Influence of Free Version upon Pay Version of High Specialty Software Diffusion

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Abstract
Today software vendors have various ways to handle their products. In contrast to non-software products, software products' properties can be changed or controlled at a low cost; vendors do not need to extend their operations, and well-designed software can be customized systematically. Moreover, its diffusion is influenced by its market's externalities. The diffusion structures of software that have single user type, e.g. World Wide Web browsers, can be expressed mainly as a single reinforcing loop. This is because users can be considered as homogeneous. However, there are multiple possibilities of structure, which corresponds to business strategies for software which has divided users. An example in this category would be highly specialized software, e.g. simulation software. We attempt to explain diffusion processes and characteristics concerning externalities of software in this category using System Dynamics models. This paper shows that multiple versions can more effectively assist diffusion of main products than strengthening externality effects.

1. Introduction

Today we can find much software that has several versions irrespective of fields, price range, or the degree of difficulty in acquisition of skills to use them. For example, Microsoft is handling two versions of an operating system and several versions of an office suite.

Many kinds of simulation software are also released with multiple versions. Most of them are given their own characteristics by which customers can distinguish them in functions, prices, or additional support services.

Some software products have a pay version and a free version. This is an extreme pattern of price distinction.

Indeed, there are already products that have similar distribution styles; some

simulation software has a free student version that is allowed to be used by full time students. Its purpose is to help or promote students to know easily how to use or learn their product. Their products have been already purchased by schools so that they can earn profit despite free distribution of the student version. It is reasonable for software vendors to occupy market as soon as possible because software markets have “Winner-take-all” rule (Frank and Cook 1998).

This free distribution can be considered as a kind of publicity. In addition, this style of publicity was only employed for new, or rather novel, software or by new or small companies. Nevertheless, Microsoft, a huge company, is also handling several versions of their products. However, they have never released free versions of them. Their lower price versions are not publicity materials. Rather, they are introduced to the market in order to meet multiple needs. People who need only basic functions can select lower price products. Moreover, Microsoft can prevent such people escaping to other companies' products or giving up using computers. Hence, we can say that Microsoft expects not that lower price versions assist higher price products but that they should meet multiple needs and keep their potential customers.

Today we can find some products which have both pay versions and completely free versions not for advertisement but for one of regular products. For example, Sun Microsystems released a pay version of an office suite "Star Office." In contrast, OpenOffice.org also released a free version of it whose name is "Open Office." Their names are different, but programs are the same. Indeed, a unitary group (OpenOffice.org) develops them. Other software vendors are also handling both versions of one product because of strategic reasons.

Sun Microsystems can obtain some benefits brought by externality effects, which is the phenomenon that one’s choice affects others’ choices regardless of merchandise’s position in markets (Arthur 1996). The free version can bring more users, and it can cause to bring more users to the pay version.However, highly specialized software, including simulation software, has different properties; their customers are clearly divided into active users who use the software in order to make something and passive users who use the software to read the result or are beginners. Their inner communication (an active user to another active one, or a passive user to another passive one) and inter categories communication can be different. If this is true, it is possible for them to be influenced by externalities in a different style or degree from the Sun Microsystems' case.

This paper shows the models of each strategy and examines them in order to explain differences between strategies to make software popular using free versions.

2. Methods

Irrespective of strategies to distribute software, there are at least three stock flow combinations: passive users, active users, and data inventories.

The passive users include a kind of research clients and recipients of reports. The active users consist of model designers, and code programmers who make workable data or some programs for their clients. The data inventories are accumulated by activities of active users.

Since diffusion of software is considered to have externalities, regardless of user types or software variety, both users have direct feedback loops to themselves. More passive users produce more passive users in the future. It is possible for followers to have more information on this software. Specifically, followers can consider that they can avoid problems. This idea incites them to choose this software, regardless of its characteristics. Likewise, more active users bring more active users. Followers can think that they can get useful information to operate this software. Highly specialized software sometimes requires us to take a long time to become skillful. Therefore, it is a general attitude of active users to choose existing software with more information, not withstanding the possibility of some problems regarding its capacity.

These two feedback loops are both reinforcing loops. They are expected to have some effects including path dependency that brings a robust characteristic of systems' performances (Sterman 2000).

In contrast, the data inventories have no feedback loops that return directly to the data inventories. The data cannot increase by themselves; change has to be stimulated by the active users' activity, i.e. marketing activities, data processing, or programming.

These three stock flow combinations are connected with a feedback loop. Increase in passive users (*e.g.* clients) leads to growth of active users (*e.g.* model builders or programmers). Increase in active users promotes making data. More data stimulates passive users' interest; its popularity brings passive users' trust in results of research and the software can be employed into their work.

In addition, there is another short feedback loop between passive users and active users; one encourages an increase in its own number. Passive users tend to choose contractors only from applicants who use famous or known methods because of their trust. Markets that have more clients attract active users because the business in such markets can be more profitable.

These basic conditions produce the causal relation diagram in Figure 1.

In order to verify the effect of free version software release, we add one stock flow

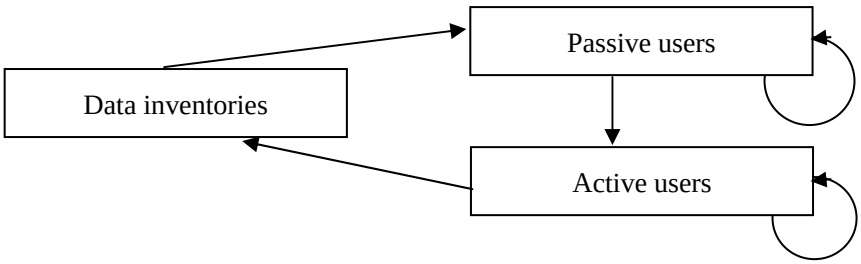

Figure 1. Causal relationship Diagram

combination concerning diffusion of free version software. This stock flow combination is connected with passive users' stock flow combination, not with active users. The reason for this connection is the assumption that most products of free version software have limitations in their function because of distinction between free versions and pay versions, which is often based on strategic or marketing requirements, not on cost of product development. Because of this, we suppose that free versions are expected more by beginners or newcomers to its market, compared with active or skilful users.

It is usual to provide some support programs or data through vendors' World Wide Web pages in the Internet today. Indeed, most vendors already have their own distribution bases in the Internet. Therefore, they do not need to have additional distribution costs for release of free versions. Moreover, software can be easily controlled by programmers whether a function works or not. This means that making multiple versions does not require additional costs. These conditions of costs are a unique characteristic of software and different from other non-software products. Hence, it is possible to eliminate discussion about the cost for free version release.

3. Simulations and Results

In order to substantiate the effects of the activity of free version releases, the model, coming from the basic conditions without additional stock flow combinations concerning free version's diffusion, was tested. This model is shown in Figure 2.

It has external inputs that give both users' characteristics which are how quick performances were changed. New function releases are done each twelve time-units.

Various sets of values in external input variables reveal that changes of combination patterns of external input values provide no difference in the result. A typical performance is shown in Figure 3. Both active users and passive users are constantly decreasing or remain constant. Pulses are given by new function releases.

Next, a diffusion structure including free version (Figure 4) was examined. This additional structure, which is inside a dotted box, is connected with stock flow

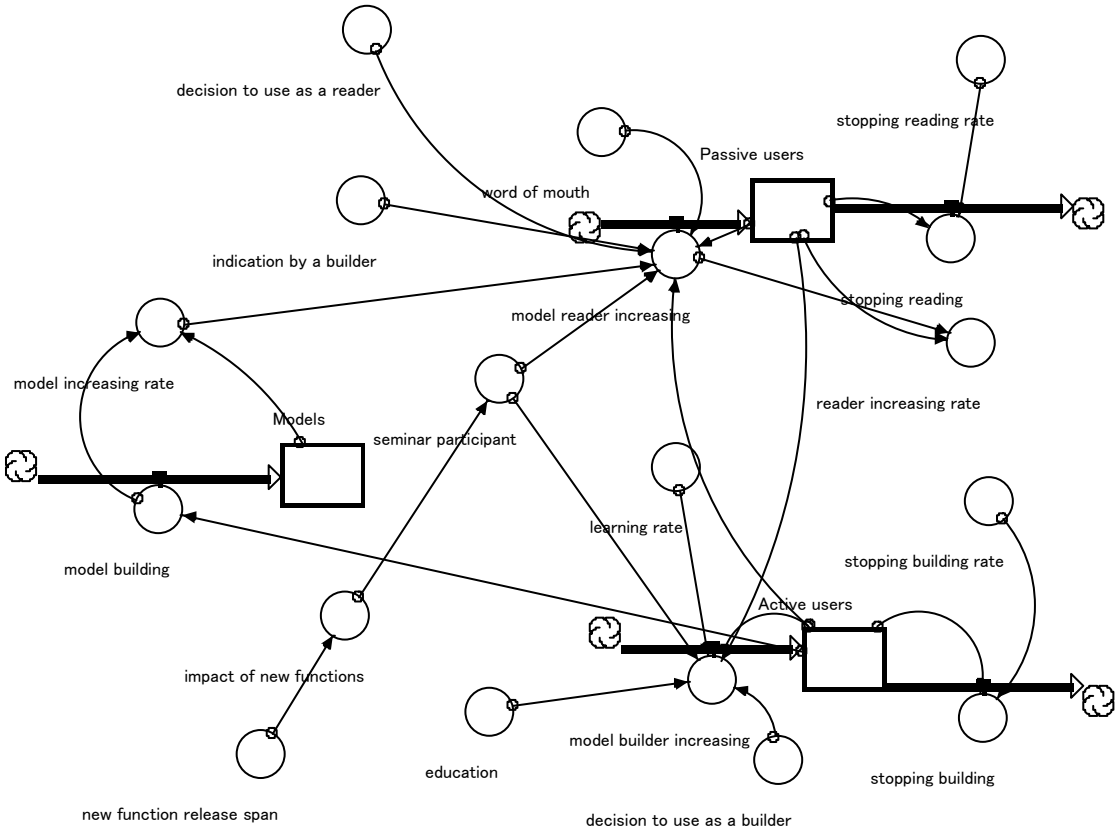

Figure 2: Stock Flow diagram for the model shown in Figure 1.

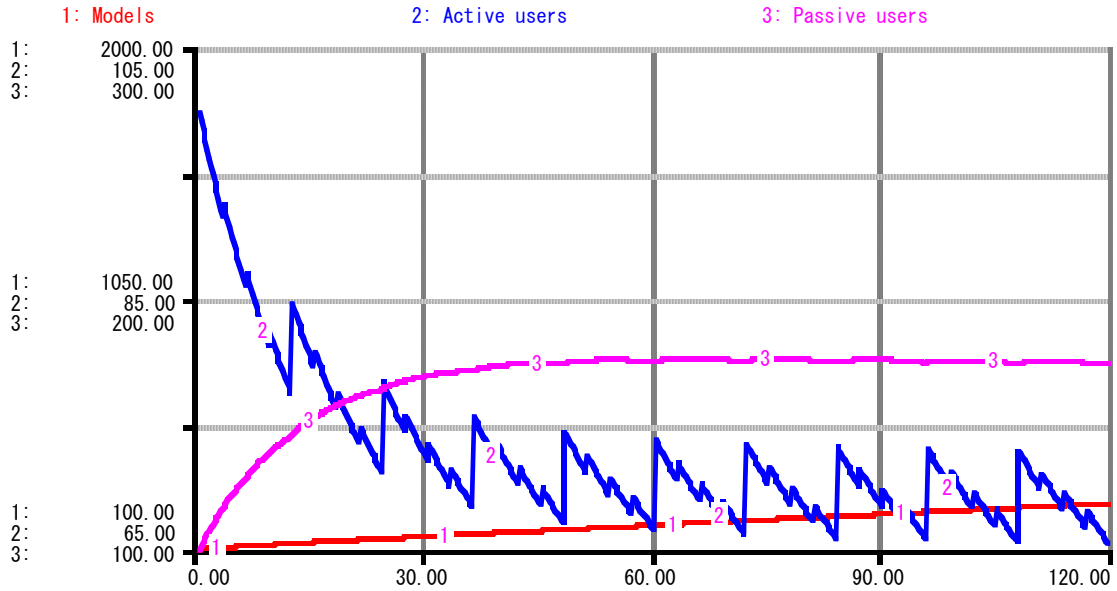

Figure 3: Transition of models, active and passive users of the model of Figure 2

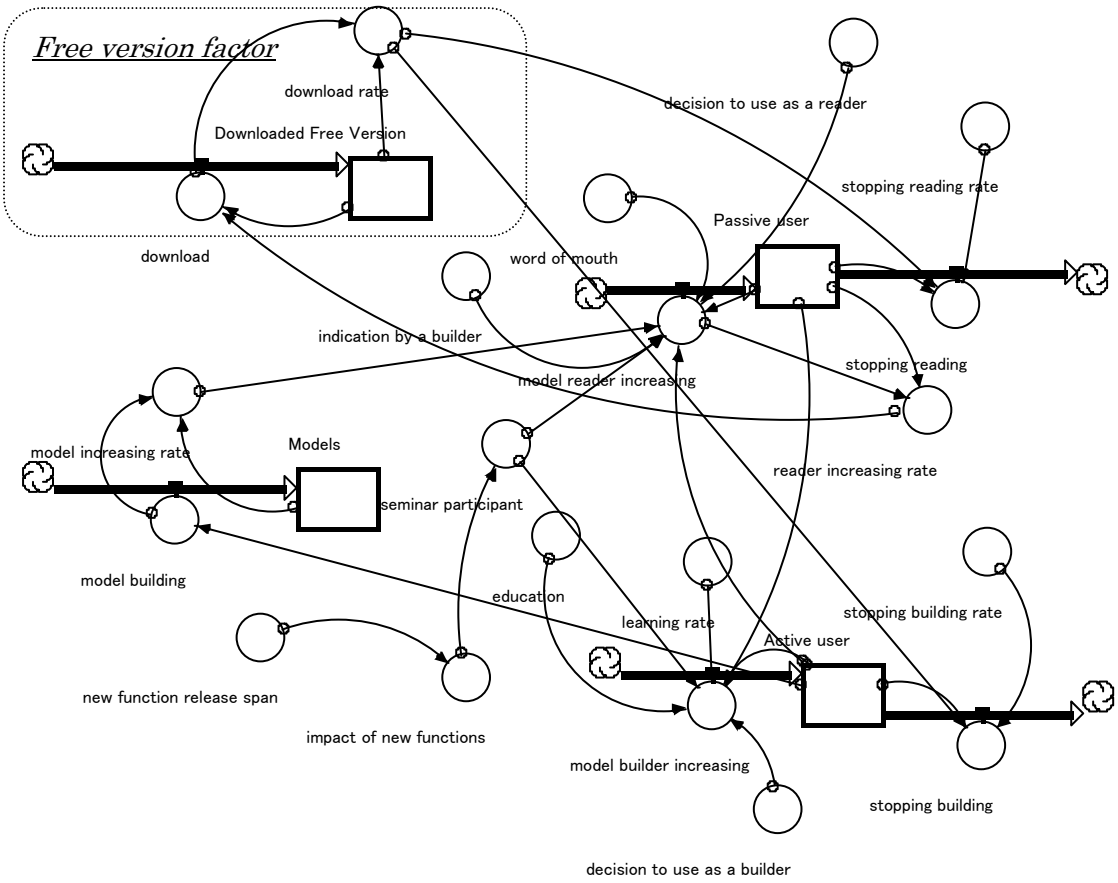

Figure 4: Stock flow diagram with the effect of diffusion of a free version

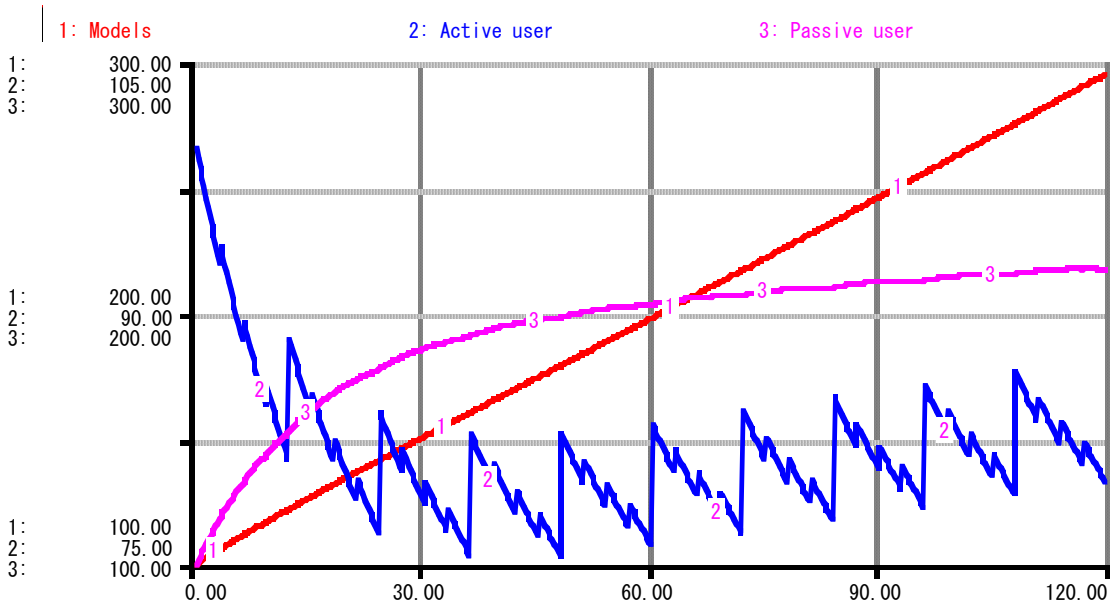

Figure 5: Transition of models, active and passive users of the model of Figure 4

combinations of both users; information that promotes increase in demand for free versions comes from passive users, and information of output goes to both users.

Various sets of external inputs, the same as the basic condition model's simulation, were examined. A typical result is shown in Figure 5. Clearly different from the basic condition model, this model indicates increase of both users after a rapid decrease in the beginning. All results provide the same tendency. Therefore, this additional structure works effectively in encouraging expansion of user population.

4. Discussion

It is argued for not only highly specialized software but also general that their diffusion is largely influenced by externalities. The phenomenon that free version's diffusion assists pay version's diffusion, examined in the previous section, is a case of result of externality effect.

Highly specialized software has another possible structure, which can cause externality effects different from non-specialized software: extension of data inventories.

The relationship between simulation software and its data is similar to one between particular hardware and its software. From this point, it is possible that data inventories can cause some change in a whole system’s performance (Fukunaga et al. 1999).

However, they have one different: speed of data inventory growth in high specialty software market and a number of software titles for particular hardware. The former is directly linked to user population so that user population and data inventories growths are nearly simultaneous. In contrast, the latter has time delays between software releases and hardware sales growths. Therefore, it is meaningful to examine the performance of the high specialty software market structure.

In order to verify the effect of extension of data inventories, an acceleration structure of model accumulation is required.

The case that active users make models more actively has been already examined; it can be expressed by the basic condition model with control of external inputs. This change of scenario (and value of external inputs) showed no different result from other simulations using the basic condition model.

There is another possible scenario: converting other software data to relevant software. This scenario requires extending the basic condition model's structure so that it is possible to cause a new result. The model is shown in Figure 6. This is also an extension of the basic condition model (Figure 2), the same as the free version effect model (Figure 4).

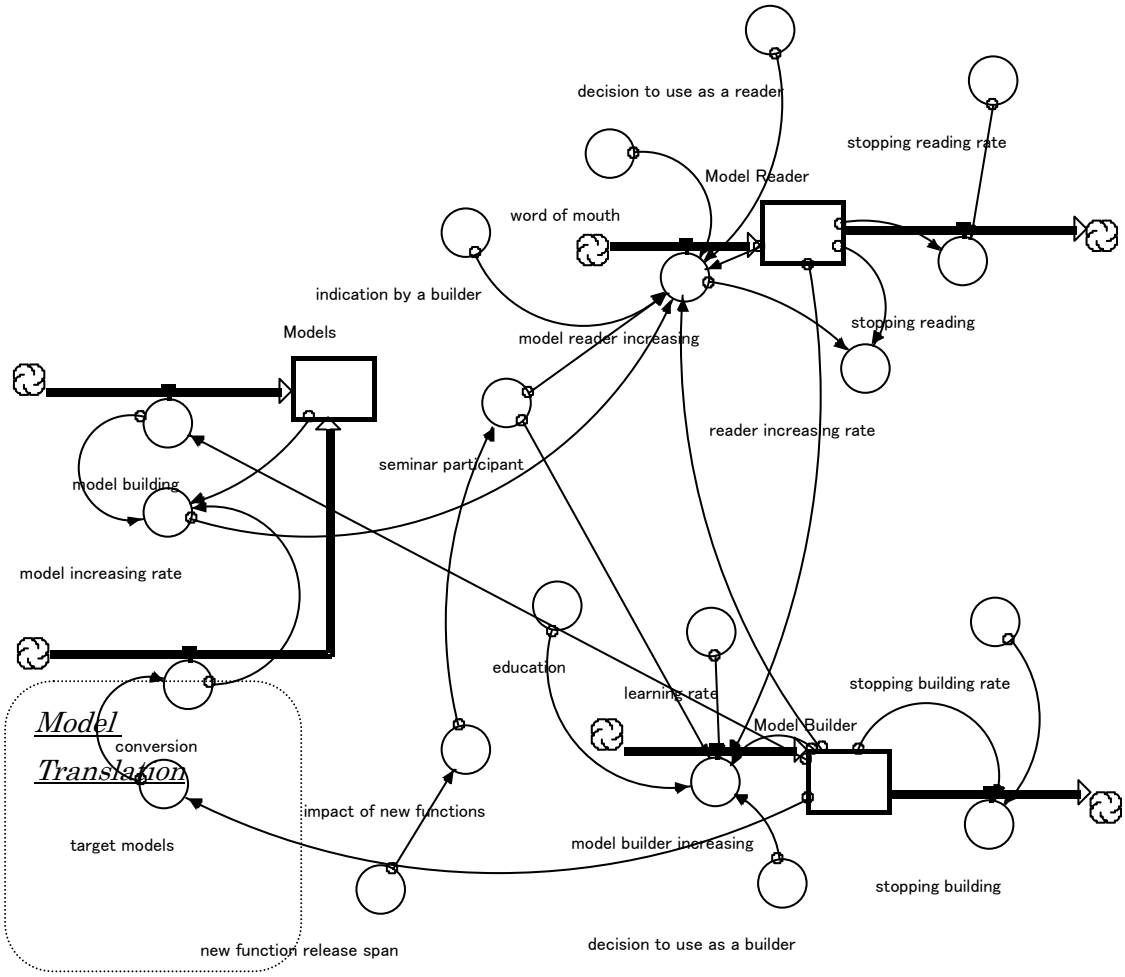

Figure 6: The model with the externality effect

One new feedback loop that consists of all stock flow combinations appeared.

Various sets of parameters were examined. As a result of these simulations, this extension (or scenario change) has no effect on the performance of this system.

The difference between the free version model (Figure 4) and data conversion model (Figure 6) is not concerned with a number of reinforcing feedback loops but with a position of each reinforcing feedback loop. Indeed, they have the same number of reinforcing loops. Moreover, both models have similar stock flow structures. However, the free version model has a short cycle that consists of "demand of free version," while the data conversion model has a long cycle that consists of "conversion." Although the latter includes whole stock flow combination, it has no effect. In contrast, the former includes only half of the elements in the model. Nevertheless, the elements drive the whole system.

Consequently, this paper has shown that free version software diffusion without output

products (*e.g.* models) can assist more effectively the pay version's diffusion than actively making more output products. It can be also said that the switch of externality effects can be hidden in the cases of having multiple user layer, *e.g.* high specialty software diffusion.

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Notes

Each software product shown in this paper can be found in vendors World Wide Web pages below.

Microsoft OS and other products: http://www.microsoft.com

OpenOffice.org: http://www.openoffice.org
Sun Microsystems Star Suite: http://www.sun.com/software/star/staroffice/index.xml