

# 노년기 정보격차의 메카니즘, 특징 및 시사점에 관하여

## Discussions on Mechanisms, Features and Implications of the Digital Divide in Old Age

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### 요약

노년기 정보격차는 정보화와 고령화로 특징되는 현대사회에서 노인 개인적 뿐만 아니라 사회적으로도 중요한 문제의 하나이다. 본 연구는 노년기 정보격차에 대한 이론적 고찰과 논의가 미흡한 실정임을 고려하여, 노년기 정보격차에 대한 이론적인 접근과 논의들을 종합적으로 탐색하여 개념적 이해를 확장하기 위한 것이다. 본 연구에서는 첫째, 지식격차가설, 정보격차가설, 혁신확산이론 및 정치경제학 등 네 가지 이론을 통해 정보격차의 일반적 메카니즘을 고찰한다. 둘째, 구조기능주의적 접근, 갈등이론적 접근 및 상호작용론적 접근 등 다양한 이론적 시각들을 통해 노년기 정보격차를 설명한다. 셋째, 노년기 정보격차 현상과 특징에 대하여 정보복지격차 등 다섯 가지 개념적 설명과 정의들에 대해서 살펴본다. 노년기 정보격차는 다중적이고 복합적이므로 이에 대해 종합적인 접근이 필요하며, 또한 노인 개인적 안녕과 사회적 불평등 측면에서 노년기 정보격차 해소에 더 많은 학문적, 실천적 관심이 필요함을 제안한다.

■ 중심어 : | 정보기술 | 정보격차 | 노인 | 정보불평등 | 정보복지 |

### Abstract

The digital divide has become an important social issue in the two waves of informatization and aging society. This study is to comprehensively examine various theoretical approaches and discussions on the mechanisms of the digital divide and to synthetically understand the features of the digital divide in old age. This study examines 1) four theoretical approaches on the mechanisms of digital divide among people in general, 2) three theoretical perspectives and six specific explanations on the digital divide in old age, and 3) five controversial features and concepts of the digital divide in old age. Consequently, this study suggests the need for a comprehensive approach to the multi-dimensional digital divide in old age and more attention to the digital divide in old age in terms of individual well-being and social inequalities. Further implications and limitations are discussed.

■ keyword : | Information Technology | Digital Divide | Older People | Information Inequality | Information Welfare |

## I. INTRODUCTION

Since the last decades Korean society has been experiencing two great waves of dramatic social change: population aging and informatization. Due to extended life expectancy and a sharply increasing number and rate of older people, Korea has undergone a demographic change of population aging. The life expectancy at birth of Korean people has extended greatly, from 71.3 years in 1990 to 80.8 years in 2010[1]. The rate of the elderly population of 65 and older has rapidly increased from about 3% until the 1970s to 7.2% in 2000, and is estimated to be 14.4% in 2019 and over 20% in 2026[2]. That is, Korea became one of the 'aging societies' in 2000, and is expected to be an 'aged society' by 2019 and a 'hyper-aged society' by 2026. Furthermore, the number of older people is estimated to increase sharply in the 2020s when the baby-boomers reach old age[3]. This unprecedented and rapid population aging in Korea has been one of the most important social issues and individual concerns.

Meanwhile, contemporary Korean society has experienced a variety of social changes due to informatization and development of information technology(IT) such as computers and the Internet. IT development and informatization, emerging as one of the most IT-competent countries since the mid-1990s quite outstandingly and rapidly in comparison with other nations. IT has significant meanings in relation to older people's lives and quality of life in old age[3-7]. IT has both inclusive and exclusive potentials for older people[8]. IT and information may provide older adults with new opportunities to live better, or may become a new impediment added to the existing physical and social handicaps of older adults.

Above all, differences of IT access and use may

exist among older people. The digital divide<sup>1</sup> has become an important issue of social inequalities and welfare of older adults in the two waves of the informatizing and aging society[6][9]. The digital divide in old age is seen as typically more serious than any other types of divides. It indicates social and individual inequalities between generations and among older people. In these circumstances, older people usually are the information poor.

The term 'digital divide' was coined in the US in the mid-1990s, following the discussions around the notion of 'information haves' and 'have-nots' in the early 1980s. Eamon(2004) defines it as the 'disparity between individuals who have and do not have access to information technology'[10]. The digital divide is defined as the divide between the 'haves' and 'have-nots', or the 'connected' and the 'disconnected' according to accessibility to IT. In addition, Servon(2002) defines it as 'the lack of access to IT for certain segments of the population, separation between information haves and information have-nots, or the social division between those who were using technology and those who were not'[11]. That is, the digital divide means the difference among individuals and groups in the extent, quality and attitude of access, usage, and utilization of information technology and resources, and a hierarchy of access to numerous forms of digital technology in various contexts, resulting in differing levels of engagement and consequences[12].

In the information and aging society, the digital divides have continuously existed between young and older generations. The rate of the Internet in old age

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1) The informational disparities have been described in various ways: as examples, 'digital exclusion', 'digital inequality', 'digital gap', 'information divide', 'information(al) inequality', 'information gap' and 'online inequality'. Although, strictly speaking, there are certainly differences between each term, hereafter this research mainly deals with the digital divide as the general concept covering other terms.

is increasing although it has been much lower than that of other age groups. In 2010, about 8 out of 10 Koreans at 77.8% used the Internet[13]. However, the rate of Internet use was only 10.1% for older adults aged 60 and over in sharp contrast with 95.3% for people in their 20s in 2004[14]. The digital divide between generations was quite huge, at 86.2%, the biggest among those of the OECD countries such as USA 34.0%, UK 45.0%, and Japan 70.0%[15]. Recently, the rates of the Internet among older adults aged 60 or over have increased from 18.7% in 2007 and 25.2% in 2011 to 27.5% in 2013 while these were much lower than the 71.8% among 50s, let alone 20s[16]. In USA, in 2014, 57% of American older adults aged 65 or over use the Internet, while the rate among adults over 18 was 87%[17].

The digital divide has been seen as a social problem with diverse consequences on society and individuals[9]. In general, the critical issues of the digital divide are social, economic, cultural and political, rather than just technological[12]. There are two stages of the social consequences of the digital divide; the immediate/short-term outcomes concern differences and inequalities in access to and use of IT, while the medium/long-term consequences relate to social participation such as social, economic, political, cultural and educational activities[12]. NCA(2000) insists that the digital divide has crucial implications in terms of welfare, social integration, and efficiency[18].

The existence of the digital divide means social division between older people and other people. Thus, some warn of the emergence of a 'two-tiered society' of information haves and have-nots[19]. In addition, the digital divide may reflect and aggravate existing social inequalities[20][21]. Consequently, the digital divide in old age may continue or even widen the long-lasting social inequalities experienced by older people.

The digital divide in old age may occur through a variety of causes and exist in diverse dimensions. There have been various studies on the state of the digital divide and its policy implications. However, there has been little study, especially theoretical, on the nature and mechanisms of the digital divide in old age. Thus, this study examines theoretically the mechanisms and features of the digital divide in old age, and on the basis of theoretical discussions suggests that the digital divide exists multi-dimensionally in old age. First, this study theoretically examines some discussions on the mechanisms of digital divide among people in general. Second, I examine theoretical perspectives to explain the digital divide in old age. Third, I continue by discussing several controversial features of the digital divide in old age. Finally, this study discusses multiple features of the digital divide in old age and further implications in terms of individual well-being and social inequalities. Consequently, I suggest the need for more attention to close the multiple digital divide in old age from a variety of angles.

## II. MECHANISMS OF THE DIGITAL DIVIDE

### 2.1 Knowledge Gap Hypothesis

In 1970, the knowledge gap hypothesis about the framework for studying issues of inequality in the effects of mass communication was proposed by Tichenor, Donohue, and Olien[22]. They argued that the mass media tends to widen the gap between the information-rich and the information-poor among people in a mass media audience[23]. They explain the general 'increasing knowledge gap' hypothesis in more detail asserting that:

"as the infusion of mass media information into a social system increases, segments of the population

with higher socioeconomic status tend to acquire this information at a faster rate than the lower status segments, so that the gap in knowledge between these segments tends to increase rather than decrease"[23].

They point out that a knowledge gap appears and widens with increasing levels of media input due to communication skills, stored information or existing knowledge, relevant social contact, selective exposure, acceptance and retention of information, and finally the nature of the mass media system. They continue by arguing that the mass media have similar functions to other social institutions in reinforcing or increasing existing inequities, and highly educated persons are at the vanguard of social and technological change. As a result, the difference in the acquisition of information and knowledge occurs between upper and lower groups according to socio-economic status, and becomes wider.

## 2.2 Information Gap Hypothesis

The information gap hypothesis states that new communication technology raises the level of information of all individuals, but this especially benefits the information-rich, thus widening the information gap[24]. According to Katzman's explanations, firstly, the amount of information increases among all individuals communicated with each other. Secondly, the increase of the amount of information is greater among the information-rich, such as scientists, engineers, and managers, than among the information-poor. Thus, although the average level of information of all individuals increases, the information-rich gain much more benefits and the information gap widens. Thirdly, the information-rich are likely to have access to computer-based new technologies to tackle information overload problems, which occurs more for the information-rich. Finally, newer communication technologies generate new information gaps 'before

old information gaps close'.

In short, the information-rich have the advantages over their counterparts in accessing new technologies and solving information overflow. Katzman's hypothesis is called an 'extended' knowledge gap hypothesis because of the extended scope from mass media to new communication technologies[25]. Thus, new technologies may create the digital divide, or new information gaps between the information-rich and the information-poor in addition to the persisting older information gaps.

## 2.3 Innovation Diffusion Theory

The diffusion theory of technology explains that technological innovations and diffusion generally cause wider socio-economic gaps among people in the process of the spreading of new technologies. That is, the invention and diffusion of new technologies tend to proceed in the order of innovators, early adopters, early majority, late majority, and laggards[26]. This theory indicates that the diffusion process of many technological innovations generally tends to follow a 'S' curve diffusion pattern[12][27-29]. This is because in the process of technology diffusion, newer technologies tend to be more expensive and require more effort than the old ones, although the costs are reduced and the ease is enhanced over time[30].

That is, through relatively earlier or later adoption of technological innovations, the divide between the forerunners and the latecomers will become wider in the differentiated process of technological diffusion. In this process, the attitudes and resources of people play an important role in the adoption of new technology. Thus, the earlier adopters become richer, while the later adopters' economic gain is comparatively smaller. Consequently, this theory reaches the conclusion, as Rogers(1995) says, that the socio-economic gap, or the digital divide, between the

earlier adopters and the laggards is widened and stratified[26]. The differentiated and stratified diffusion of IT relates to the digital divide among people.

## 2.4 Political Economy

Political economy, a critical perspective from neo-Marxists, contends that the crucial cause of the information inequality is the unequal socio-economic power structure based on the market system[31][32]. Critical theorists think that information and IT are seen as a private commodity for sale in a capitalistic society[33][34]. They assume that information and communications innovations are strongly influenced by the market pressures of buying, selling and trading in order to make a profit[35]. The economic capability to pay for new communication technology is important in unequal access to information and exclusion from the new marketplace of IT[36]. That is, IT developments, as the outcome of capitalism, are shaped by capitalistic interests, and mean social and cultural gaps in the level of IT adoption between groups[34][37].

In other words, the existing social stratification or class inequalities by wealth and education levels are regarded as a major factor in the production, distribution, access and utilization of information and IT developments[35]. Thus, due to the capitalistic logic oriented toward profit and efficiency in the market system, IT reinforces existing inequalities in which the existing rich and well-educated people better utilize new technology than the poor[34]. This implies the possibility of a wealth gap leading to the digital divide, and consequently to inequality in terms of the quality of life[37][38]. In this way, the present structure of socio-economic inequality and IT developments as a result of capitalism together cause the digital divides and exacerbate existing social inequalities between groups.

In sum, three of the perspectives above, excluding political economy, focus on the gap in the level of adoption of new technologies resulting from the different abilities of the individual in terms of social status and knowledge level. That is, the perspectives of the information gap and diffusion theories are more focused on the individual dimensions and the developing nature of media and technology itself. The knowledge gap hypothesis and information gap hypothesis imply that the differences in knowledge and information needs among people lead to the digital divide, or gaps in information life and IT use. According to the innovation diffusion theory, the digital divide can be understood as gaps in IT adoption and its use in the differentiated diffusion process of new technological innovation like IT. In contrast, political economy focuses on the macro-level of the digital divide in terms of socio-economic structure and capitalistic mechanisms. That is, unequal socio-economic inequality and social stratification lead to gaps and inequalities among social strata in information life of accessing and using information and IT.

A comprehensive viewpoint considering both social structure and the characteristics of technology may be important in explaining the digital divide. Taking just one of the theoretical perspectives may be misleading about the complicated nature of digital inequality. Thus, there is a need to consider sociological and cultural variables like education, occupation, age and attitudes as well as the economic capability subject to the existing socio-economic inequality structure[31]. Consequently, the digital divide can be understood better with a multi-focused lens, because the digital divide is not simple but quite complex and multi-faceted.

### III. THEORETICAL EXPLANATIONS OF THE DIGITAL DIVIDE IN OLD AGE

#### 3.1 Structural Functionalist Perspectives

- Disengagement Theory

Focusing on both individual actions and societal forces, disengagement theory insists that ‘aging individuals and society mutually withdraw from each other, and that this process is mutually beneficial’[39]. The theory assumes the characteristics of older people to be ‘incompetent role players subject to inevitable decline’ in old age[36]. More specifically, Vincent(1995) states:

“aging involves the gradual withdrawal by elderly people from social networks and from role obligations, and a complementary tendency for other people to lower their expectations of older people. So the elderly person both disengages and is disengaged from society. The process is seen to operate on three levels: societal, individual and psychological”[40].

That is, the disengagement theory focuses the actions of individuals as they age and also the action of society in responding to aging people at the both micro- and macro-level of aging. This may lead to lowered social activities of older people and, in turn, low adaptation to social and technological changes. Thus, the disengagement theory implies that in the reciprocal disengagement process, older people both individually and socially experience a lowered social role and expectations for themselves in information life and face inequalities as they are separated from social networks represented by informatization.

- Modernization Theory

As a macro-level theory, the modernization theory puts its focal point on large-scale social institutions, social change, and the social status of a group[39]. This theory explains that modernization lowers the

status of the elderly[40][41]. Modernization is depicted as social changes such as technological developments for health, developments of economic production technology, urbanization and mass education[42]. Thus, modernizing social changes force older people to experience a weakening status, poverty, alienation and a lack of role[42][43].

This theory argues that due to modernization, or the social changes that accompany the economic development of a society, the social status of older people is lowered. The modernization theory implies that the weakened social status, economic poverty and psychological decline of older people caused by social changes may lead to the digital divide, that is, the low level of access to and use of information and IT in old age.

In sum, the structural functionalist perspectives such as disengagement theory and modernization theory provide a social structural view of the digital inequality in old age according to aging and social changes. However, these theories also have the limitation of overlooking the micro-level individual and psychological aspects of the digital divide in old age.

#### 3.2 Conflict-based Perspectives

- Political Economy of aging

The political economy perspective argues that political and economic powers determine the distribution of social resources, and that they are unequally distributed between the capitalistic state and people, and between social classes in a society[43]. Political economy gives attention to the interrelationships between polity, economy and society, and the reciprocal influences between government, economic institutions and interests, and social classes and status groups[40]. Older people slip down among the powerless and poor classes in the

political and economic power structure, as they lag behind in generational competition for the distribution of social resources[43]. This unequal power structure causes social conflict among social groups.

In addition, the political economy of old age suggests the term 'structured dependency', which means the 'process by which some people in society receive an unequal share in the results of social production'[40]. Restricted access to a range of social resources, such as wealth or income, results in structural dependency in old age, which curtails the autonomy of older people. There are tendencies to reinforce the dependent and non-participative status of older people[40]. That is, as Vincent(1995) further explains:

"Low social status for elderly people is not the inevitable outcome of a natural process of aging but is socially structured and hence potentially open to change. In this process of inequality the state plays a large part in determining the events in the latter half of life which promote dependence, poverty and isolation among elderly people"[40].

In this view, the unequal structure of political and economic power, in which social resources are unequally distributed, makes older people structurally dependent on social institutions. This implies that in the social inequality structured in a political and economic context, older people may confront inequalities in accessing and using information resources as well.

#### • Age Stratification Theory

The age stratification theory basically focuses on the 'stratified' structure of life chances between different age groups. The life chances of people at different ages vary and cause society to be divided into age strata[40][44]. As people age, members in successive cohorts develop biologically, psychologically

and socially [41]. In line with social changes, people in different cohorts in the successive flows experience unique aging and sequential historical events in different ways[40][41]. Also, multiple layers of successive cohorts are recognized as strata within society. Members of different cohorts contribute to the social structural changes, as they continue to force their predecessors into and out of roles in the social structure[41]. In this process, older people may experience a 'structural lag'[45], in that the role structure by age has lagged behind the unprecedented changes in the age structure of people[41]. One social repercussion of this differing cohort experience is sometimes referred to as a 'generation gap'[40].

In short, the age stratification model suggests that society is stratified and ranked by age strata; that successive cohorts affect social changes; and that there are differences in expectations, abilities and willingness to perform roles as well as in the rights and prestige granted by society for each age group[43]. This theory shows that the digital divide in old age may be due to the overall lack of or low adaptation to rapidly changing cultural values, attitudes, life styles, and social life rather than merely technologically 'lagging' behind in using IT[43]. That is, the age stratification theory implies that the digital divide in old age means inequality in informational life resulting from low social resources differentiated by age.

Consequently, to conflict theorists, an age-based hierarchy is inherent in an industrial-capitalist society, and furthermore, age-based inequality is socially structured. The conflict paradigm implies that social stratification or structured dependency resulting from differences in accessing social resources reflect the interests of the more powerful members of society with affluence and ability. In this respect, the digital divide in old age is seen as a social inequality which

is socially experienced by older people of low social and economic status within a stratified and differentiated social structure. However, these macro-level theories are also restricted by underestimating micro-level individual and psychological aspects of older people in the digital inequality in old age.

### 3.3 Interactionist Perspectives

- Rational Choice Theory

Based on micro-economics theories, the rational choice theory was adopted to explain social phenomena by James Coleman. The theory begins with Coleman's basic idea that 'persons act purposively toward a goal, with the goal (and thus the actions) being shaped by values or preferences'[46]. That is, individuals are considered as rational actors who 'intentionally and rationally' choose their actions in order to maximize satisfaction with preferences or needs while minimizing costs[46-48]. The theory accounts for an individual's behavior by referring to the subjective beliefs and preferences of that individual - not to the objective conditions and opportunities faced by that individual[47].

This theory implies that individuals ultimately make choices through their subjective evaluation, although objective conditions and opportunities are available. In this way, older people, subject to their preferences and beliefs, may choose not to access and use IT, even though they can do so. In other words, older people are expected to be able to use IT if they want to, and vice versa. Thus, IT use or non-use in old age is interpreted as the different results of 'rational' choice by older people, who evaluate the benefits and costs of accessing and using IT.

- Exchange Theory

The exchange theory, one of the micro-level theories, is based on symbolic interactionist principles,

and was especially influenced by rational choice theory. Exchange theory pays attention to 'the interactions between individuals, and the attempts people make to maintain some sort of balance in their exchanges with others' [39]. According to Rosow(1965), people's social activities are incessantly and inevitably to exchange their own resources with each other, and social relationships are formulated and maintained according to the degree of reward for the exchange[49][50]. Resources include social, economic, individual, and intellectual - either material or non-material ones. However, the values of exchangeable resources are so different among people that this creates the disparity of social relationships[43].

That is, exchange theory assumes that older people experience a reduction of socio-economic, cultural and cognitive resources such as wealth, prestige, knowledge and so on as they age. These factors lead to shrinking or unequal social exchange activities. Regarding the digital divide in old age, this means weakening abilities and unequal opportunities for access to and use of information and IT. In turn, the disparity and depletion of changeable resources may result in the digital divide in old age.

Consequently, the interactionist perspectives such as the rational choice theory and the exchange theory are helpful in addressing the digital divide as a result of individual choice or exchange at the micro-level. That is, the micro-level theories may give a hint to explaining the differences in IT use between individuals among older people according to subjective, individual and psychological variables such as the awareness, attitudes, motivation, and feelings of older individuals. Non-users can be those who do not want or need to use IT because they may think that IT is not useful for them or is too expensive in either actual or opportunity cost. This view may be relevant to explain the existence of



Table 1. Theoretical explanations of the digital divide in old age

Theoretical views		Key points	Digital divide in old age
structural functionalist perspective (macro-level)	disengagement theory	gradual withdrawal and disengagement by elderly people from social networks and role obligations on societal, individual and psychological levels	disengaged roles and lowered social activities of older people → low adaptation to social and technological changes like IT revolution and informatization
	modernization theory	older people experiencing a weakening status, poverty, alienation and a lack of role caused by modernizing social changes	weakened social status, economic poverty and psychological decline of older people → low level of access to and use of information and IT in old age
conflict-based perspective (macro-level)	political economy of aging	older people under low social status, dependency and inequality in the unequal political and economic power structure	unequal political and economic power for the distribution of social resources → low level of access to and use of information resources and IT
	age stratification theory	inequality in life chances in old age by stratified and ranked social structure by age strata	low social resources and inequality in life chances in old age → low level of accessing and using information and IT, and generational inequality in informational life
interactionist perspective (micro-level)	rational choice theory	people rationally acting and making choices through subjective evaluation to maximize satisfaction and minimize costs	individual choice subject to the elderly's preferences and needs for information and IT → differences in accessing and using information and IT
	exchange theory	social activities to exchange own resources different among people, resulting in the disparity of social relationships	reduction of exchangeable resources and low social exchange activities in old age → weakening abilities and unequal opportunities for accessing and using information and IT

many non-users who do not use IT because of lack of necessity. However, the rational choice theory is not concerned with what are these preferences or their sources, but instead focuses on the individual's behavior as acting according to their subjective values and preferences[48].

In sum, the digital divide in old age can be explained from various theoretical viewpoints[Table 1]. However, each perspective has advantages and disadvantages. This implies a need for diverse approaches to the digital inequality in old age. In sum, the digital inequality in old age may be affected by lowering status in the process of disengagement or modernization; by structured social inequality of power or resources; and/or by decreasing values of resources or individual choice. These factors may determine social and technological conditions and individual capabilities and attitudes to accessing and using information and IT. In turn, these lead to the digital divide of older people both between generations and among older individuals. Ultimately, the digital divide in old age is likely to make older

people experience digitalized inequalities in the opportunity for life chances and the quality of later life.

#### IV. DESCRIPTIONS OF THE DIGITAL DIVIDE IN OLD AGE

##### 4.1 Cultural Lag

The 'cultural lag' is a hypothesis that the failure of social institutions to keep pace with technological change causes social problems and conflicts. The term 'cultural lag' conceptualized by Ogburn(1964) refers to the difference in the speed of change between material culture and non-material culture[51]. It means the existence of social disharmony between two parts in a social culture. That is, material culture, like technology, is changing rapidly, while non-material culture is changing at a relatively slow pace. In other words, the cultural lag describes the phenomenon of changes in social institutions and popular values lagging behind technological and economic

developments[40]. The cultural lag phenomenon may occur in both social and individual dimensions. That is, changes in technology or industrial, material civilization are racing on like a 'rabbit', but non-material civilization such as ideas, values, norms, education and so on go slowly like a 'turtle'[52]. Thus, non-material culture failed to keep pace with the changing speed of material culture leading to a serious social disharmony.

The digital divide can be interpreted as a kind of 'cultural lag'. That is, the digital divide can be seen as the differences between individual and social adaptation and IT development, or individual and social needs and the level of diffusion of technological development. Thus, the digital divide is interpreted as a social problem caused when social institutions or policies related to using IT does not fit IT expansion. Digital inequality means the inadequacy of socio-economic institutions such as the (re)distribution system for effective use of social resources in relation to technological progress for the improvement of the quality of life, or social welfare for all.

## 4.2 Structural Lag

Drawing attention to the failure of modern Western societies to provide suitable roles appropriate for the growing numbers of elderly people, Riley suggests the concept of 'structural lag' as the counterpart of cultural lag[40][41]. According to Riley and her co-authors, the structural lag is defined as 'the tendency for the social structure of roles, norms, and social institutions to change more slowly and thus lag behind changes in people's lives'[53]. In other words, structural lag occurs because human lives, including the timing of life-course events, change more rapidly than social structures and institutions[39]. This notion means that 'outmoded social institutions fail to

provide opportunities for the growing aspirations and increased numbers of older people'[40]. That is, there is a mismatch between society and people's lives in line with successive generation changes.

The concept of structural lag views the digital divide as a social phenomenon of differences of gaps existing between technological development and the everyday lives of people. The existence of the digital divide means that social institutions such as social support for and re-education of older people do not provide a timely response to the changes in older people's later life, even though older people's lives are experiencing important changes along with rapid population aging and informatization. Social structures such as information ethics, informatization education, and welfare institutions do not match up with changes in older people lifestyles resulting from aging and informatization.

## 4.3 Generation Gap

Contemporary individuals' experience of old age is framed both by their individual age and position along a biological life span, and also by the demographic structure of society[40]. 'Generation gap' generally means the existence of differences between young and old generations in terms of socio-cultural attitudes and cognition. As Mannheim(1952) argues, it may be natural that different generations, and even individuals in the same generation, have historically different ways of thinking and living and adapt differently to social changes or historical events [54]. In general, older people are seen as having low adaptability to new environments. The generational gap occurs between old generation and new generation in various ways.

The digital divide is a gap between generations taking place in terms of IT use. Henderson(1999) points out that age and education mainly affect

people's comfort level and experience of computers and information technology[55]. There are gaps between young and old people because:

"Young people have grown up with computers and the Internet. (...) Many older people, on the other hand, have had to play catch-up while young people have grown up. (...) They may feel intimidated by the technology and be reluctant to find ways to learn about it"[55].

The current older generation seems to be unfamiliar with and uneasy about the new technologies and generally much weaker than its younger counterpart in terms of their capability to adapt to changing social trends and to acquire new information and knowledge. Tapscott(1998) identifies these phenomena as the 'new' generation gap[32]. He argues that the older generations are seen to be uneasy about and unfamiliar with the new technology and new media that younger people are embracing and are familiar with. This technological gap between generations is considered as a new generation gap.

#### 4.4 Generation Lap

Furthermore, beyond the existence of the generation gap, many older people may be falling behind their successor generation, with regard to understanding and using new media and technology. In general, the young are more adept at using new technologies like computers and the Internet than the elderly. Children born and educated with technology adopt new technologies much faster than their parents, as well as grand parents. As Tapscott(1998) notes, it is as 'natural as breathing' for many young people to use new technology[32]. However, learning something completely new is very hard, and needs more time and effort for many older people, and their thinking and attitudes must change to accommodate the new technology[32]. Regarding this tendency,

Tapscott refers to a shift from a generation gap to a 'generation lap'.

Accordingly, the digital divide between generations can be regarded as a generation lap. New technologies certainly seem to be much more difficult for older people to learn and use. Thus, the young, with the ability to use adeptly new technologies, are educating older people who have traditionally transmitted socio-cultural capital and knowledge to their successors. The generation lap means that younger kids 'outpace' and 'overtake' older adults on the technology track, 'lapping' them in many areas of daily life[32].

#### 4.5 Information Welfare Gap

The digital divide relates to social, economic and cultural inequalities in old age[56]. The digital divide, as a new kind of social disadvantage, is seen as a barrier to individual and social welfare for older people[32][57]. The use or non-use of IT in old age has effects on the welfare of older adults in both positive and negative ways[3][58]. IT or informatization may play a two-faced or 'double-edged sword' in daily life in old age[59]. IT use is seen as information needs to be satisfied for the welfare of older adults[3]. That is, IT and its use are required for 'information welfare' in old age[3][60].

IT use relates to the life satisfaction of older adults[3]. Recently, there was a significant disparity in the level of life satisfaction in old age between IT users and non-users[5][61]. A model of information welfare gap shows that a life satisfaction gap associated with IT use or non-use in old age relates to a gap in information welfare of the elderly[60][61]. Consequently, the digital divide between IT users and non-users among older adults means the life satisfaction gap among older adults, leading to an information welfare gap in old age[61]. The gap in

information welfare in old age can be interpreted as an social inequality according to IT use or non-use. Also, the information welfare gap as an social inequality exists both between generations and among older generation. This means older adults may experience an inequality associated with a gap in information welfare or the quality of information life in old age.

## V. Discussion

### 5.1 The Multiple Digital Divides in Old Age

The digital divide is not a binary but a complex and multi-dimensional notion, incorporating diverse social divisions in the digital environment[62]. The digital divide in old age may exist multi-dimensionally as an inter-generational divide between generations, and an intra-generational divide among older individuals. It ranges from the dichotomous, absolute and quantitative gaps in terms of the proportions of users or non-users to the multi-dimensional, relative and qualitative divides in terms of the different levels or degrees among users or non-users within older adults. According to IT use/non-use and the extent/quality of IT use/non-use, the digital divide in old age may be a triple divide: between generations; between IT users and non-users; and within users and non-users. Also, the divides in old age include quantitative and qualitative gaps in access, use, and attitudes[60].

The digital divide in old age is determined by diverse variables including social structure, socio-economic and individual factors. A main focus is especially on the conflict-based theories and interactionist theories. With the notions of structured inequality or dependency and stratified age structure, the social structural variables of the digital divide can be

understood. Also, the digital divide of older adults is comprehended as a result of exchange activities or rational choices of individuals. The different theoretical approaches are complementary, rather than mutually exclusive, in any comprehensive understanding of the digital inequality in old age.

In terms of differences in the extent and quality of possessing, accessing, using and utilizing information and IT, the digital divide occurs diversely according to a variety of factors, such as historical, socio-economic, socio-demographic, technological, and other environmental factors. The digital divide in old age occurs in a multiple and complex manner in which social structural factors, individual variables and characteristics of technology itself are interactive[60][62][63]. These factors may result in differences in availability, abilities to use, and attitudes to IT of older adults. Individuals' abilities and attitudes to IT and its use may be affected by a selection of social, economic, demographic, psychological, and cognitive factors. The differences in abilities and attitudes of older people result in the digital divide in old age[60]. That is, the three causes of availability, ability and attitude will lead to the multiple digital divides in old age.

### 5.2 Digital Divide as Social Inequality in Old Age

Why does the digital divide matter for older adults? The digital divide should be understood as a social problem, not just a technological one, with diverse consequences on society and individuals.

The digital divide means social exclusion, which results in the inequality in access and opportunity for information or information networks[64][65]. The existence of the digital divide means older people are being increasingly 'marginalized' and 'excluded' in this information age[29][66]. The Internet has been traditionally regarded as altering the order and form

of social life, and thus those who are unable to access and use it risk social exclusion[67]. Accordingly, the digital divide in old age leads to the political and economic exclusion of older people[56].

In addition, the digital divide is one of the critical issues in terms of social integration. The digital divide may also be a social wall as well as a physical barrier in the digital age[68]. The digital divide in old age may cause a generation gap and cultural disharmony between generations[56]. In addition, the digital divide means lack of communication between IT users and non-users. Thus, the divide is able to cause conflict between the younger and the older generations and between older people according to social class in the information age, and leads to weakened social integration.

In consequence, the digital divide is also deeply problematic for the welfare of older adults. The digital divide can be a threat to quality of life, and brings about disparities of welfare between people. Castells and Himanen(2002) regard the digital divide as the decline of the welfare state[69]. If the disadvantaged elderly cannot use IT, they may experience lack of opportunities for social participation and education, which may result in a lower quality of older adults' lives. The digital divide means an information inequality, which relates to welfare gaps among older adults and between generations. These gaps caused by the digital divide mean information welfare inequality in old age.

### 5.3 Generational Effect: A Temporary Divide?

There have been two conflicting views regarding whether the digital divide will widen or close in the long run: the optimistic normalization model and the pessimistic stratification model. Some with optimism think the low rate of IT use in old age or the digital divide will decline in the future. This is rooted in the

viewpoints of a myriad of optimists and futurists[70][71]. Non-use of IT is seen as just a 'generational effect' that will soon disappear as cohorts of computer-using workers become older people themselves[72]. This suggests that the problem of low accessibility, even the digital divide, will be alleviated age by age, because the current young generation familiar with new technology, is getting older, and as such many obstacles to IT use will be solved along with technological advances. This implies that time is the solution to a temporary digital divide.

However, this seems to be too optimistic, even naïve. Despite the increasing rate of IT use in old age, differences between generations and within a generation may continue to be significant. Furthermore, new problems with new meanings and types will be accompanied by social changes and technological developments. Also, the digital divide in old age may not be merely a generational problem but also a multi-faceted intra-generational one within older adults. Consequently, it is more plausible that if there is no action to deal with low rates of IT use among the elderly and the digital divide, a social problem of inequality, may continue in a different manner in the future. The existence of the digital divide is a social inequality to be tackled in terms of the information needs and the welfare of older adults.

## VI. CONCLUSION

This study theoretically examined the general mechanisms of the digital divide, the theoretical explanations and several aspects of the digital divide in old age, and the existence of the digital divide and its meaning in old age. Each theoretical approach has its reasons and limitations paying attention to different parts of the new, big 'elephant' called the

digital divide. Any explanation from only one viewpoint has its own limitations in better understanding the multi-faceted digital divide and inequalities. The digital divide in old age may exist multi-dimensionally and relate to various social issues such as welfare and social inequality as well as individual well-being and the quality of life of older adults in an information society.

Moreover, without any appropriate responses against the digital divide in old age, it may continuously exist, or even widen, in a different way according to IT development in the future. This is why we have to keep the gap in mind. Consequently, this study suggests a comprehensive approach to the multi-dimensional digital divide in old age. Also, more attention should be paid to the digital divide as a significant social inequality in terms of gaps in individual well-being and social welfare among older adults due to the digital divide in old age.

This study may contribute to enhancing a theoretically comprehensive understanding of the mechanisms of the digital divide in terms of the general and multiple aspects and features of the digital divide in old age. Also, this study is expected to make a contribution to expand further theoretical discussions on the digital divide in old age. In addition, this study implies that practical studies and intervention efforts to tackle multiple digital divides in old age are required to be conducted in various ways to not only increase individual well-being but also decrease social inequality in old age. Especially, the enhancement of IT use and informatization education for older adults are required in order to close the digital divide in old age.

However, this study has some limitations. In terms of theoretical completeness, this study lacks critical review of theoretical views as mentioned above and may not examine all of the plausible social,

gerontological and technological theories. Also, because the purpose of the study was for a theoretical examination on the digital divide, this study pays little attention to examining the state and reality of the digital divide in old age. In addition, this study has limits in discussing practical alternatives and policy intervention to close the digital divide in old age. Thus, there is strong need for further studies on individual and social influences of the digital divide, and practical approaches such as IT diffusion and informatization education for the elderly to narrow the digital divide in old age in various aspects.

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