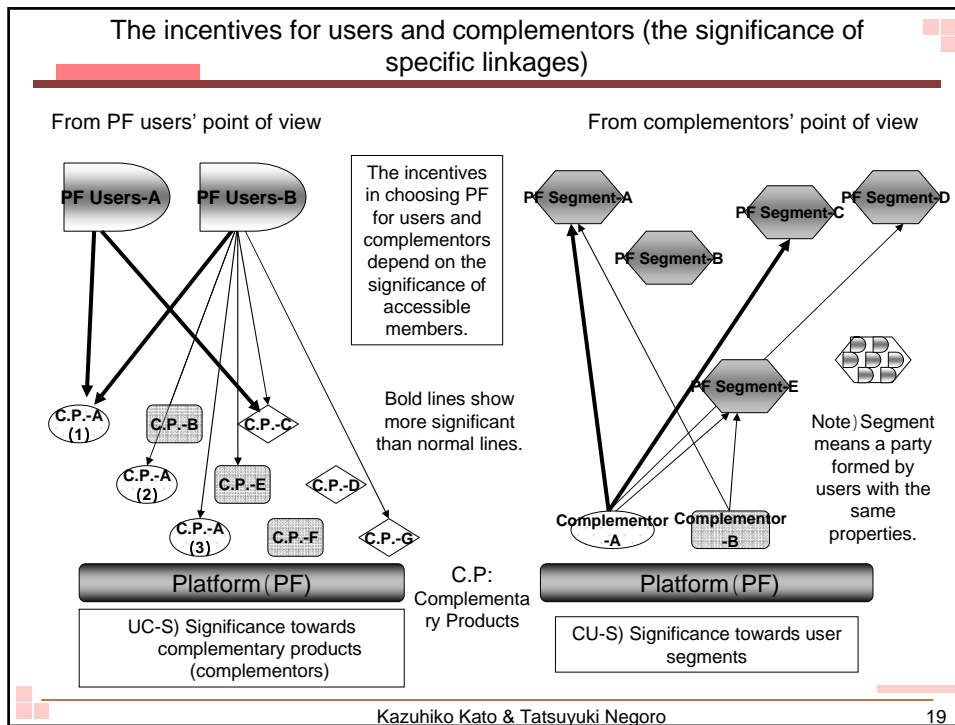
Platform (PF)

CU-N) The number and diversity of user segments

Note) Segment means a party formed by users with the same properties.

The incentives in choosing PF for users and complementors depend on the number and diversity of accessible members.

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### Corresponding actual cases 3),4)

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

Actual case in the number of linkages (case UC-N): Game users chose 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 chose the platform for getting **killer** game application software. e.g. Final Fantasy X/ Sony Play station user

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 chose 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 USB cable connecting PC to portable game chose the platform game maker with targeting the **specific segment** of music listeners over the portable game. e.g. GAMETECH CO.,LTD./USB cable for Play station portable

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The classification of network effects and comparison with Katz&Shapiro (1985)

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Comparison between traditional classification of network effects by Katz and Shapiro (1985) and that of this study (in case of the number of linkage)

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Classification on this study	Place where exhibits network effects	Factor bringing effects	Katz&Shapiro's classification
1) Network effects between users	Between users	The number of platform products' users	Direct physical effects
2) Network effects between complementary products	Between complementary products (complementors)	The number of platform products' users	<b>None</b>
3) Network effects between a user and complementary products (complementors)	A user and complementary products	The number and diversity of complementary products (complementors)	Indirect effects
4) Network effects between a complementary product (complementor) and users	A complementor and users	The number and diversity of end-users and user segments	<b>None</b>

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## Conclusion and future assignments

## Conclusion and future assignments

**To sum up**, there have been many studies about network effects and lots of studies argue the influence to end-users, based on the network scale (the number of subscribers). However, this paper alludes the necessity of network effects with the significance of linkages between members **i.e. accessible frequency and weight**, as well as the number of linkages between members.

**In addition**, the paper 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 studies shall be provided.

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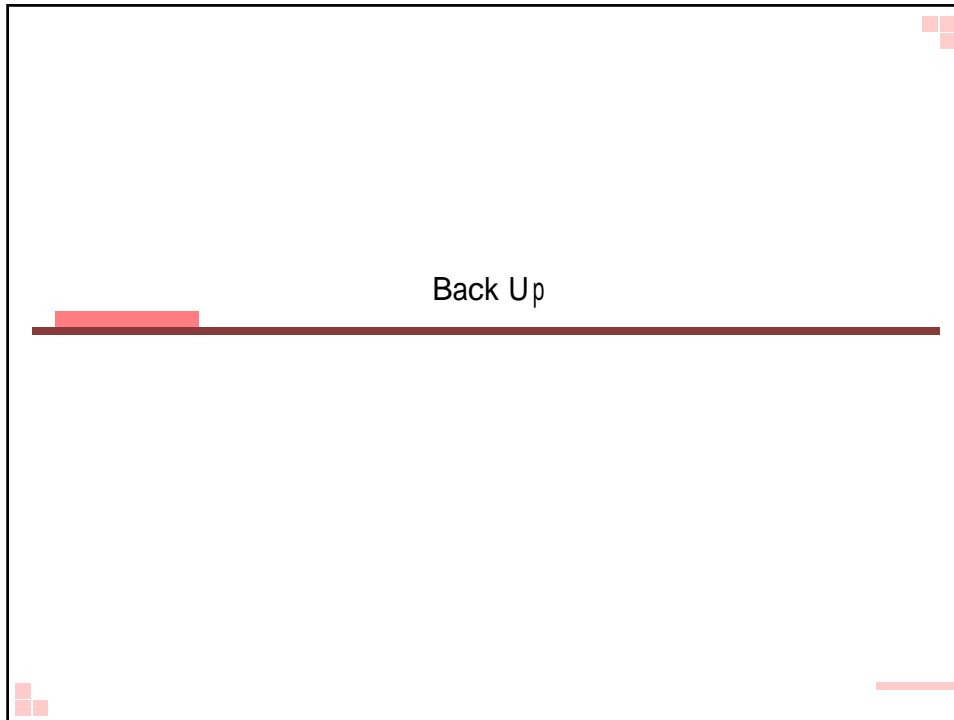
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Thank you so much for your kind attention.





## 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,
  - Network effects between users, Network effects between complementary products (complementors), Network effects between a user and complementary products (complementors), 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

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- There are many products for which the utility that a user derives from consumption of the good increases with the number of other agents consuming the good. There are several possible sources of these positive consumption externalities.<sup>1</sup>
- 1) 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, for example, 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.
- 2) 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.

- 1 In addition to the sources of consumption externalities mentioned in this paper, there are a number of more subtle ones. These include: (i) the fact that product information is more easily available for more popular brands; ii) the role of market share as a signal of product quality; and (iii) purely psychological, **bandwagon effects**.

References of network effects on this study( in case of the number of linkages)

Classification on this study	Place where exhibits network effects	Factor bringing effects	Substance of effects 'example	Actual cases in case of the number of linkages	Example:Which to choose?
Network effects between users	Between users	The number of platform products' users	Sharing complementary products and its information with other users	MS-Word users chose to continue the same OS as complementary products in a system renewal to share applications, and information regarding OS with others.	Word OR Ichitaro ?
Network effects between complementary products	Between complementary products (complementors )	The number of platform products' users	Offering complementary products of its own with tie-in other complementary products	Complementors developing statistics software chose to adopt the spreadsheet software that is already diffused widely.	Excel OR Lotus 1-2-3 ?
Network effects between a user and complementary products (complementors )	A user and complementary products (complementors )	The number and diversity of complementary products (complementors)	Getting the number and diversity of accessible complementary products (complementors)	Game users chose the platform i.e. game hardware brand, because of the diversity of application software.	Sony Play station OR Microsoft Xbox ?
Network effects between a complementary product (complementor) and users	A complementary product (complementor ) and users	The number and diversity of end-users and user segments	Getting the number and diversity of accessible users and user segments	Complementors developing portable game contents application chose the platform game maker due to the number of game users.	Sony PSP OR Nintendo DS ?

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References of network effects on this study( in case of the significance of specific linkages)

Classification on this study	Place where exhibits network effects	Factor bringing effects	Substance of effects' example	Phenomenon in the case of the significance of specific linkages	Examples: Actual cases
Network effects between users	Between users	The number of platform products' users and <b>access significance</b>	Sharing complementary products and its information <b>with other significant users</b>	Prevalence (or survival) of platform between specific significant users even it has small number	A user adopts the same application with partners because they are using only Ichirato.
Network effects between complementary products (complementors)	Between complementary products (complementors)	The number of platform products' users and <b>access significance</b>	Offering complementary products of its own with tie-in <b>other significant complementary products</b>	Prevalence (or survival) of platform between specific significant complementary products even it has small number	A complementor releases integrated software; Lotus Super Office for niche long-standing users
Network effects between a user and complementary products (complementors)	A user and complementary products (complementors)	The number and diversity of complementary products (complementors) and <b>access significance</b>	Securing the accessibility of <b>significant</b> specific complementary products and (complementors)	Prevalence (or survival) of platform between a user and specific significant complementary products even it has small number	A user chooses Sony Play station for getting killer game application software. e.g. Final Fantasy X
Network effects between a complementary product (complementor) and users	A complementary product (complementor) and users	The number and diversity of end-users and user segments and <b>access significance</b>	Securing the accessibility of <b>significant</b> specific users and user segments	Prevalence (or survival) of platform between a complementor and specific significant users even it has small number	A complementor developing a cooking recipe application choose Nintendo DS with targeting the segment of housewives

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