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Janice C. Sipior
Villanova University, janice.sipior@villanov.edu

Burke T. Ward
Villanova University, burke.ward@villanova.edu

Joanna Z. Marzec
Villanova University, marzec@netreach.net

AN INITIATIVE TO NARROW THE DIGITAL DIVIDE: PRELIMINARY RESULTS

Janice C. Sipior

Villanova University, Villanova PA 19085 USA
Phone: 1-610-519-4347, Fax: 1-610-519-5015
janice.sipior@villanov.edu

Burke T. Ward

Villanova University, Villanova PA 19085 USA
Phone: 1-610-519-4375, Fax: 1-610-519-5204
burke.ward@villanova.edu

Joanna Z. Marzec

Villanova University, Villanova PA 19085 USA
Phone: 1-610-519-4347, Fax: 1-610-519-5204
marzec@netreach.net

ABSTRACT

The Digital Divide has been defined as a gap between those with access to new information technologies and those without. The term is also used to characterize the disparity between those who can effectively use information technology and those who cannot. This paper first explores the digital divide within the United States (U.S.) and worldwide. Factors contributing to the widening of the gap are identified, including differences in income, age, education, race, household type, and geographic location. In an effort to reduce the Digital Divide, various initiatives have been undertaken. Preliminary results of an initiative designed to narrow the divide are presented.

1. INTRODUCTION

The Digital Divide has been defined as a divide between those with access to new information technologies (IT) and those without, or in other words, the gap between the 'technology haves' and 'have-nots' (Novak et al., 2000 and Wilhelm, 2000). The term is also used to characterize the disparity between those who can effectively use new information and communication tools, such as the Internet, and those who cannot. No matter how we define the term, there is consensus that some sort of divide exists that excludes many from benefiting from IT and the telecommunications infrastructure, increasingly crucial to economic success and personal advancement. "The Digital Divide is arguably the single, largest, segregating force in today's world. If it is not made a national priority, a generation of children and families will mature without these tools that are proving to be the key to the future" (PR Newswire, 2000b).

This paper explores the digital divide within the United States (U.S.) and worldwide. Factors contributing to the widening of the digital divide are identified to provide insight into how the gap

might be reduced. Initiatives addressing the critical challenges presented by the divide are presented. A global perspective on the problem is discussed to understand the far-reaching problems, implications, and potential for solutions. Finally, preliminary results of an initiative designed to narrow the divide are presented.

2. FACTORS WIDENING THE DIGITAL DIVIDE

Internet access continues to expand worldwide. While the exact number is difficult to determine, current estimates range from 130 million (Nielsen, 2000) to 322 million internet users worldwide (ecommerce.gov, 2001). There are an estimated 46.5 million users in the U.S. alone, expected to reach 90 million in the next four years (Strategis Group, 2000).

Although internet use has been growing, the gap between high income technology 'haves' and low income 'have-nots' is getting wider. Internet use is thus an indicator of which side of the divide on individual resides. At least half of all U.S. households earning less than $15,000 are expected to remain unconnected through 2005 (Wilhelm, 2000). The gap between well-educated segments of the U.S. and the not-so-well-educated, wealthy and poor, white and non-white, and rural dwellers and urban residents has widened significantly in the last five years (www.ntia.doc.gov, 1999). The most important factors separating 'haves' and 'have-nots' in the U.S. were identified as income, age, education, race, household type, and geographic location. While it is recognized that a complex combination of factors contributes to the divide, each of these is discussed in the following sections.

2.1. Income

While a combination of factors determines if an individual is online, income is the strongest predictor (www.ntia.doc.gov, 1999). Across all groups, online penetration rises as income rises. In households with income of $5,000 - $9,999, 12.1% use the Internet, contrasted with 58.9% in the highest income bracket of over $75,000. Households with incomes of over $75,000 are more than 20 times more likely to have access to the internet than those at the lowest income level and are more than 9 times as likely to have a computer at home (cyberatlas.internet.com, 1999). Low-income white families are 3 times more likely to own a computer than Hispanic families and 2 times more likely to have a computer at home than a comparable Black household. Only 23% of low-income children have access to the internet at home compared to 58% of children in high-income families (Wilhelm, 2000).

2.2. Age

Among those 35 – 44 years of age 39.8% use the Internet, the largest percentage among age groups. In general however, internet usage is high among all age groups, with the exclusion of seniors. Seniors, aged 55 years and older, rank lowest in usage among all age groups, with 11%. Children aged two to twelve and seniors over 65 lag behind the national average in online penetration (Schreiber, 2000). However, this gap is expected to compress in the next five years. Internet usage among children is projected to increase to 62% by 2005 from 32% in 2000. Senior penetration is projected to rise to 48%, up from 16% currently (Schreiber, 2000).

2.3. Education

Level of education and internet usage are highly correlated (www.ntia.doc.gov, 1999). Those who have earned a college degree are more than 9 times as likely to use the internet than those with an elementary school education. The dramatic difference in use may be attributable to literacy. Despite efforts to make the internet a true multimedia experience, the vast majority of online content is text-based. As many as 44 million American adults, or almost one in four, are functionally illiterate and another 50 million have limited literacy skills (digitaldividenetwork.org, 2000). The disturbing fact is

that between 1997 and 1998 the disparity between the highest and the lowest level of education increased 25% (cyberatlas.internet.com, 1999b). Across minority groups, the differences are even more visible. Only 56% of Latino students graduate from high school and only 19% complete courses required to get into college (Anonymous, 1999). The differences in level of education go hand-in-hand with income disparities because most people who are poor are uneducated.

2.4. Race

Internet use varies by race (www.ntia.doc.gov, 1999). White individuals use the internet more than either Blacks or Hispanics, at 37.7%, 19% and 16.6% respectively. Blacks and Hispanics are less connected at home and in other places such as school, work, libraries, and community centers. The gap in internet access between White and Hispanic households and White and Black households is now 5% wider than in 1997 (www.ntia.doc.gov, 1999). Between 1994 and 1998 computer ownership among Latinos in the U.S. grew from 13% to 30%. Nevertheless, the gap between non-Hispanic Whites and Hispanics has actually increased by 42% and the gap in internet access has widened by 56% in the last year (Beneton Foundation, 1999). However, regardless of race, higher income levels correspond to an increased likelihood of owning a computer at home (Novak, 1998). The same is true for education, with higher educational levels associated with owning a computer at home.

2.5. Household Type

Family structure impacts household access to the Internet. Married couples with children less than eighteen years of age have the highest internet penetration of 37.6%, while female-headed households with children have the lowest at 22.3%. In recent years, the number of single-parent families has grown, particularly those headed by never-married mothers. Single-parent families earn about half as much as two-parent households. At the same time, there has been a significant increase in families in which both parents work, contributing to higher income levels. The likelihood of owning a computer and having internet access increases for families with higher incomes.

2.6. Geographic Location

In general, the western states have the highest internet usage with 35.5%, and the southern states the lowest with 29.8%. Two-thirds of small communities across the U.S. are expected to have high-speed internet access. The last mile – connecting the remaining third – is a challenge. Providing high-speed access through traditional means – through copper wires and fiber optics – to areas with a small population base is too expensive. Wireless access might be a cheaper alternative. However, extending internet services to some states will be difficult. In the state of North Carolina USA for example, 8 to 10% of the population still do not have telephone service (Barton, 2000).

Population levels sufficient to support the cost of internet access in remote areas are an issue. Less than 5% of towns with a population of 100,000 or less and 1% of towns with a population of 250,000 or less have broadband DSL or cable modem services (PR Newswire, 2000a). The advanced telecommunications services used by business for high-speed internet access cost $21,000 per year in rural Columbus County, NC USA for example, compared with $3,000 per year in urban areas like Raleigh, NC USA (FDCH Federal Dept., 2000). Residents of twelve states in the U.S. – called the "Disconnected Dozen" (Alabama, Arkansas, Idaho, Iowa, Maine, Montana, New Hampshire, North Dakota, Oklahoma, South Dakota, West Virginia, and Wyoming) – are more likely to be left behind.

3. THE IMPORTANCE OF BRIDGING THE DIGITAL DIVIDE

The growth of IT and the increasing expansion of electronic commerce are changing the way individuals work, communicate, vote, purchase goods, and obtain information. More and more,

today's jobs require technical skills and familiarity with new technologies. The U.S. Department of Commerce estimates that by the end of 2000, 60% of jobs will require skills with technology. If the Digital Divide is left untouched, the gap between the technology 'haves' and 'have-nots' will create a barrier which will prevent people on the unfortunate side of the divide from obtaining a quality job and from benefiting from life-long educational opportunities.

3.1. What Is Being Done to Bridge the Digital Divide?

There is no single solution to reduce the Digital Divide. Business and government leaders recognize the importance of bringing everyone onto the information grid. One way to help close the gap is through promotion of competition. In recent years, competition among personal computer (PC) providers resulted in a reduction in the selling price to below US$1,000. Lower costs for PCs and free internet access help to narrow the divide in terms of income levels. Among new internet users, 47% have free internet accounts (Yankee Group, 2000). Nevertheless, the high cost of internet access was still cited as a reason for not having access (www.ntia.doc.gov, 1999). If we consider the cost of the computer and ISP service, the internet is still beyond many low-income households' budget. Since the cost is still one of the most significant factors contributing to the divide, there are an increasing number of projects to bring internet technologies to low-income communities. The Commerce Department has funded 332 such projects in all 50 states (Shepard, 1998).

There are also programs to provide the internet technology to Native Americans. StarBand Communications, the Southwest Navajo Nation Virtual Alliance (SNNVA), and Northern Arizona University (NAU) plan to provide high-speed internet connection to 120 locations within Navajo, Hopi, and Havasupai reservations, some of the most remote areas of Arizona, Utah, and New Mexico (Business Wire, 2000a).

Senior citizens are among the least connected to the Internet. To assist senior citizens, "Generations Online," software which provides step-by-step instructions for going on line, was introduced in September 2000. It is designed for use in libraries, retirement centers, elder housing sites, and senior centers, where seniors can work individually or take computer classes.

The issue of language barriers as a factor in the Digital Divide has also been addressed. For example, in September 2000, BlueLight.com, Kmart Corporation, Yahoo! Inc. and Spinway, Inc. announced the launch of a customized Spanish-language version of a free internet service (Business Wire, 2000b).

The U.S. government is seeking to close the divide through legislation that provides incentives to internet providers. The U.S. Congress signed the Broadband Internet Access Act of 2000, which provides tax relief for the deployment of high speed Internet. Any provider deploying broadband access to targeted areas would be eligible for the tax credit, when 10% market penetration is achieved.

3.2. The Digital Divide as a Global Issue

The Digital Divide is a complex issue, the complexity of which is compounded as a worldwide issue. Internet penetration rates provide an insightful indication of the worldwide digital disparity. It has been estimated that of 322 million people online as of March 2000, less than 1% or 2.77 million live in Africa (ecommerce.gov, 2000). For example, in Mozambique, only one in 3,000 people have internet access. Joaquim Alberto Chissano, the president of Mozambique, said, "New York City has more internet hosts than the entire African continent" (Hoffman, 2000). In Europe, there are about 108 million internet users, which account, on average, for a penetration rate of about 34%. However, the rate varies among European countries from 65.2% in Sweden to 45.6% in U.K., 31.6% in France and 11.4 in Portugal (Rohde, 2000). Worldwide, there is even more disparity.

There are only an estimated 57.5 internet users per 1,000 people around the world (Rohde, 2000), ranging from 492 internet users in North America, to 7.88 users per 1,000 people in Middle East and Africa. By some estimates, the U.S dominance in internet users will soon be overshadowed by other

countries. In three years, 50% of internet users will come from other parts of the world. Within six years, Chinese will likely be the most widely used language on the internet (Rohde, 2000).

Before the information infrastructure can be deployed in the developing parts of the world, reliable sources of electrical energy have to be provided. The Global Information Infrastructure Commission's guide for developing countries notes that 33% of the world's population has no electricity at all and about 33% has only intermittent electricity. Another key factor for development is a telecom infrastructure. While the world has 6 billion people, there are only 0.8 billion telephone lines. Over 80% of the world has yet to make a phone call. Both governments and the private sector must be involved in helping the poor and disadvantaged find jobs and benefit from the new technologies. Some governments must first deal with gender discrimination and other social issues in their countries.

The G-8 Heads of State have committed themselves to establish the Digital Opportunity Taskforce to help coordinate government efforts in closing the Digital Divide (Clinton/Gore Administration, 2000). There have also been a number of smaller but equally important initiatives to bridge the Global Digital Divide. For example, American Assistance for Cambodia, a nonprofit group based in Tokyo, is trying to deliver a permanent internet connection to a primary school in the village of Robib, Cambodia. Former Asian correspondent for Newsweek Bernard Krisher, who runs a nonprofit group, is hoping to assist in economically transforming a Cambodian region, where the average per capita income is about $37 a year (Markoff, 2000). The program will provide education and internet access to 400 students.

4. AN INITIATIVE TO NARROW THE DIVIDE

This study was undertaken to gain insight into the digital divide within the U.S. and more importantly, to contribute to narrowing the divide. The latter is a seemingly lofty goal, but it has been said that the longest journey begins with one step. In this case it begins with one small community on the unfortunate side of the divide.

4.1. Research Questions

This study addresses the following three sets of questions.

What demographic characteristics are associated with the technologically disadvantaged?

To understand the underlying nature of the technology gap, the most important factors separating 'haves' and 'have-nots' in the U.S. were identified and discussed, leading to the following:

Proposition 1: The demographic characteristics associated with the digital divide are:

- income,
- age,
- level of educational attainment,
- race,
- household type, and
- geographic location.

What contributes to narrowing the digital divide?

As previously discussed, narrowing the gap requires that the "have-nots" have access to technology and connectivity to the internet. However, access alone is short-sighted. Also important is successful learning of computing skills. Further, computer technology must be in homes and neighborhood institutions. Finally, the whole community must be engaged in using technology on a regular basis.

Proposition 2: The pervasiveness of computer technology within the community will promote use among residents of the community, reducing the divide.

Proposition 3: To reduce the divide, residents of the community must successfully learn computing skills.

Does computer training make a difference in narrowing the digital divide?

A number of programs bringing internet technologies to low-income communities were previously described. Indicative of the prevalence of such programs is the Commerce Department funding of 332 projects in all 50 states (Shepard, 1998). In addition to these programs are a multitude which have other public or private support. While descriptions of these various programs are numerous, measures of the success of such programs are not reported.

Proposition 4: Computer training makes a difference in narrowing the digital divide.

4.2. Research Method

This study was conducted as a field study within one small community on the disadvantaged side of the divide. The authors serve as volunteers within the community. A survey was first undertaken, during the fall and winter of 1999, to understand the complexity of circumstances the community confronts and to identify their overall needs. This led to the formulation of a community development plan. Among the priorities of the plan is access to technology. As a result, a computer training program was initiated within the community. Launched in the fall of 2000 and continued through the present, this program provides on-site training to residents by university students. This study focuses on the first training session in the fall of 2000, at the completion of which, a survey was administered.

4.3. The Unfortunate Side of the Divide

The William Penn Housing Development is located in the City of Chester, which occupies 4.8 square miles in Delaware County, Pennsylvania (PA) USA. Chester began its decline in the 1950's, experiencing a "deteriorating home stock, a dramatic decrease in size, a four-fold increase in the African-American population, and a significantly poorer population" (Brief of Amicus Curiae, 1998). In the 1980s, government programs attempted to improve the economy and living conditions in the city. Currently, this formerly industrial city is home to a low-income population of 39,000, 65% of whom are African-American, and has the highest infant mortality rate in PA (Worsham, 2000). By contrast, the remainder of Delaware County is 91% white (Brief of Amicus Curiae, 1998).

4.4. Identifying the Needs of the Community

The WPTA Development Plan (William Penn Tenant Association, 1999) was formulated with assistance from the Community Organizer, a position held by a skilled professional community program planner, and Unity Center, Inc., a nonprofit corporation founded in 1987 to "bring people together who would normally not come together" to work on a common concern or project such as tutoring, mentoring, or helping the elderly. Unity Center is a member of the Philadelphia Higher Education Network for Neighborhood Development (PHENND). To appropriately plan for and respond to the needs of the residents and neighbors of the William Penn Housing Development, a survey of 200 households was undertaken. The results, based on a response rate of 37.5%, reveal 60% of households have one or more members in need of employment. However, job skills and/or specialized training is present among the households surveyed, with 30% skilled or trained in construction and 24% in nursing and healthcare. While 20% expressed a strong interest in further education and/or training in construction and 28% in nursing as would be expected, 46% indicated a strong interest in computer training. Indeed, only 12% reported having job skills and/or specialized training in computer technology. A conspicuous 0% had a computer in their home. The survey enabled the identification of five priorities to promote the development of household self-sufficiency. Among them is Priority 3: Access to technology.

Although immediate employment needs are recognized due to the high percentage of unemployed and the particular urgency for welfare recipients to become employed under recent welfare reforms within the U.S., a major goal of WPTA's self-sufficiency plan is to develop the capability to do more than address this immediate need. Of primary importance is the demonstration of the potential for successful resident-conceived and resident-run initiatives. This is intended to promote self-sufficiency and the capability of WPTA to have a constructive role in community change. Residents may thus begin to believe in the possibility for change and for their participation in their own self-development.

4.5. Formulating the WPTA Development Plan

For each of the five priorities identified through the resident survey, goals, objectives, and strategies were formulated within the Plan. Responding to Priority 3 is Goal 3: Enhancement of community-based Computer Lab and development of community-based computer technology. The WPTA Technology Committee, comprised of leaders from the community, oversees this goal. The stated objectives of this goal include: acquisition of computer equipment for computer lab, internet connection for the lab, development of a community webpage, computer training, employer-linked computer training, installation of computers and software in homes, and a community-based network via internet connection. The overall strategy is to develop technological resources and capacities right in the neighborhood. This new technology will be used to enhance computer literacy generally and provide basic and specialized computer training to neighborhood residents.

4.6. The William Penn Tenant Association Computer Training Program

Preparations for the Training Program began in March 2000 with a proposal to Villanova University's Institute for Teaching and Learning. Numerous weekly meetings were held at the Community Center with Unity Center and other volunteers including the authors, the WPTA, its Technology Committee, and residents and neighbors. By August 2000, a training site at the Community Center was secured and equipped with computer equipment and furniture obtained through donations and purchase. Ten Intel Pentium computers were donated. Refurbishing of 14 Intel 80486 donated computers was accomplished through a partnership with students from Cardinal O'Hara High School, Springfield, PA USA. The on-site Computer Lab was made functional through a partnership with students from Eastern College, Radnor, PA USA. As word of this initiative spread, a second location was developed at In the Name of Jesus Outreach Church, within a two-mile distance, equipped with 15 computers.

The program "kicked off" on September 9, 2000. Forty-three Villanova University students were formed into trainer teams. Residents were assigned to trainee teams. The student trainers and resident trainees met twice a week from 6:00 – 8:00pm, Monday through Thursday. On Saturday mornings, a two-hour open lab was available. The program concluded with examinations and graduation. The graduation ceremony took place on the evening of Tuesday, December 6, 2000 with 31 of the initial 60 resident participants receiving certificates and free refurbished Intel 80486 computers to take home.

5. PRELIMINARY RESULTS

At the completion of the fall 2000 Training Program, a survey was administered and completed by all 31 participants who successfully fulfilled the requirements of the program. The survey captured demographic data to address Proposition 1. Data was also collected to address Propositions 2-4. This paper reports the results of Proposition 1.

5.1. Participants

Of the 60 residents who began the program, 31 met the requirements set forth by the Technology Committee to receive a certificate of completion at a graduation ceremony. Participants were required

to attend at least 19 of 22 classes and pass a competency exam to graduate. The 31 graduating participants ranged in age from 13 to 65, with an average age of 43. Of the 31 participants, 10 were male (32.1%) and 21 (67.7%) were female. The average educational attainment was high school equivalency or high school diploma. One individual had no high school, 2 had some high school, 5 had a high school equivalency, and 23 participants (38.7%) had a high school diploma. More than half of the participants (58.1%) were employed. More males (70%) than females (52.4%) reported being employed. The median household income is within the range of US$15 – 25,000. Eleven participants (36.7%) have a household income below $15,000, and only one person (3.3%) reported a household income over $45,000. Among household type, 5 participants are single (16.1%), 9 are single with children (29.0%), 5 are married (16.1%), and 12 (38.7%) are married with children.

5.2. What demographic characteristics are associated with the digital divide?

Proposition 1 addresses the demographic characteristics associated with the digital divide. While a seemingly simple set of characteristics is presented, it is recognized that a complex combination of factors determines on which side of the divide an individual resides. Each of the demographic characteristics previously identified is examined for the graduating participants by comparison with comparable statistics. This analysis is intended to provide a relative assessment of the community in contrast to previous findings generalizing the characterization of the digital divide.

Low income is associated with the technologically disadvantaged. The median household income among the participants is within the range of US$15 – 25,000. The U.S. Census (2001) reports the 2000 median household income within the U.S. to be US$42,148 and that of PA USA to be US$43,742. The income level within the community is thus on the low end relative to the entire country and to the entire state. This income characterization is consistent with that of the technologically disadvantaged. None of the participants have a home computer or internet access. Indeed, only 31% of households in the U.S. with income levels under US$30,000 have internet access (cyberatlas, 2000). This contrasts with 80% of households with income exceeding US$75,000.

Age is an indicator of which side of the divide an individual falls. Those who have attained senior status, aged 55 and older, are the least likely to use the internet, while those 35-44 represent the largest percentage of users among all age groups (Schreiber, 2000). Within the community, 0% of seniors had used the internet, consistent with the age characterization of those on the unfortunate side. The largest percentage of users within the U.S., 39.8%, is within the 35-44 age group, while 0% of participants aged 35-44 had previously used the internet.

Level of education and internet usage are highly correlated. Those who have earned a college degree are more than 9 times as likely to use the internet than those with an elementary school education (www.ntia.doc.gov, 1999). Among participants of the program, the average educational attainment is high school equivalency or high school diploma. Only two of the participants, or 6.45%, had previously used the internet. These two individuals, aged 13 and 16, both have attained less than a high school education to date. Their internet experience was gained through their educational experiences, with access to the internet through the public library. Although this result is not consistent with the correlation between education and internet usage, it is consistent with projections that internet usage among children will increase to 62% by 2005 from 32% in 2000 (Schreiber, 2000).

Race has been found to be a factor in the digital divide. All 31 participants, or 100%, identified themselves as African-American. Internet use among Blacks has been reported to be 19% (www.ntia.doc.gov, 1999). Among the participants, internet use was 6.45%. This result is consistent with the characterization of those technologically disadvantaged.

Household type is a factor contributing to the digital gap. Married couples with children under 18 years of age have the highest internet penetration of 37.6%, while female-headed households with children have the lowest at 22.3% (Murphy, 2000). Among the participants, the 6.45% internet use was within a household somewhat consistent with these findings. That is, the 2 individuals, aged 13

and 16, who had previously used the internet are members of a married household. The couple however, are the grandparents of these children. The elements of the family structure, married couple and children, are nonetheless present as influencing factors consistent with previous findings.

Geographic location is a discriminating factor for the digital divide. Population levels, indicative of the size of the subscriber base, may be insufficient to support the cost of high-speed internet access. Less than 5% of towns with a population of 100,000 or less and 1% of towns with a population of 250,000 or less have broadband DSL or cable modem services (PR Newswire, 2000a). Chester, the city in which the Housing Development is located, with a population of 39,000, has neither DSL nor cable modem. In addition to population and income levels, Chester suffers from an isolation within Delaware County, not unlike that of an inner city. The characterization of Chester, as a geographic area with a low population level and isolated location, is consistent with previous findings.

6. CONCLUSION

This project benefited both the students and the residents, not just academically, but socially and spiritually. It was very evident at the graduation ceremony that the residents gained not only technology skills, but an increased sense of accomplishment and self-esteem. Many of the residents trainees commented that two worlds, differing socio-economically and technologically, were bridged. University student trainer comments focused on the meaningfulness of interacting and training the residents in a world very different and less fortunate than theirs. Additional details of the program can be found in two newspaper articles (Hardy, 2000a and Hardy, 2000b) as well as on the website of the U.S. Department of Housing & Urban Development (HUD) at: www.hud.gov/local/phi/WilliamPennTechnologyCenter.html.

Although some progress has been made in closing the Digital Divide, more can be done. The challenge is to further knock down the barriers that exclude individuals from the new economy. Although developing an information infrastructure is the basic building block, other initiatives should be undertaken to connect those in poor and rural areas. The key is education and training. Providing schools with the internet access is a necessary first step. Providing training to those on the unfortunate side of the Digital Divide is essential.

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