

Diffusion of E-services: Data from Seven Swedish Municipalities

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Abstract: Intensified use of digital technology enables new ways for governments to interact with their citizens. One such way they interact is through the use of electronic services (e-services). The diffusion of such services is not yet fully understood. Against this backdrop, this paper aims to study demographic differences in e-service diffusion. The research is conducted by using data from a Swedish region. The novelty of this paper is that it builds on actual usage data. Quantitative data from an e-service platform is presented through descriptive statistics. The results reveal interesting findings related to citizen demographics such as gender, age, and living in a city or rural area, and also findings related to category of e-service. A general observation is that women use e-services more than men, up to the age of 50. Many of these services are aimed towards parents with children in school. One exception from the pattern is services related to building permits and related areas, where men are the most frequent users. The results also reveal that the differences between men and women are smaller in an urban area studied compared to the other municipalities. Overall e-service usage peaks at the age of 40-49, but two rural municipalities deviate from this pattern with an earlier peak. This paper adds to current knowledge on e-service diffusion with data on actual usage, based on age, gender, rural/urban areas, and service categories.

Keywords: e-government, e-services, diffusion, adoption, demography

1. Introduction

Intensified use of digital technology enables new ways for governments to interact with their citizens. One such way they interact is through the use of electronic services (e-services). Lindgren and Jansson (2013) define e-services in the public sector using three characteristics; they are public (rather than private), electronic (digital) and intangible (unlike e.g. goods). By emphasizing the "public" part, Jansson (2012) argues that e-services can be conceptualized as either a swing door or a gatekeeper to public services. E-services often manifest in forms on websites, where citizens may identify themselves using electronic means of identification and fill in information required for e.g. making an application. However, as argued by Lindgren and Melin (2017) (see also Jansen and Ølnes, 2016) it is difficult to establish a precise definition of what constitute e-services. E-services often range from downloadable forms to more complicated self-service systems, and IT systems with specific processing capacity.

Prior research on e-services is heterogeneous (Arduini and Zanfei, 2014). Research on e-government or e-service diffusion is often conducted through the use of technology acceptance models (TAM) in combination with web surveys. These approaches are problematic because they do not capture actual usage (or, nonusage) of e-services since they are sensitive to sampling problems. Web surveys are problematic when it comes to generating representational samples (see e.g. Fricker and Schonlau, 2002), especially concerning large target groups, often the case with public e-services. Moreover, these approaches usually assess individuals' willingness to adopt e-services. Actual diffusion patterns may deviate from what is output by a TAM model (see e.g. Ajibade, 2018).

Henriksen (2004) conducted a study in the Danish context and argues that urbanization, population density, educational level of citizens, and increase in employment appear to be the most significant explanatory factors for a high level of e-service adoption. Seeing the low adoption of e-services in Danish municipalities, this author also argued that the development may be driven by technology fads rather than citizen demands (Henriksen, 2006). As reported by van Dijk et al. (2007), the maturity of e-service delivery is often measured by the number of services produced. However, there is a gap between supply and demand (see also, Sutan et al. 2013). A search on diffusion and e-service adoption in the Digital Government Reference Library (Scholl, 2020) reveals that remarkably few studies have focused on actual use of services. Solvak et al. (2019) explain that there is a lack of understanding of e-service diffusion in the e-government literature. These authors present results from a large dataset of e-service usage in Estonia. Their study reveals that e-government adoption rate increases linearly over time, and that adoption rates are highest among population groups currently in higher education or active on the labour market. Moreover, they suggest that women use e-services at a higher rate than men in many age groups.

Against this backdrop, the purpose of this paper is to study demographic differences in e-service diffusion. The research is conducted by using data from a Swedish region. The material, which will be further described in the next section, allows the analysis of e-service diffusion using four variables: age, gender, service category, and urban or rural municipality.

2. Materials and Methods

This paper builds on data from an e-Service platform used by seven municipalities (Table 1) in a Swedish region. The data from the e-service platform is openly accessible (see e-Samverkan, 2020) and contains data on e-service usage from seven municipalities between 2018-2020. The e-services can be described as an "archetype" of e-services (Melin and Lindgren, 2017): they are mediating e-services, in which the user indirectly interacts with a case handler. Many of the e-services were created in a collaboration project between the municipalities, with the goal to "generate 100 e-services". At the time of the study, the database included 25,177 cases where users identified themselves with an eID. From this dataset four variables were studied: gender, age, urban or rural area, and category of service (services are thematically divided into building and environment [BaE]; care and health [CaH]; culture and recreation [CaR]; childcare and education [CoE]; enterprise and work [EaW]; municipality and politics [MaP]; and traffic and infrastructure [TaI]; see Table 2). It should be noted that the categories are not always distinct. For example, traffic and infrastructure contains both services related to vehicle use and a service allowing parents to apply for replacement

bus cards for their children's commute between home and school. Another limitation is that the municipalities display slight variations on how they categorize their individual e-services.

Table 1: Studied Municipalities

Municipality	Population	Class (SKR, 2020)
A	99376	Larger city
B	56060	Smaller city
C	25184	Smaller city
D	19275	Rural area
E	18364	Rural area
F	17996	Commute area near larger city (A)
G	9329	Rural area
All	245 584	

Table 2: Service Categories

Service (% of errands)	Variable	Description
Building and environment (11.5%)	BaE	Building permits and similar e-services.
Care and health (6.3%)	CaH	E-services aimed at people with disabilities, trustees etc.
Childcare and education (38.4%)	CaE	E-services aimed at parents with children in kindergarten and school.
Culture and recreation (1.3%)	CaR	Summer camps, union aid, season cards for ski tracks etc.
Enterprise and work (5%)	EaW	E-services aimed at businesses and citizens looking for work.

Municipality and politics (4.4%)	MaP	E-democracy.
Traffic and infrastructure (30.1%)	TaI	Permits for a variety of vehicle operations, replacement bus cards for school pupils.

3. Results

As revealed in Table 3, women use e-services more than men in all municipalities (men constitute 36% of users, women, 64%). The pattern of use is fairly stable over the years studied: 64.5% of users were women in 2018, 64% in 2019, and 62% in early 2020 (although 2020 only includes 2088 cases at the time of writing). Municipality A displays a more equal use of e-services than the other municipalities (men: 43.1%, women 56.9%) This municipality is the largest (population: 99 376) and includes the largest city (population: 58 248) in the region.

Table 3: Male and Female Users

Municipality (n of errands)	Men (%)	Women (%)
A (5376)	2318 (43.1%)	3058 (56.9%)
B (7377)	2421 (32.8%)	4956 (67.2%)
C (4995)	1845 (36.9%)	3150 (63.1%)
D (1316)	442 (33.6%)	874 (66.4%)
E (2999)	1047 (34.9%)	1952 (65.1%)
F (2141)	652 (30.5%)	1489 (69.5%)
G (973)	328 (33.7%)	645 (66.3%)
Total 25177	9053 (36%)	16124 (64%)

Figures 1 and 2 illustrate that women use e-services more than men until the age of 50, when the graphs even out. As seen in figures 3 and 4, municipality A follows a similar pattern, but with a smaller gap between men and women. The data for the Under 18 and 70+ age groups should be

interpreted with caution since these groups contain few cases. One service category, building and environment, deviates from the pattern. As shown in figures 5 and 6, men use these e-services more than women in all age groups. This is the only service category that displays this pattern. Most other services reflect a similar pattern to the overall results. For childcare and education e-services (figures 7 and 8) there is a gap between male and female users that closes with age, with slightly more male than female users among those over 60 years old.

As shown in Figure 9, the overall use of e-services peaks at age 40-40, then declines in the older population. It should be noticed that large volumes of services target parents (as displayed in the previous section, Table 3), who are usually of working age. However, two municipalities in Figure 10 deviate from the pattern: the e-service usage in municipalities E and G peaks at age 18-29 and then declines. These municipalities are both rural, but so is municipality F, which peaks at age 40-49, just like the larger municipalities. Hence, whether this phenomenon is more common in rural municipalities should be subject to further research.

Figure 1: Numbers of Users, All e-Services

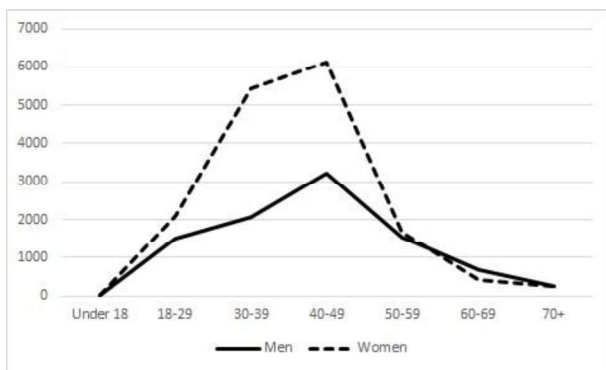


Figure 2: % of Users, All e-Services

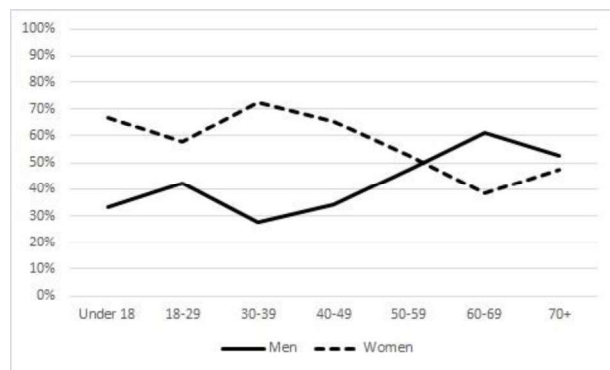


Figure 3: Number of Users, Municipality A

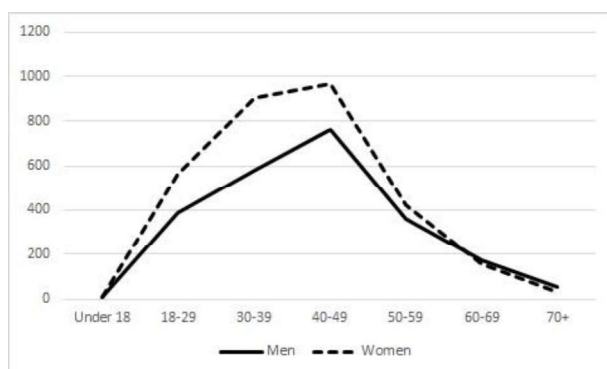


Figure 4: % of Users, Municipality A

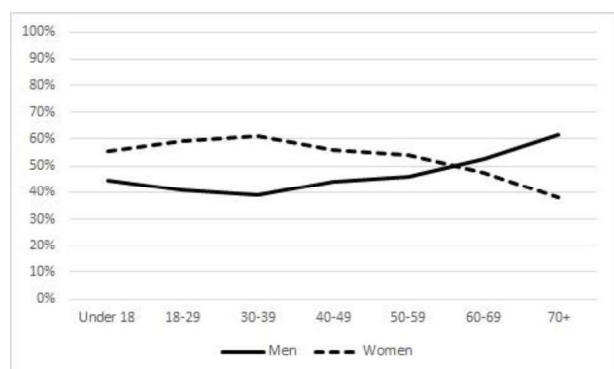


Figure 5: Number of Users, BaE e-Services

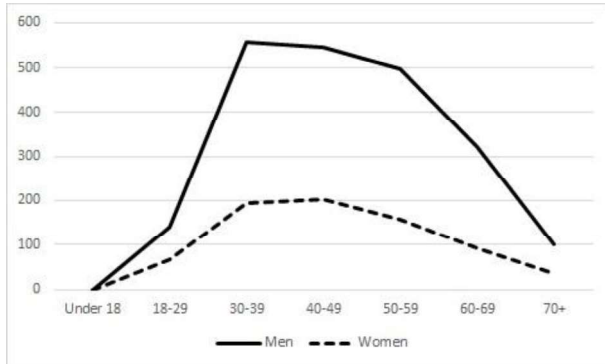


Figure 6: % of Users, BaE e-Services

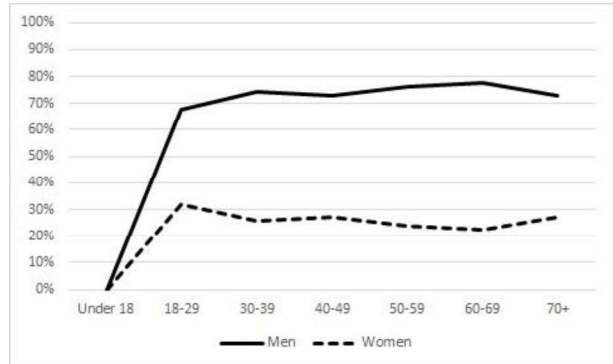


Figure 7: Number of Users, CaE e-Services

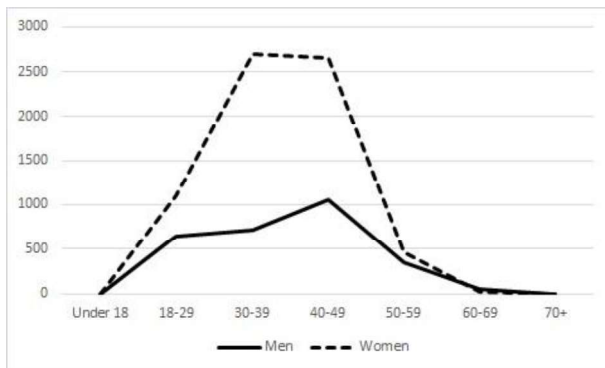


Figure 8: % of Users, CaE e-Services Services

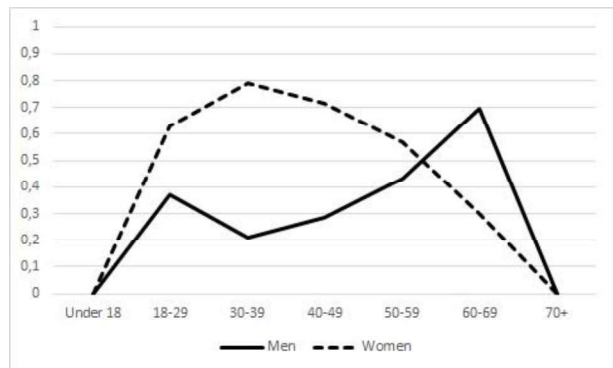


Figure 9: Age Distribution, All Services

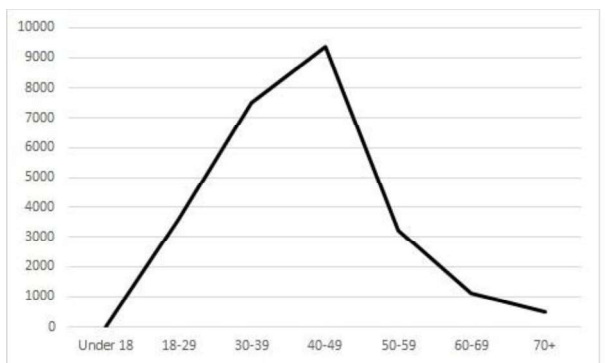
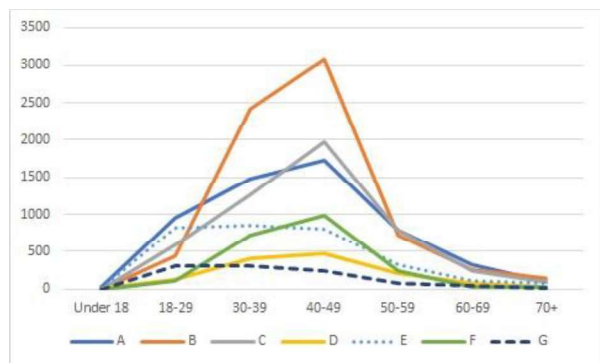


Figure 10: Age Distribution, Municipalities



As shown in Table 4, the most used e-services for people aged 18-49 belong to the childcare and education category. At age 50-59, the results shift. The e-services most used by men over 50 belong to the building and environment category. Women aged 50-59 use the traffic and infrastructure category most, and after age 60, they use e-services in the care and health category most (in the care and health category, women in all age groups use e-services more than men).

Table 4: Most Used Services

Age group	All	Men	Women
18-29	CaE (1739)	CaE (643)	CaE (1096)
30-39	CaE (3407)	CaE (710)	CaE (2697)
40-49	CaE (3718)	CaE (1057)	CaE (2661)
50-59	TaI (894)	BaE (497)	TaI (477)
60-69	BaE (413)	BaE (321)	CaH (165)
70+	CaH (204)	BaE (100)	CaH (144)

4. Concluding Remarks

This study contributes to current research on e-government and e-service diffusion through the following findings:

- Gender. The study confirms recent results that women use e-services more than men. However, this varies based on the category of the service: men use services related to building and environment more than women, and it appears that women use services related to family, such as school, education, bus cards, health care, more than men.
- Age. The use of e-services peaks among the population in working age, and the pattern between men and women in different ages varies. It needs to be taken in account that many e-services are aimed towards people with children in schools, and thus are not relevant for the older population.
- Rural/City. The data showed that e-service diffusion might be more evenly distributed between men and women in cities than in rural areas.
- Category of service. As mentioned above, e-service diffusion is different among men and women. One interpretation of this data is that e-service diffusion reflects traditional gender roles: Men build, women take care of the family.

These results are important given the narrative of digitalization and e-government as disruptive and transformative processes. The use of technology may change some aspects of our societies, while other aspects are reinforced.

4.1. Limitations and Future Research

The current study was limited to a region in central Sweden. As such, generalizations should be made with caution. However, the results are useful for making comparisons with e-service diffusion in other contexts as well. The difference between city and rural areas is one area for further

investigation. The material in this paper did not allow for a deepened analysis of development over time, but more longitudinal studies would constitute a welcome contribution to the e-government research field.

References

- Ajibade, P. (2018). Technology acceptance model limitations and criticisms: Exploring the practical applications and use in technology-related studies, mixed-method, and qualitative researches. *Library Philosophy & Practice*.
- Arduini, D., Zanfei, A (2014). An overview of scholarly research on public e-services? a meta-analysis of the literature. *Telecommunications Policy* 38(5), 476 - 495.
- van Dijk, J., Pieterse, W., Van Deuren, A., Ebbers, W (2007). E-Services for Citizens: The Dutch Usage Case. eSamverkan (2020). <https://esamverkan.nu/anvandningsstatistik-e-tjanster/> (last accessed June 2020)
- Fricker, R. D., & Schonlau, M. (2002). Advantages and Disadvantages of Internet Research Surveys: Evidence from the Literature. *Field Methods*, 14(4), 347-367. <https://doi.org/10.1177/152582202237725>
- Henriksen, H.Z (2004). The Diffusion of e-Services in Danish Municipalities. *International Conference on Electronic Government*. Springer.
- Henriksen, H.Z (2006) Fad or Investment in the Future: An Analysis of the Demand of e-Services in Danish Municipalities. *Electronic Journal of e-Government* 4(1), 19-26.
- Jansen, A., Ølnes, S (2016). The nature of public e-services and their quality dimensions. *Government Information Quarterly* 33(4), 647-657.
- Jansson, G (2012). Putting "Public" Back Into Public E-services: A Conceptual Discussion.
- Lindgren, I., Jansson, G (2013). Electronic services in the public sector: A conceptual framework. *Government Information Quarterly* 30(2), 163-172.
- Lindgren, I., Melin, U (2017). Time to refuel the conceptual discussion on public eservices-revisiting how eservices are manifested in practice. In: *International Conference on Electronic Government*. pp. 92-101. Springer.
- Swedish Association of Local Authorities and Regions, SKR (2020). <https://skr.se/tjanster/kommunerochregioner/faktakommunerochregioner/kommungruppsindelning.2051.html> (last accessed June 2020)
- Scholl, J.H (2020). The Digital Government Reference Library (DGRL). Versions 15.0 – 15.5. Retrieved from <http://faculty.washington.edu/jscholl/dgri/> (last accessed June 2020)
- Slovak, M., Unt, T., Rozgonjuk, D., Vörk, A., Veskimäe, M., Vassil, K (2019). E-governance diffusion: Population level e-service adoption rates and usage patterns. *Telematics and Informatics* 36, 39 - 54
- Sutan Ahmad Nawi, H., Ibrahim, O., Rahman, A.A (2013). Public E-Service Sustainability Failure Factors: An Exploratory Study. *PACIS 2013 Proceedings*.

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