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Demographics and Sociographics of the *Digital City*

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During the last decade, various systems have been created to support local communities and shared interest groups. Knowledge about the use, users, and effects of these new systems is needed to inform design and implementation. In this paper we present the results of a survey among inhabitants of the *Digital City*, a large infrastructure for 'virtual communities'. The number of users, the range of facilities offered in the *Digital City*, and mutual interaction between the users does increase. At the same time, the original local (Amsterdam) base of the system has disappeared, and today's users are living all over the Netherlands. The population of the *Digital City* is fairly homogeneous, and therefore does not reflect the heterogeneous nature of a 'real' city. Use of the *Digital City* is mainly recreational, and not yet integrated with other aspects of daily life.

1. Introduction

Information and communication technology (ICT) is used intensively in the economy and in organizations. However, since the late eighties, it has been recognized that ICT also can be used to support *community life*, and *community networks* have emerged as extensions of public domain within cyberspace.¹ A community is an association between people, which is not coordinated by money (the market) or by power (formal organizations) but through communication based on shared norms and interests. Communities are often defined as *local* [7], but this locality can be in geography (villages and neighborhoods) as well as in information space (special interest groups, using the Internet as a medium). Community networks are meant for rebuilding community life by improving communication, economic opportunity, participation, and education. [16] To do so, community networks offer various functions, such as access to community services and information, tools for communication, and discussion platforms related to community issues. Early community networks used BBS technology, and during the mid-1990^s, a transition to WWW-technology took place. More recently, new tools are being developed to increase the functionality of community networks. These include awareness tools, intelligent agents, and filtering tools [7].

¹ Literature on community networks is growing, e.g., [5, 8, 13, 15, 16, 17]. A useful overview from an activist point of view is [15]. For an overview from a computing point of view see [7].

The development of community networks and digital cities can be studied from the wider perspective of coordination mechanisms in society. In modern societies, various mechanisms exist for the coordination of social, economic, and political life. On a somewhat abstract level, three classes of mechanisms can be distinguished: markets, hierarchies (formal organizations), and social networks (or communities, e.g., families, neighborhoods, special interest groups). [18] Which of these mechanisms are appropriate in a certain situation depends on the transaction costs (coordination costs) involved. [2] As transaction costs are mainly for information and communication, they are expected to change because of the use of modern information and communication technologies (ICT). Markets are developing into *electronic markets* [10], using the new technology for reducing costs of gathering information and coordinating market transactions. At the same time organizations are changing into *virtual organizations* [11, 12]. And, because ICT influences the various transaction costs in different degrees, the relative efficiency and effectiveness of markets, hierarchies, and social networks may change. For example, Malone, Yates, and Benjamin [10] have argued that ICT reduces the transaction costs of markets more than of hierarchies. In other words, while electronic markets and electronic hierarchies are emerging and replacing traditional markets and hierarchies, the balance may shift to more market and less formal organization. Whether this tendency is dominant and irreversible, is of course highly dependent on the direction of technological development and on the way new technologies are adopted.

Also the role of communities and social networks in society depends on their relative efficiency. In pre-modern, traditional society, local communities carried all the different functions needed for the reproduction of the community. During the historical process of modernization and differentiation of society, traditional communities have lost many of their social functions, which have been taken over by the market, and by government. However, with the emergence of ICT-based community support systems, transaction costs in communities and social networks may decrease. Modernized, social networks may become more important again for society.²

Whether community networks succeed in improving community life, depends of course on the design of the community systems, but also on contextual factors. For example, Van Alsteyne and Brynjofsson have demonstrated that the use of the Internet by scientists can result in *widening access*, as well as in a *balkanization* of science [19]. Science, as other social systems, behaves as a *complex adaptive system* [4], and the effects of technological change therefore may be counter-intuitive. Community networks add additional layers of communication to existing communities, which may reinforce the social network, but also lead to new communities, and to a change or disintegration of existing communities. Therefore, it cannot be concluded from the mere *technological possibilities* that community life will benefit from adopting ICT-based community networks.

² It has been argued that the market and the state are no longer able to solve the unemployment problem. Advocates claim that community networks may strengthen local economy, and also support a 'social (non-monetary) economy' [15]. If this is true, community networks may become a useful tool in the creation of new forms of employment. [20]

This uncertainty opens up a whole research agenda into the use, the effects and the design of community networks, and other forms of *community computing*. Under what conditions will these new media for communication and interaction transform and create sustainable communities? What tools (for filtering, awareness, decision making, information search, chat) are useful in various situations? What infrastructures are appropriate in which contexts? Do modern means of communication create new ‘hybrid’ communities, less based on real space and more on information space? What does this imply for the design of community systems? Because it is uncertain how community networks and community support systems will influence society [4], it is relevant to study the functioning of existing community systems, and how these community systems affect social networks, and society at large. In this paper, we analyze the development of a large community system: the (*Amsterdam*) *Digital City*, as a contribution to this research program.

2. The *Digital City*: History and Organization

Early in 1994, the Amsterdam *Digital City* began as an initiative of hackers and cyberspace activists, the objective being to democratize access to the Internet. The organizers, funded by the local government, created a text based (BBS) system, accessible through telephone and modem. As the number of Dutch people with Internet connections and modems was very low in 1994, terminals were installed in public places, such as libraries and cultural centers, to improve access to the system. The main project was to use the *Digital City* for communication between citizens and local politicians and for the dissemination of political information among the citizens of Amsterdam. The DDS was founded shortly before the local elections in 1994 in Amsterdam, and the ten week experiment was planned to end after the elections. However, the *Digital City* was a large success, and it stimulated the interest for the Internet in the Netherlands enormously. The number of registered users increased very fast: during the first ten weeks, some 10.000 inhabitants were registered, and over 100.000 visits took place. Growth has continued ever since. In 1996, the population had increased to 48.000, with in average 8000 visits per day. Additionally, per day some 2000 (non-registered) ‘tourists’ were visiting the *Digital City*. In June 1998, the number of inhabitants had grown to 80.000, despite the fact that citizens who do not use the facility for more than three months, are expelled from the *Digital City*.

From a grass roots and subsidized initiative (in 1994), the Amsterdam *Digital City* (DDS³) evolved into a non-subsidized not-for-profit organization, with a turnover (in 1997) of about \$ 500.000, and employing (in 1998) more than 25 persons (all together filling 17 full time positions). Its main objectives have become broader:

- Democratizing the electronic superhighway: creating an electronic sphere that allows for participation, discussion and information exchange. In other words, the creation of an electronic public domain, freely accessible, and with freedom of

³ The acronym DDS stands for *De Digitale Stad*, Dutch for *The Digital City*.

expression. The DDS offers its inhabitants free email, the possibility to create a 'digital house' in the city (WWW-page), facilities for chat and discussion, and access to a myriad of information about all aspects of daily life.

- Innovation: development of knowledge, and conducting research and development about information and communication infrastructures, and disseminating this knowledge.
- Supporting small and medium sized firms in using the Internet and WWW, and improving the regional economic structure.

The DDS earns its income mainly through the second and third objectives: by advising other organizations about the use of the Internet and WWW, by providing computing facilities, by providing WWW services, and by providing digital office space and possibilities for advertising within the DDS. The local government in Amsterdam, which funded the start of the DDS, is now paying for services.

The fact that the DDS has to generate its own income, based on its expertise (consulting) and its sizable population (renting virtual offices as well as space for advertisement), also affects the way the DDS is organized. Although it started as a local grass roots movement, the DDS has lost its original democratic structure. In contrast to the dominant idea of community networks as bottom up activities, owned by the users, and often based on public funds [13, 15], the DDS is a 'not-for-profit company'. The digital citizens are 'customers', without a formal and organized representation in the DDS. An early plan to establish an 'advisory board' with users of the system, never materialized.

An example of an important top-down decision, initially not having support of the users, was a major change in the design of the system. When the DDS moved from a text-based interface to a WorldWideWeb interface, many 'digital citizens' opposed it as unnecessary. However, the leadership of the DDS felt that they had to use the most advanced technology (in 1995: WorldWideWeb) to remain attractive in the long run, even if users initially opposed the change.

On the other hand, the lack of formal influence has never resulted in questions of legitimacy. Several users of the *Digital City* participate in various design aspects, e.g., in an advanced users group, where new designs and tools are discussed and tried out. In this sense, the DDS is similar to traditional *participatory design projects*. [3]

3. The Design of the *Digital City*

The current (third) system of the *Digital City* is a WWW based system, in which the metaphor of the city is implemented quite literally. Figure 1 shows the map of the DDS, which can be found at <http://www.dds.nl>. The city consists of more than thirty squares with cultural, recreational, technological, civic, and political themes, providing a meeting place for ideas and information exchange. A list of the squares is added in appendix 1. The squares are the location for the commercial information suppliers, and for not-for-profit organizations. On the squares, companies and organizations can rent virtual offices, to provide information, and to sell products and services. For

example, the 'Europe Square' houses the Dutch Office of the European Commission, and other organizations related to the European Union. They provide information to the public. Political debate around European issues takes place here.

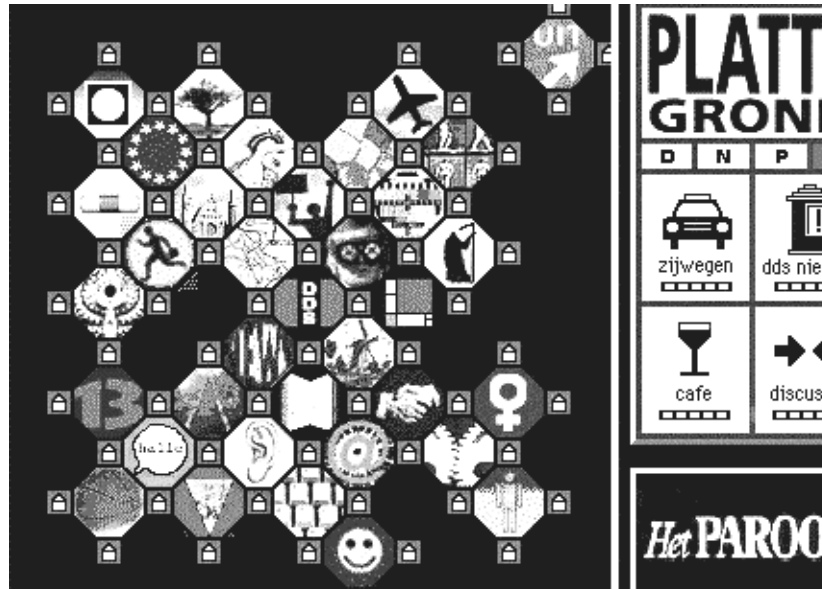


Fig. 1. The map of the Digital City

The 'houses' of the digital citizens are located around the squares (in the form of WWW-pages). Digital citizens use their houses for presentation of themselves, and for information they feel may be of interest to the visitor. Some very interesting houses exist, such as a house that provides links to the homepages of various media (journals, magazines, movies, etc.) from the entire world. The main difference between the shops and offices and the private houses is, that the latter are free. Therefore, one is not allowed to provide commercial information in one's house. Private houses lack tools for communication.

Because the number of inhabitants increases faster than the number of squares, there is a shortage of building space for houses. A variety of measures have attempted, only with partial success, such as building 'skyscrapers'. It is also permitted to 'squat' houses that are not maintained by their inhabitants. By now, it is also allowed to build houses in the *Digital City* that are not properly located in the 'city structure'. In 1996, some 3300 inhabitants had their house, a number that doubled to 6500 a year later. Of these, some 1500 houses are properly located, that is, have a 'door'. The others can be accessed through an index.

A popular facility in the *Digital City* is the 'metro', a complex text-based Multi User Dungeon. Other facilities are the weekly DDS-magazine, various café's and kiosks, email, and discussion groups. Many 'billboards' for advertisements and an-

nouncements are spread over the DDS. Originally, the DDS provided free and full Internet access. This was terminated quite early, because of the costs involved, and because many Internet access providers entered the market in the Netherlands from 1995 onwards. The *Digital City* maintains both a text-based interface and a WWW-based interface; 82% of the users are using the WWW-based interface.

3.1 Innovation

In 1997, the *Digital City* started to experiment with 3D virtual reality. Dam Square has been built as a 3D model (<http://dam.dds.nl/xdam/damBang.html>), and citizens were invited to extend the 3D virtual space with their own buildings, streets, and squares. This experiment with 3D was a consequence of the need for the DDS to attract users, and to remain competitive in the WWW-advisory market and in the market for Web-commercials. However, the use of advanced technology may result in decreasing accessibility, because users need fast computers and especially fast telecommunication connections to use the 3D interface. Recently, the DDS decided not to move into the 3D direction, as it is still much too slow. An updating of the interface, and new awareness and communication tools, however, are being developed.

3.2 Community Networks and Digital Cities

What is the difference between a ‘digital city’ and a ‘community network’, as variants of ‘community computing’? As already discussed, communities share geographical space or information space, and community networks can be designed for both types of communities – however, different architectures and different functions may be required. A digital city is simultaneously similar to and different from both types of community networks. The DDS does not see itself as a *local* community network, because the scope of the *Digital City* is much larger – the content is not restricted to the Amsterdam region, and the services are available for everybody who wants to register. In fact, the users of the DDS live all over the Netherlands. The DDS is also not a *topical* community network, as it covers a large number of different topics. This is clearly represented in its various squares, each focusing on a certain topic: Women’s Square, Books square, Music square, Gay Square, Culture Square, Technology Square, and so on. On the other hand, the DDS does have a local component, as much information in the DDS is about Amsterdam.

In other words, the DDS aims at providing an *infrastructure* for many different thematic communities. The DDS is a community of communities, and, consequently, the city-metaphor has broader implications than simply as an interface. As in real cities, the DDS supports highly diverse activities. And, as a real city, the DDS attracts people from many places outside.

To what extent is the *Digital City* successful in realizing these goals? Does the new communication infrastructure of the DDS result in the emergence of sustainable (local and topical) communities? Does the DDS offer functions, which are useful, and integrated into peoples’ everyday life? What is the connection between cyberspace

and community space? [17] In this paper, we present results of surveys among users of the DDS towards answering these questions.

4. Data and Methods

Some months after the start (in January 1994) of the *Digital City*, a survey was held among the users (Schalken & Tops 1994). We organized a second survey (May/ June 1996) to investigate digital life in a more mature environment. We did not yet finish the analysis of the data from the third survey (May/June 1998), and therefore we can only present some preliminary results of the last survey. The research is a cooperation between the *Digital City* and the University of Amsterdam, and will be repeated on a regular basis. This may result in a growing body of knowledge about citizens and city life in digital cities.

Of course, a survey method is not sufficient to generate a complete picture of social relations and processes in digital environments. Therefore, we also undertake more detailed studies, based on interviewing and observing users. However, the surveys provide us with information about tendencies in use and users, which is the focus of this paper. Where appropriate, we will add information obtained from the more in depth interviews and observations.

4.1 The Questionnaire

The questionnaire, in the form of Web-pages, was announced at several localities in the *Digital City*. The questionnaire remained for about five weeks in the DDS, to enable more incidental users and tourists to participate, too. Apart from the 50 questions (included as appendix 2), we also asked respondents to (voluntarily) fill in their name and address, and about three quarters did so. We will use this database for interviewing, and for longitudinal research.

To become a citizen of the DDS, one needs to register. In 1996, at the time of our second survey, 7% of the registered citizens had either a house or a homepage in the DDS. This stands in contrast to 22% of our respondents who had this high level of involvement. As a consequence, the sample is not representative, and we expect the more active digital citizens to be over-represented, and the incidental visitors under-represented. After the first analysis of the data, we re-weighted the sample to match available population statistics: growth of the number of digital citizens, the share of users with a house. The results before and after the correction of the sample, however, are quite similar. We base our analysis on the data from the original sample.

4.2 The Analysis: Data and Method

After answering the questions, the respondents needed to click a button on the screen to send their responses. These were then automatically placed into a data file, accessi-

ble to SPSS. The analysis consisted of various steps. First the descriptive statistics were produced on users and use of the Amsterdam *Digital City*. In a second phase, we searched for relations between the independent variables (characteristics of the users, such as gender, age, education, experience with the Internet, and so on), and the dependent variables (indicating the use of the DDS). In a third phase, we used factor analysis to reduce the number of 'DDS-use' variables to underlying dimensions. This resulted in several identifiable factors, representing various use-dimensions. The analysis was aiming at 1) describing use and users of the DDS, and 2) trying to find out whether 'typical' groups of users and ways of using the DDS do exist.

Table 1. Some basic statistics

	<i>May 1994</i>	<i>May 1996</i>	<i>May 1998**</i>
Total number digital citizens	10.000*	48.000*	80.000*
Average visits per day	2.000*	8.000*	
Tourists per day		2.000*	
Respondents	1.200	1.300	700
Of which: Male	91%	84%	79%
Higher education [#]	86%	86%	64%
Age 18-25	29%	48%	38%
Amsterdam based	45%	23%	22%
Working	49%	39%	40%
Unemployed, old aged	8%	0.5%	12%
Housewives	0.1%	0.6%	***
Student incl. high school	31%	56%	48%
Turn over in 1997		\$500.000	
Number of employees		About 15	About 25

* Provided by the *Digital City*.

** Preliminary results.

*** Included in 'unemployed'.

Users studying at college or university, or with a degree.

5. Results: Use and users of the Amsterdam *Digital City*

An overview of some characteristics of digital citizens is given in table 1. As is clear, the digital citizens are male, young, high educated or trying to become so. The decrease (between 1996 and 1998) of the 'high educated'-group and the 'age 18 to 25'-group is due to the quickly increasing number of high school students in the DDS. Inhabitants with a job are mainly working in education, culture, business services, and public administration. Digital citizens are also increasingly distributed over the entire country: only 23% of the 1996-respondents were based in Amsterdam, and this share is even lower in the 1998-survey. Ethnic and cultural minorities (the language in the DDS is Dutch!), the lower educated, the elderly, the unemployed, housewives are all

underrepresented, although their share in the DDS populations seems to increase again. However, the DDS is still a homogeneous community and not a modern heterogeneous *urban* community. The *Digital City* is more like a digital suburb, or a digital campus.

The figures reflecting the number of visits per day suggest a rather intensive use of the system. On average, these figures suggest that digital citizens visit the city a little more than once a week. This is corroborated by the answers in the questionnaire. However, our systematic ‘ethnographic’ observations over a three week period never found such large numbers in the DDS. This is most likely because the system does not register on-line use in a meaningful way. This is a problem that has been reported by the DDS, and has not been solved during the last two years. As a consequence, the possibilities of interaction in the system are not optimal: one cannot communicate on-line with fellow citizens if one is not aware of their presence.

5.1 Use of the Digital City: City Life

An important characteristic of communities is the level of interaction and communication. Are digital communities emerging within the DDS? To get a provisional answer to that question we asked whether digital citizens have contact with fellow digital citizens. The question was also asked in the 1994-questionnaire, and therefore we are able to see changes. Table 2 gives the results, suggesting that a digital community is emerging over time. The frequency of mutual contact clearly is increasing.

Table 2. Frequency of communication between digital citizens

	1994	1996
Often	3%	20%
Sometimes	18%	37%
Seldom	33%	22%
Never	46%	21%

As described above, the DDS offers various functions to its inhabitants. In the questionnaire, we distinguish the following functions: *information supply* (through WWW-pages), *information retrieval, debate* on political, social and other issues (discussion groups), *asynchronous communication* (electronic mail) and *synchronous communication* (web café’s, chat).

Table 3. What do digital citizens do: use of various functions*

<i>Activities:</i>	1994	1996
Email	52%	95%
Information search	54%	85%
Information supply		55%
Debate	16%	40%
Virtual face-to-face	22%	30%

* % (very) important

We asked the respondents how they value these functions and how they use the functions (for private activities and/or professionally). As table 3 shows, email and search for information are the most important functions for the respondents, and the supply of information, debate and chatting are less important. Additionally, the use of these functions is predominantly private, rather than job related.

What kind of things are digital citizens doing and talking about? This may be indicated by the thematic squares that the respondents consider important. Table 4 shows a classification of the various squares in six categories: 1) Internet related squares; 2) culture, lifestyle and leisure related squares; 3) information and education; 4) politics and civic activities; 5) squares related to work and economy; and 6) miscellaneous. The distribution of information providers and discussion groups over these six categories is also exhibited. Finally, the table shows (on a ten points scale) how the respondents value the relevance of the various squares. Appendix 1 gives the scores per square.

Table 4. What do digital citizens do: fields of interest

<i>Topics</i>	<i>Important Squares*</i>	<i>Information Providers**</i>	<i>Discussion Groups**</i>
Technology, Internet, DDS	10	13%	12%
Culture, leisure, lifestyle	7.5	35%	64%
Information & education	7	15%	-
Politics & civic	4.5	20%	24%
Economy & work	3	12%	-
Miscellaneous	-	05%	-

* 1996-Survey

** Adapted from [6].

The figures suggest that the use of the DDS is Internet related and mainly recreational. This is also reflected in the distribution of information providers in the DDS and the distribution of the discussion groups. Although the DDS started as an activity aiming to improve local democracy, it is not very strong in political issues and civic activities. The DDS does not play a main role in the local political debates, and the political community is not very active in cyberspace. ‘Traditional’ communication media are still far more important here. It should be noted that civic organizations are only starting to use the DDS (and the Internet in general), and therefore their activities on the Web are still in their infancy.⁴

5.2 Patterns of Use

The above figures are averages. However, we are also interested in whether different groups of digital citizens use the DDS in different ways. For example, do men use the DDS differently from women? Do differences exist between use by older and by

⁴ Kole [9] studied email use by women’s organizations and NGO’s in the context of developmental issues. She found that these organizations generally are just starting with email.

young citizens? Between students and workers? Between digital citizens with and without a house in the DDS? And, what is the link between community space and cyberspace; do users who live in Amsterdam use the DDS differently from others? Using *analysis of variance*, our data suggest the following similarities and (sometimes small) differences:

Men versus women. Female users have less experience with the DDS, use it more often, and stay a little longer on-line. They use the DDS somewhat less for professional purposes, although professional use by men is low as well. Women use the chat facility in the web café more than men, but a male user is more apt to have a house in the DDS. There are some indications that women have slightly more contact with fellow DDS citizens than men do. Finally, we saw a small difference in the way men and women navigate in the DDS. Men more often use URL's, and women more often the index and map of the DDS.

Student versus employed. Employed persons (of course) use the DDS more often professionally than students, however professional use is generally low as already mentioned. Students have more contact with other DDS-users. Chatting in the Web café is more important for students than for other users; for discussion groups the reverse is true.

Users with a 'house' versus other users. Digital citizens with their own house in the DDS have more contact with other users. They also make professionally use of the DDS more often, and are generally more experienced. They consider the information function as more important than do other DDS users, but this relation does not hold true for the communication and discussion functions.

Level of education. The more highly educated digital citizen uses the DDS more often for professional aims, has more experience with the DDS and the Internet, and has much more contact with others. Interestingly enough, he values 'information search' less than the less educated user does.

Age related use. Younger users have significantly more contact with others in the DDS. This is not surprising, as age strongly correlates with the student-employed distinction (see above). The relation holds when checking for gender.

Amsterdam based users versus others. Amsterdam based users arrived earlier with the DDS and later with the Internet than others, indicating that the DDS may have functioned as a learning tool for Amsterdam based users with respect to the Internet. There is no difference between the two groups with respect to the frequency in use of the DDS and the Internet. Also the frequency of contacts with others in the DDS is identical, as is the relative value they place on the communication and discussion functions. However, Amsterdam based users seem to place less value information search, the web café, and the chat facilities than do other users. On the other hand, they score higher on creating and accessing Web sites. Finally, the Amsterdam based user scores slightly higher on professional use. Summarizing, the differences between Amsterdam based users and others do not indicate strong relations between community space on the one hand and cyberspace on the other.

Frequent versus infrequent users. Frequent users have more contact with other users, and sign on for longer sessions in the DDS. They especially value making WWW-pages and use of email, but there is no difference with respect to their job related use of the various functions.

Experience and use. The longer one visits the DDS, the higher the various functions are valued, and the more the user communicates with others. New users are more apt to make professional use of the DDS.

Another way of approaching the question of differences in ways of using the DDS is based on a factor analysis of the 22 items in the questionnaire which are related to the use of the DDS. The analysis resulted in the following six 'use dimensions', that have been used to identify various 'typical users', and 'typical behaviors'.

- Degree of professional use;
- Contact with fellow DDS-citizens;
- Degree of substitution of other media by email;
- Use of chat facility;
- Use of the information function;
- Use of communication & discussion function.

Combining the results of the comparison of groups with the results of the factor analysis, we are inclined to distinguish five overlapping groups in three dimensions: main activity of the user (employed versus studying), type of use (professional versus recreational), and level experience of users (new users). Summarizing the findings results in the 'use map' (figure 2).

6. Conclusions and Discussion

On the basis of the first two surveys (1994 and 1996), a few preliminary results of the 1998 survey, and some additional observation and interviewing, we can now answer the question whether a virtual public space and cybercommunities are emerging in addition to 'real' space and local communities. The answer is 'yes and no'. Yes, in the sense that:

- An increasing number of DDS squares are built, with social, political, and civic topics, and related organizations.
- An increasing number of digital citizens have regular contact with fellow citizens.
- The DDS as a digital sphere is successful and sustainable, with many enthusiastic citizens, a rapidly growing population, and potentially a viable combination of 'civic' and 'economic' activities. Although the survey did not show the emergence of more or less stable communities within the DDS, it becomes clear from interviews that on a smaller scale some active communities are existing. Examples are groups of enthusiastic users of the MUD (the Metro), around the Chess Café and the Literature Café, the Motor Club and the Skeeler Club, and around Gay Square.
- Similar to a 'real' city, the DDS attracts a lot of people from the entire country.

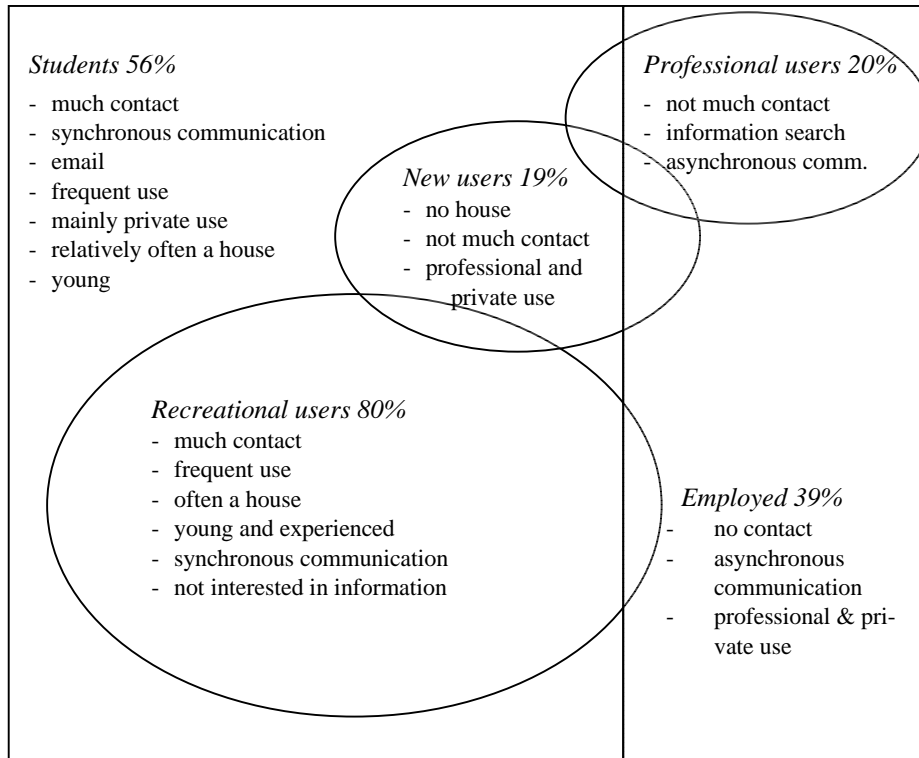


Fig. 2. Use map (1996)

However, also opposite tendencies were discovered:

- The DDS is mono-cultural and used in a mono-functional way, and does not reflect the social structure of 'real' urban communities.
- Although the DDS covers many civic topics, the actual level of activity around these topics is low. This is as well true of the organizations that are present on the civic squares. They probably are still unsophisticated users, and the DDS is not a part of their organizational culture. Alternatively, the DDS may not offer enough added value for these organizations.
- In sum, the level of economic, work-oriented, and professional activities is low. Much office space is empty. Digital citizens generally do not use the DDS for work related issues. In other words, the relevance of systems as the DDS is not (yet) clear for this type of use.

Different tendencies are visible simultaneously. *Existing* interest groups are only beginning to use network technology to improve their communication and information exchange. For these groups, the DDS may become a resource and a medium. However, although the mutual interaction within the DDS increases, it is less clear whether *new* (thematic) communities emerge from interaction within the DDS.

For the majority of the digital citizens, the *Digital City* does not seem to be part of their 'normal', every day activities. This can be concluded from what are the most popular functions of the DDS, and the most popular squares (i.e., topics), and from the valuation of the various available functions. For example, recreation sites are most popular, while the civic and economy oriented squares are among the least visited.

The social structure of the *Digital City* differs significantly from the social structure of the Amsterdam population and of the Dutch population as a whole. This is not uncommon with the use of new technologies: various social groups are entering cyberspace in stages. In 1996, university and college students received access to the Internet. More recently, this has been the case for high school students. On the other hand, to push the city metaphor a bit further, it also may indicate that within the new media landscape, digital communities are the garden cities, not yet accessible for the socially and culturally deprived citizens.

Despite the differences in use and users, the general picture is one of homogeneity. This may change with a possible arrival of new groups of users, and with the maturing of the medium and of its use (learning by using). Additional research may answer these open questions.

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References

1. Beckers, D.: Use and Users of the Amsterdam Digital City, Masters thesis. University of Amsterdam, 1998. URL results: [http://swi.psy.uva.nl/beckers/results/digital city.html](http://swi.psy.uva.nl/beckers/results/digital%20city.html)
2. Ciborra, C.U.: Teams, Markets and Systems. Cambridge, CUP, 1993.
3. Clement A., Van den Besselaar, P.: Participatory Design Project, A Retrospective View. Communications of the ACM 36 (1993) 6, pp. 83-91.
4. Cohen, M.D., Axelrod, R.: Complexity and Adaptation in Community Information Systems: Implications for Design. This volume.
5. Cohill, A.M., Kavanaugh, A.L. (eds.): Community Networks, Lessons from Blacksburg, Virginia. Boston: Artec House, 1997.
6. Francissen, L., Brants, K.: Virtual Going Places, Square Hopping in Amsterdam's Digital City. Tsagarousianon, Tambini, Bryan (eds.), Cyberdemocracy, Technology, Cities, and Civic Networks. London, Routledge, 1998.

7. Ishida, T. (ed.): Community Computing, Collaboration over Global Information Networks. John Wiley & Sons, 1998.
8. Kraut, R. (ed.): Internet@Home. Special Section. Communications of the ACM, 39 (1996), 12, pp. 33-74.
9. Kole, E.: Myths and Realities in Internet Discourse, Using Computer Networks for Data Collection and the Beijing World Conference on Women. The Gazette, The International Journal for Communication Studies, 60/4, August, pp. 343-360.
10. Malone, T.W., Yates, J., Benjamin, R.I.: Electronic Markets and Electronic Hierarchies. Communications of the ACM, 30 (1987), 6, pp. 484-497.
11. Mowshowitz, A.: Virtual Organization, a Vision of Management in the Information Age. The Information Society 10 (1994) pp. 267-288.
12. Mowshowitz, A. (ed.): Virtual Organization - Special Section. Communications of the ACM, 40 (1997) 9, pp. 30-64.
13. Rheingold, H.: The Virtual Community. Harper 1993.
14. Schalken, K., Tops, P.: The Digital City, A study into the backgrounds and opinions of its residents, 1994.
15. Schuler, D.: New community networks, wired for change. New York: ACM Press, 1996.
16. Schuler, D.: Community networks, building a new participatory medium. Communications of the ACM 37 (1996) 1, pp.52-63.
17. Schuler, D., Page, C.: Community Space & Cyberspace, what is the Connection? Proceedings 6th DIAC, March 1997. Seattle: CPSR, 1997.
18. Thompson, G., J. Rances, R. Levacic, J. Mitchell (eds.), Markets, Hierarchies & Networks; the Coordination of Social Life. London etc., Sage 1991.
19. Van Alsteyne M., Brynjolfsson, E.: Widening Access and Narrowing Focus: Could Internet Balkanize Science? Science, 274 (5292), 1997, November, 29, pp. 1479-80.
20. Van den Besselaar, P.: The future of Employment in the Information Society: a Comparative, Longitudinal and Multi-Level Study. Journal of Information Science 23 (1997) 5, pp. 373-392.

Appendix 1. The squares in the *Digital City* (1996)

Square	R*	Square	R	Square	R
Book Square	185	Gay Square	219	Park Square	27
BVE Square (educ.)	57	Health Square	48	Politics Square	84
Computer Square	346	IBM Square	52	Square 13 (Youth)	48
Culture Square	221	Internet Square	422	Sports Square	144
DDS Central Square	2119	Local Government Sq	46	Technology Square	73
Digital Cities Sq.	267	Metro Square	285	Tourism Square	22
Ecology Square	65	Movie Square	272	Travel Square	58
Education Square	118	Music Square	340	TV & Radio Sq.	131
Entrepreneurs Sq.	61	National Government	112	World Square	60
Europe Square	66	News Square	267	Work Square	28

* Respondents were asked to mention three squares most important to them. A first place is good for three points, a second place is good for two, and a third place for one point. The table (R) gives the total number of points per square.

Appendix 2: Questionnaire

Nr.	Variable	Values
Var1	Gender	Male / female
Var2	Age	0-99
Var3	Education	Highest school level
Var4	Main activity	Work/school/household/civic duties
Var5	Employment	Industrial sectors
Var6	Occupation	Management/professional/clerical/sales/ services/other
Var7	Income	Net income per month
Var8	Political orientation	Political parties
Var9	Political commitment	Do you vote – last elections
Var10	Civic duties	Yes / no voluntary work
Var11	Civic duties	Hours per week
Var12	Member DDS	Yes/no login name in the DDS
Var13	Internet experience before DDS	Yes / no
Var14	Entering DDS from	Home/school/work/public terminal/ other
Var15	Speed modem	Baudrate
Var16	Entering DDS through	Modem bank / internet provider
Var17	Which provider	Name
Var18	Since when internet	Date (half year periods)
Var19	Since when DDS	Date (half year periods)
Var20	How often in DDS	Number of times per week
Var21	Average stay in DDS	Minutes
Var22	Learned about DDS	Various media
Var23	Average stay in Internet	Minutes
Var24	Most important square	Names
Var25	Second square	Names
Var26	Third square	Names
Var27	Importance of information	5 points scale
Var28	Use of 27	Private / professional – 5 points scale
Var29	Importance of web-café	5 points scale
Var30	Use of 29	Private / professional – 5 points scale
Var31	Importance of IRC	5 points scale
Var32	Use of 31	Private / professional – 5 points scale
Var33	Importance www-making	5 points scale
Var34	Use of 33	Private / professional – 5 points scale
Var35	Importance www-browsing	5 points scale
Var36	Use of 35	Private / professional – 5 points scale
Var37	Importance of email	5 points scale
Var38	Use of 37	Private / professional – 5 points scale
Var40	Use of 39	Private / professional – 5 points scale
Var41	Does email influence phone use	5 points scale
Var42	Ibid. fax use	5 points scale
Var43	Ibid. letters	5 points scale
Var44	Ibid. face to face communication	5 points scale
Var45	Own house in the DDS	Yes / no
Var46	Contact with other inhabitants	4 points scale
Var47	Confrontation with sexism	3 points scale

Var48	Hinder from sexism	5 points scale
Var49	Confrontation with racism	3 points scale
Var50	Hinder from racism	5 points scale
Var51	Confrontation with rude behavior	3 points scale
Var52	Hinder from rude behavior	5 points scale
Var53	Type of interface	Text / graphics
Var54	Ability to navigate in DDS	5 points scale
Var55	Navigate through URL	4 points scale (from always to never)
Var56	Navigate through map	4 points scale (from always to never)
Var57	Navigate through index	4 points scale (from always to never)
Var58	Navigate through walking around	4 points scale (from always to never)