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Rules of Convergence

What would become the face of the Internet TV?

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Abstract

Internet TV is a convergent appliance from TV and desktop PC with Internet. Since TV and desktop PC have many different characteristics, so two major questions would be raised. The first question is which one of two media will be the dominant anchor across the three domains of Internet businesses: contents, community and commerce. The second question is how the total value of convergence will be determined on the Internet TV. In order to find answers to these two questions, an Internet TV consortium is organized and a nation-wide online survey has been performed. According to the survey results, the converging anchor of Internet TV is dependent on which one of the two is the stronger media in the three domains, i.e. TV in the domain of content, and PC in the communication and commerce domains. And converging value is decided by total value of three major converging applications, i.e. convergence between TV content and PC's 3 C's, the convergence between PC communication and TV's 3 C's, and the convergence between PC commerce and TV's 3 C's. This paper concludes with research limits and possible implications for the design of interface for Internet TV.

Keywords: Internet TV, Internet Appliance, Convergence, Converging anchor, Converging value

1. Introduction

Recently, computing environment is changing from the era of personal computer (PC) to the age of post-desktop (Hennessy, 1999). Post-desktop means that the placement of computer is no longer limited to a desk. Network computers will be accessible to everyone and everywhere in this new age. For example, a housekeeper can get a recipe in the kitchen through an Internet refrigerator or a family can buy a piece of furniture in the dining room by means of Internet television (TV). Such network-enabled computer devices are called information appliances.

Prior studies put various definitions on information appliances, which could be summarized into two important points. One is that information appliance has a special purpose and Norman argues it as "an appliance specializing in information: knowledge, facts, graphics, images, video, or sound. An information appliance is designed to perform a specific activity, such as music, photography, or writing" (Norman, 1998). The other is that the information appliance makes information using and sharing possible through the Internet and Lewis uses broader definition focusing on the connectivity of the information appliance (Lewis, 1988). Based on these prior researches, this paper defines information appliance as a specific purpose device that can be used and shared through Internet. By this definition, such devices as mobile phone, Internet TV, and Internet refrigerator can be classified as information appliance.

Among various Internet appliances, Internet TV is that a traditional TV is network-enabled by blending the features of desktop PC. Internet TV is one of the most important information

appliances because of its popularity. Most homes all over the world usually use TV services already. In addition, TV is important in that its main purpose has been very similar to the Internet. That is to say, before the spread of the Internet, TV as an appliance had played a key role in providing information in domestic life.

Because of the importance of Internet TV, many researchers have studied to find out key success factors on the Internet TV. As a consequence, many researchers discovered “convergence” as one of the most critical factors of Internet TV because Internet TV is a device in which two radically different technologies are blended together, TV and PC. For example, Huang presents that convergence architecture of PC, multimedia and TV is different (Huang, 1997). Wirtz analysed that convergence process in the multimedia business can be explained by integration of various communication and content factors of each medium (Wirtz, 1999). Even though such researches about convergence between TV and PC have been done, they still lacks in finding the rules about how TV and PC will be converged and what factors should be bounded for creating value despite that it is fundamental questions which can explain principles of convergence on Internet TV.

Therefore, this paper tries to find out the rules of the convergence between TV and PC through the empirical study. In other words, the goal of this research is to show the fundamental rules of the convergence of Internet TV. The rest of the paper deals with related theoretical background, methodology and empirical results, and finally concludes with discussion.

2. Theoretical Foundations

Internet TV has convergent characteristics between TV and PC. It resembles TV in a view of interface and PC in a view of interaction. The appearance of Internet TV is TV-like but the navigation and the structure of contents are PC-like (Kohar, 1997). The role differences between TV and PC can be examined from three aspects: audiences, media and the circumstance as summarized in Table 1 (Kim, 1997). Audiences are watchers or users of Internet TV. Media refers to PC or TV system itself, and circumstance means the environment where audiences are placed in (Reeves, 1996).

First, in regards to the audiences, TV audiences are usually relaxed and passive with no specific goals in mind. They commonly use the TV set for satisfying their hedonic needs. Such audiences’ attitudes are due to their dependency on TV. According to the Individual Media Dependency (IMD) theory, contemporary people just depend on TV without attempting to do something by themselves (DeFleur, 1989). User and gratifications theory (Katz et al., 1974) also supports the idea that viewers would like to satisfy their needs through TV. To the contrary, PC audiences are usually tensional and active, and try to satisfy their utilitarian needs. These differences in the audience aspect can be explained in that they use different mode by different media. Audiences use active mode for utilitarian needs and passive mode for hedonic needs (Bernoff, 2000). In general, people who watch TV will take the passive mode and people who use PC will adopt the active mode, which causes the differences between TV and PC in the audience aspect.

Second, in the case of media, TV is more dedicated purposed, convenient, easily controlled and has a shorter set up time. On the contrary, PC is more generally purposed, provides various services, complicated to learn and use, and has a longer set up time than TV. The obvious differences of each media stem from the fact that PC and TV are the systems that interact with human beings with its own user model (Allen, 1997).

Finally, in the circumstance aspect, TV is used in the open place such as dining room and kitchen, and the longer distance between the TV set and its viewers provides a wider range of vision. Therefore, TV circumstance is more physically sharable. Whereas, PC is used in the closed place such as office desk and private room, and the short distance between the PC and its users provides relatively narrow range of vision, and therefore PC circumstance is physically private. The differences between TV and PC circumstance prompts different interaction patterns. In usual, TV causes the social interaction between human and human because it is physically sharable, whereas PC takes the technical interaction between media and human because it is physically private (O'Brien et al., 1999).

[Table 1] The differences between TV and PC in terms of audience, media, and circumstance

	TV	PC
Audience	Passive Dependent Hedonic Relaxed	Active Interactive Utilitarian Tensional
Media	Dedicated Convenient Easily controlled Shorter set up	General Various Complicate Longer set up
Circumstance	Shared Open Wider vision Physical	Private Closed Narrow vision Cyber

These differences between TV and PC in terms of audiences, media and circumstance bring up two interesting questions in convergence. The first question is "Which media between the two will be the leading anchor". In other words, is the face of Internet TV more similar to the face of TV or that of PC? This is a very important question because the interface and interaction features of the Internet TV will be radically different depending the answer to the question. For example, if the Internet TV is perceived more like TV, the interface of the Internet TV is more likely similar to the remote control interface of traditional TVs. The second question is "How will the converged value be determined?" In other words, how much value the Internet TV can provide to the audience compared to the value from TV or PC. This is also a very important question because the business potential of Internet TVs is determined based on the answer to the question.

We assume that answers to the two questions above depend on the specific features of the Internet. The entire features of any Internet appliances can be classified into three categories: contents, community and commerce, which have been the key domains in the Internet business (Meyer, 2000). Features related to the contents, such as search engines, are provided for users to access the information in the appliance. Features that can provide tools to exchange ideas and opinions among people are usually classified into community features. Popular features for the community include bulletin boards and emails. Finally, features are classified into the commerce if they are related to any kinds of commercial activities, such as ordering and payment. Based on the three types of features, conversions between TV and PC can be performed in nine different ways as displayed in Table 2 shown below.

[Table 2] Convergence applications matrix

	TV Contents	TV Communication	TV Commerce
PC Contents	CA of T1P1	CA of T2P1	CA of T3P1
PC Communication	CA of T1P2	CA of T2P2	CA of T3P2
PC Commerce	CA of T1P3	CA of T2P3	CA of T3P3

* CA refers to convergence application.

** T1, T2, and T3 refer to TV content, TV communication, and TV commerce respectively.

*** P1, P2, and P3 refer to PC content, PC communication, and PC commerce respectively.

Key success factors on Internet TV is to understand which convergence pattern is best and to find out the rules of the convergence. It means that the successful applications on the PC do not necessarily make the success on Internet TV. Therefore, this paper will present the role of Internet TV and find out the answers for these questions regarding to convergence through an extensive empirical study.

3. Empirical Study

3.1. Methodology

A nation-wide survey was performed in order to collect information about the customer's perceptions of the Internet TV. For the survey, we organized a research consortium that consisted of Internet TV service providers, set-top box manufacturers, and Internet portal companies. Questionnaires are developed through the discussion sessions with chief executive officers of the participating companies. The questionnaires mainly consist of the importance of 3 C's from the viewpoint of the Internet, TV, and the Internet TV, and subjectively expected value of the Internet TV. The actual questionnaires are shown in the Table 3 below.

[Table 3] Questionnaires used in the survey

Purpose	Questionnaire	Measures
Level of subjective importance of 3 C's	Which of the following is the most important in <u>Internet TV</u> ? <ul style="list-style-type: none"> - Contents - Communication - Commerce Which of the following is the most important in the <u>Internet</u> ? <ul style="list-style-type: none"> - Contents - Communication 	7 points Likert scale

	<ul style="list-style-type: none"> - Commerce <p>Which of the following is the most important in <u>TV</u>?</p> <ul style="list-style-type: none"> - Contents - Communication - Commerce 	
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In addition to the questions presented in Table 3, nine more questions were developed to measure the value of nine different convergence patterns shown in Table 2. Each of the nine questions asked respondents how valuable is the converged application. The survey questionnaires were pre-tested with undergraduate and graduate students in order to diagnose any possible misunderstandings, through which the wordings for the twelve questionnaires were finally determined.

The online Internet survey was performed for 2 weeks during the October of 2000. We built an online survey site (<http://www.tbiz.or.kr>) and recruited respondents from several Internet portal sites. The potential Internet TV users were encouraged to participate in the survey by providing monetary compensations. For two weeks, 23,500 respondents completed the questionnaires. We added a question on the social security number (SSN) of respondents that was used later to check the validity of personal information provided by the respondents. The valid number of respondents is 23,261 out of 23,500 after the SSN filtering process. The 59.8 percent of the respondents are male, 40.2 percent are female, and the average age is 28.3.

3.2. Survey Result

Survey results would be categorized into two issues. The first issue is about the anchoring point on converging, and the second one is about the final value that customers would get through convergence. We scrutinized both issues in terms of 3 C's as discussed: content, communication, and commerce.

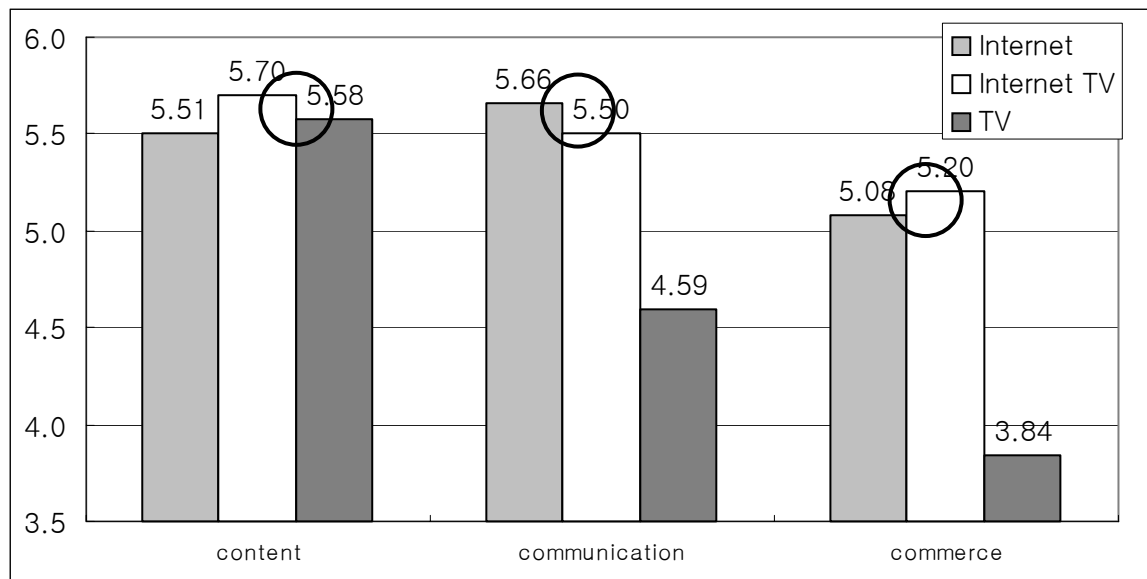
3.2.1. Anchoring Point for Convergence

3.2.1.1. Responses to the conventional media

First, we asked the level of subjective importance of 3 C's, of the two conventional media, TV and PC respectively. Participants were asked to indicate their subjective importance of 3 C's using 7 points Likert scale.

As the left white bars in Figure 1 show, in TV, respondents answered that the content is the most important factor. Since TV shows many entertainment programs directly to the audience such as dramas and news, its content would be regarded most important. The reason why the subjective evaluations on communication and commerce of TV are low because TV is one-way media, and therefore the communication and commerce function might not be well recognized. The mean differences among 3 factors are statistically significant at the level of 0.01 ($F(1, 23260) = 373310.01, p=0.00$)

[Figure 1] The difference of 3 C's



The middle grey bars in Figure 1 show that the survey participants responded that communication functions is the most important factor compared to the other two factors among 3 C's on PC. Considering that email is the most successful killer app (Downes, 1998), people think the most attractive feature of the PC based Internet is communication with other people. Moreover, the recent phenomenon that the community sites are booming reconfirms that communication is a major function of the PC based Internet. The differences of means of 3 C's show statistical significance at the level of 0.01 as well ($F(1, 23260) = 1382.81, p=0.00$).

3.2.1.2. Expectations on the Internet TV

Based on the importance evaluation on 3 C's, we have found that TV is more of a content-oriented media, and the Internet is more of a communication-oriented media. Next, we asked the participants the subjectively expected importance of the Internet TV from the point of 3 C's in order to figure out what the expectation of Internet TV is. Even though the Internet TV has not come into market in a massive scale, 96.6 % of the respondents answered that they are already aware of the Internet TV and its function. The right black bars in Figure 1 show the result that they mostly expect the importance of content of the Internet TV. They responded that content function of the Internet TV is the most important feature, the communication function is less important than content providing feature, and the commerce feature is the least important feature of the Internet TV. The mean differences among 3 C's of Internet TV are also statistically significant at the level of 0.01 ($F(1, 23260) = 2024.56, p=0.00$).

3.2.1.3. Convergence Anchoring Point

Based on the subjective importance level of the 3 C's on the TV, PC and Internet TV, we are ready to investigate the issue of convergence anchoring issue: Is the Internet TV more similar to TV or PC? As discussed in the previous section, the Internet TV would consider features related to contents strongly and content providing is the main function of the TV, but the Internet also provides content somehow. And Internet TV would be expected to support communication and commerce function as well. Then which feature from the "parent"-appliance would be stronger at the "offspring"-appliance? We also looked over the fact in terms of 3 C's.

First, in terms of the subjective importance of content features, the mean difference between Internet TV and TV ($0.12 = 5.70 - 5.58$) is smaller than that between Internet TV and the Internet ($0.19 = 5.70 - 5.51$). The mean differences are statistically significant according to the result of t-test at the level of 0.01 ($t(23260) = 6.074, p=0.00$). It means that Internet TV would be more similar to TV rather than to PC in terms of contents.

Second, the mean difference of communication between Internet TV and TV ($0.91 = 5.50 - 4.59$) is greater than that between Internet TV and PC ($0.16 = 5.66 - 5.50$). These two mean differences are also statistically significant ($t(23260) = -83.765, p=0.00$). It implies that people expect that the Internet TV would inherit the characteristics of PC in terms of communication function. Because the PC based Internet supports various two-way communication applications such as email, chatting, and the Internet phone, it would be more efficient for the Internet TV to follow the communication features of PC.

Third, the mean difference of commerce between Internet TV and TV ($1.36 = 5.20 - 3.84$) is larger than that between Internet TV and PC ($0.12 = 5.20 - 5.08$). These mean differences are also statistically significant ($t(23260) = -104.092, p=0.00$). The expectation that the Internet TV will attract attention as a tool of commerce reflects that the Internet function of the Internet TV would enables interactive shopping just as in the real world.

Consequently, as the circles in Figure 1 show, the convergence anchoring point would be the stronger feature from the “parent”-appliance. In other words, the Internet TV would be more similar to either TV or PC whichever is considered more important in the domain. Therefore, in case of the Internet TV, TV would be the convergence anchoring point in the content domain, and the PC would be anchoring point in the communication and commerce.

3.2.2. Total value of converged appliance

In addition to the subjectively expected importance of each media from the viewpoint of 3 C's, we also asked the respondents to select the most probable convergence patterns of the Internet TV from the three possible types of converging alternatives. The actual questionnaires are shown in Table 4.

[Table 4] The questionnaires and the frequency on the value of convergence on the Internet TV

Which of the following is the most advantageous feature that the Internet TV would give to you,

Questionnaire 1) In terms of TV content

While you are watching TV shows and movies with comfort and ease,	
Content	you can also use diverse information content. (67.3%)
Communication	you can communicate with other remote viewers while watching the same TV programs. (24.3%)
Commerce	you can buy the product on the spot while watching TV shows.(8.5%)

Questionnaire 2) In terms of TV commerce

While you are buying things simply by operating remote controls,	
Content	you can also find more information about the product at any time. (50.3%)
Communication	you can also communicate with other sellers and buyers. (14.1%)
Commerce	you can also buy things at any time and finish payment. (35.6%)

Questionnaire 3) In terms of TV communication

While you are sharing various activities with your family during watching the Internet TV,	
Content	you can also look for additional information with the family (53.2%).
Communication	you can also use e-mail, web-board, and be active in your interest group. (35.4%)
Commerce	you can also share the opinions when purchasing family goods. (11.4%)

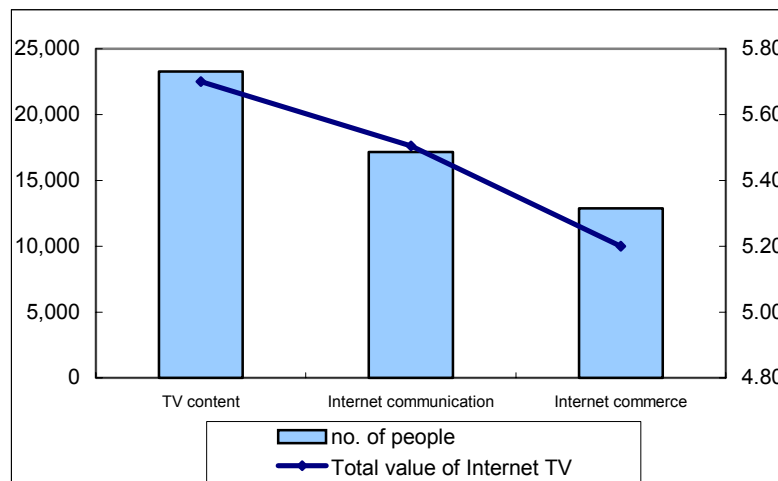
These questions were designed to investigate which convergence pattern among the three alternatives were subjectively most valuable to the users for content, communication and commerce. Since the respondents were required to answer only one item from one questionnaire, the sum of the number of items among 3 C's answered by respondents would indicate the subjective probability of each convergence pattern. The numbers of respondents who select the specific convergence alternative as the most probable one are represented in the parenthesis at each column. The results indicate that content features of PC are blended most nicely with the TV contents (67.3%). Similar patterns were observed both for the TV commerce (50.3%) and TV communication (53.2%). Therefore, content features of PC are most well blended for the all 3 C's of TV.

Based on the results, we are now ready to infer what might be the rule to determine the subjective value of converged appliance. In other words, why the subjective importance of content related features of Internet TV is 5.70, while those of communication and commerce are 5.50 and 5.20, respectively, as shown in the right black bars in Figure 1.

One of the possible explanations for this finding is provided in Figure 2. The line graph represents the subjective importance of the 3 C's on Internet TV as shown in Figure 1. The bar graph represents the number of people who chose the convergence as the most important one based on the anchoring point. For example, the leftmost bar in Figure 2 represents the number of people who chose the three convergence patterns based on the TV's contents as the anchoring point. Therefore, if we want to represent the number using the converging patterns in Table 2, it is the summation of T1P1, T1P2, and T1P3. In other words, the value of the Internet TV in the content domain is achieved by the convergence between TV content and PC's 3 C's. On the other hand, the centre bar represents the summation of T1P2, T2P2, and T3P2. In other words, in the communication domain, it represents the convergence between PC communication and TV's 3 C's. Finally, the rightmost bar shows the number of people who selected T1P3, T2P3, and T3P3. In the commerce domain, it is attained by the convergence between PC commerce and TV's 3 C's because PC has stronger commerce function than TV.

As shown in Figure 2, the two graphs show amazingly similar patterns. The correlation between two tendencies is high (correlation = 0.977 (sig. = 0.138)). Therefore, this research cautiously proposes that total value of convergence on Internet TV is closely related to the summation of the value of the three convergence types according to the anchor points. In other words, since TV is the anchoring point in the content domain, the total value of Internet TV in the content domain is closely related to the number of people who preferred TV contents plus 3 C's of PC. Similar patterns are observed in both the communication and commerce domain.

[Figure 2] The relationship between the convergence between TV contents and 3 C's of PC



4. Discussion

In conclusion, this paper proposes that converging applications between two heterogeneous media is performed by two major rules. First, The media that has more important role than the other one will be the anchor of convergence on the converged application. For the Internet TV case, TV plays as an anchor in the content domain, while PC plays as an anchor in the communication and commerce domains. This is because TV is more powerful in the content domain, while PC is more powerful in the communication and commerce domains. Second, the total value of converged application might be determined based on the anchor point. For the Internet TV case, since TV is the anchor point in the content domain, the value of Internet TV might be determined by the summation of

There are several limitations in this study. First of all, the proposed rules of convergence may not be the only rules that rule the convergence process because we have not investigated all the possible explanations exhaustively. In order to overcome the limitation, a carefully designed experimental study is required in the future. Moreover, the two rules in this paper need an assumption that convergence from PC to TV is exactly the same as the one from TV to PC, which should be tested by further empirical studies. The study of comparing Internet TV and Web-casting on PC already have been initiated in order to remedy this limitation.

Another critical limitation of this paper is that the results are mostly based on the expectation of people. Even though most respondents already know about Internet TV (96.6%), a further study should be conducted after the Internet TV is widely spread so the same questions can be asked to actual users. Online survey method also has a defect that it does not guarantee random sampling, and it might lead to self-selection bias. However, the sample size in this study is large enough to cover the general shortage of online survey.

In spite of the limitations mentioned above, this paper may also contribute both theoretically and practically. Theoretically, it shows that the role of each media can be a converging anchor on Internet TV and the converging value is taken by each factor on the role. Furthermore, the convergence rules could be applied to any “offspring” information appliance to which two or more “parent” appliances are converged. Practically, these principles also may be served as a guideline for developing killer apps on the Internet TV. Actually, some of the interviews with the company CEO’s partially validate the convergence rules proposed in this paper. For example, they agreed with the survey results that the convergence of TV contents and PC contents would probably be the most powerful marriage

between TV and PC. These contributions of the convergence rules should be large enough to guarantee more extensive future studies on the convergence patterns.

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