



The Relationship Between Outbound and Inbound Communication in Government-to-Citizen Interaction

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Abstract: While many citizens have adopted digital channels for public service interaction, the use of traditional channels remains high, preventing economic benefits from digitalization. The channel choice (CC) and multi-channel management (MCM) fields of e-government study citizens' choice of channels and the management of service interactions across channels. Research has mostly focused on either the citizen or organizational side and single channel communication. Thus, the relationship between public authorities' outbound communication (letters), and citizens' inbound communication (telephone calls and website visits) is understudied. Therefore, we present a longitudinal quantitative study, which analyzes channel traffic data from two service areas, pensions, and parental leave, across three channels (letters, telephone calls, website visits). We apply interactivity theory and the concept of multiplexity to guide our analysis. We seek to offer contributions to the CC and MCM literature by demonstrating a relationship between outbound and inbound communication and the multiplex nature of government-citizen interaction.

Keywords: Channel choice, mixed methods, multi-channel management, multiplexity

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1. Introduction

Government organizations have spent considerable efforts on migrating citizens from traditional interaction channels such as counter visits, physical letters, and telephone calls towards digital self-service channels, especially websites (Madsen & Hofmann, 2019; Pieterseon & Ebbes, 2020). Several Northern European countries, such as Denmark and The Netherlands, have high adoption rates for digital channels (Eurostat, 2019). However, the use of traditional channels remains high among

adopters and non-adopters of digital channels alike (Pieterse & Ebbers, 2020; Rey-Moreno & Medina-Molina, 2016). This traditional interaction form is expensive because it requires the involvement of caseworkers. From public organizations' point-of-view, the continued use of traditional channels in public service encounters is problematic because it prevents organizations from reaping the full economic benefits from digital self-services (Ebbers, Pieterse, & Noordman, 2008). From citizens' point-of-view, this is problematic because it indicates that the current self-service applications are incapable of solving all of their needs and problems (Madsen, Hofmann, & Pieterse, 2019).

Within the e-government field, two related research streams focus on this phenomenon. Channel choice (CC) research studies citizens' choice of channels in public service encounters (Madsen & Kræmmergaard, 2015a; Pieterse, 2009). Multi-channel management (MCM) research studies how public organizations can manage interactions with citizens across multiple channels (Ebbers et al., 2008; Madsen & Hofmann, 2019). Most CC and MCM research regard this interaction as discrete event occurring on a single channel, rather than studying the entire service encounter holistically as it occurs across multiple channels (Madsen et al., 2019). Moreover, existing work tends to focus on inbound contacts only. Few studies have analyzed the relationship between outbound and inbound channel traffic, i.e., how public organizations' communication *to* citizens influences communication *from* citizens (Madsen & Hofmann, 2019; Teerling & Pieterse, 2010).

Therefore, this paper presents an ongoing longitudinal quantitative study which seeks to establish and explain the relationship between public authorities' outbound traffic and the subsequent inbound communication from citizens. We present and analyze channel traffic data from a six-year period covering two public service areas (pensions and parental leave) and across three communication channels (letters, telephone calls, website visits). Following previous CC and MCM studies (Ebbers et al., 2008; Madsen et al., 2019), we will apply the related concepts of multiplexity and intermediality to guide our analysis (Bordewijk & van Kaam, 2002; Haythornthwaite, 2005). Next, we briefly describe the background of our study, followed by related CC and MCM research and the gaps herein we seek to address. Then, we present our study's research aim and method. Finally, we present preliminary and expected results from the study.

2. Background: Mandatory Self-Service Channels and Udbetaling Danmark

In 2015, digital self-service became mandatory for a number of public services in Denmark (The Danish Government, 2011). For these service areas, citizens are required to use digital channels and self-service applications to find information and apply for the services. Citizens who are incapable of using the digital channels can request to be made exempt from them. All citizens can contact public authorities in person, by telephone or in writing for help.

The study presented here revolves around two public services in Denmark, a lifelong pension scheme (Pension) and a parental leave scheme (Parental). These services are administered by the pension's fund ATP, and the public authority Udbetaling Danmark (UDK), respectively. ATP also administers UDK and the two organizations were partly co-located at the time of the study.

Information and self-service applications for both services are located at the national web-portal borger.dk. **The Pension scheme** was established in 1965 as a supplement to the Danish state pension. Most Danish citizens contribute to this scheme by paying a percentage of their income, such as wages or unemployment benefits. The pension is paid out at retirement age, either as a lump sum or as monthly payments. Once yearly, ATP sends out an annual letter to inform pensioners about the coming year's payments. From 2012 to 2019, the number of pensioners in Denmark grew from approximately 950,000 to 1.1 million (Statistics Denmark, 2019). **The Parental leave scheme** consists of four underlying leave schemes (pregnancy leave, maternity leave, paternity leave, and parental leave). The availability and duration of these different leave types depend on the parents' collective agreements. The economic benefits provided by these schemes often constitute a person's sole source of income while on leave. There are approximately 100,000 parental leave cases annually, including parents and their employers.

3. Channel Choice and Multi-channel Management Research

Channel choice (CC) is "an individual's specific decision to use a medium in a particular communication incident" (Trevino, Webster, & Stein, 2000, p. 163). CC studies in e-government literature seek to explain citizens' CC for interacting with government organizations (Madsen & Kræmmegaard, 2015a; Pieterse, 2009). These studies have identified factors that affect this choice and measured their influence. Recent studies from Northern Europe show that online channels are now the most used channels there, while people still turn to traditional channels when problems arise (Madsen & Kræmmegaard, 2018; Pieterse & Ebbers, 2020). Most research has simplified CC as a single binary choice between several channels for a service interaction. Few studies acknowledge that most CC is of multiplex nature (cf. e.g. (Haythornthwaite, 2005; Madsen et al., 2019)). Channel multiplexity describes the sequential or parallel use of several channels in one service interaction (Madsen et al., 2019). Channel multiplexity occurs when citizens encounter problems that they cannot solve with one channel. For instance, a citizen may search for information online and then call a government organization (sequential interaction) for help, or they may be logged into a self-service application while calling (parallel interaction).

Multi-channel management (MCM) concerns how government organizations can improve the public service encounter, integrate channels, and migrate citizens across channels (Pieterse, 2010). Multi-channel strategy refers to public organizations' "selection, rationalization and integration of service delivery channels." (Kernaghan, 2013, p. 124). Ebbers, Pieterse and Noordman (2008) developed a multi-channel strategy for public organizations in response to the discrepancy between the channels that the public sector wants citizens to use and the actual channels citizens prefer. According to this strategy, government organizations should guide citizens to the most efficient channels for a given problem or task based on task complexity (the number of steps involved) and ambiguity (possible and conflicting interpretations). Simple tasks low in ambiguity should be handled online, while complicated tasks high in ambiguity should be dealt with on the phone or in-person (Ebbers et al., 2008). The strategy combines elements from media richness theory (Daft & Lengel, 1986) and interactivity theory (Bordewijk & van Kaam, 2002) with empirical knowledge on channel traffic and service modes. It distinguishes between *channel types*, which describe what

channels citizens and public organizations interact through, and *channel modes*, which refer to how and for what purpose the channels are used. The interaction between citizens and the public sector is divided according to who initiates the interaction (citizens or public sector) and whether the interaction is single-sided or two-sided and allows for feedback. Based on these dimensions, four different channel modes are distinguished. (1) Allocution, the push of information towards citizens typically via mass media and (2) registration where citizens send information to public organizations on their request, belong to the government-initiated channel modes. Citizen initiated channel modes are (3) consultation where citizens consult information sources provided by the public sector to retrieve information without, however, enabling a real interaction, and (4) conversation where citizens request information which is then provided by the public sector tailored to the citizens' needs, for example via phone. A fifth channel mode (5) transaction, refers to financial transactions.

In sum, most CC and MCM studies assume that a government-citizen encounter occurs as a single interaction via one channel and initiated by the citizen. A few qualitative studies have, however, shown that citizens may use several channels in one encounter (Madsen et al., 2019; Madsen & Kræmmergaard, 2015b), as well as a relationship between channel modes. However, to the best of our knowledge, no e-government CC or MCM studies have statistically analyzed the relationship between out- and inbound channel traffic between government and citizens or demonstrated how to connect channel modes in larger service encounters (Madsen & Hofmann, 2019; Madsen & Kræmmergaard, 2015a).

3.1. Research Design

The purpose of our research project is to study the relationship between a public organization's outbound channel traffic and the incoming channel traffic from citizens. First, we conduct a quantitative study, which seeks to establish this relationship by analyzing channel traffic. In the future, we seek to understand why this happens, by gaining insight into the reasons citizens provide for their behavior, and discuss the implications for CC and MCM models in e-government research.

We have collected and analysed outbound (letters) and inbound (website visits and telephone calls) channel traffic data. We collected data from two services; the Parental Leave (Paternal) scheme (four years of data) and Pensions (six years). Data were aggregated on a weekly level. This allowed us to assess a) how outbound communication impacts inbound communication and b) whether inbound communication via one channel (e.g. web) affects the other (e.g. phone). In addition to measuring the direct effect (e.g. an outbound letter leading to inbound traffic that same week), we calculated the effects with a 1-3 week delay as well (e.g. does an outbound letter translate to inbound traffic after two or three weeks?). Previous studies have indicated such a lag (Ebbers & van de Wijngaert, 2020; Madsen & Kræmmergaard, 2018). For this we used the 'lag' function in R to shift the base (outgoing letters) of our time series. Thus, we looked at a number of different models for the individual services (Pension & Paternal) as well as the total.:

- The effect of outbound letters on inbound website traffic, directly or lagged (1-3 weeks).
- Effect of outbound communication on inbound phone calls, directly or lagged
- Effect of inbound web traffic on inbound phone calls, directly or lagged.

There were no missing data fields in the data set: for the years and variables mentioned above, all inbound and outbound communication was recorded. We used R to calculate the sample characteristics (**Error! Reference source not found.**) and the linear regression models discussed below.

3.1.1. Quantitative Sample

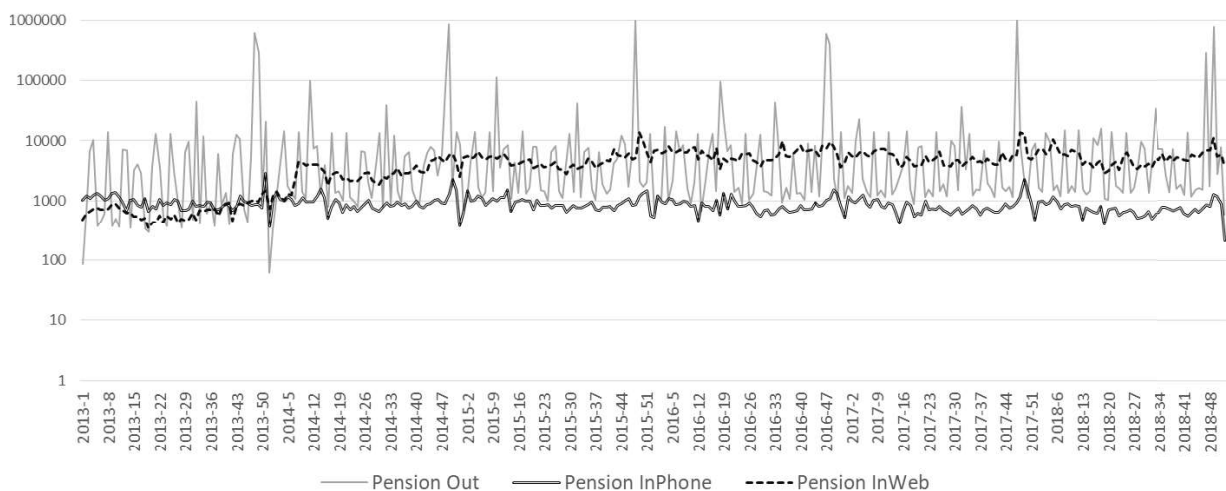
During the sample period, around 12 million letters were sent out, and almost 6 million inbound contacts were recorded. Of these inbound contacts, 67.20% came via the website and 32.80% via the telephone. **Error! Reference source not found.**, below, presents the key statistics for both services and the total.

Table 1: Sample Characteristics

	Parental			Pension			Total		
	Outbound	Inbound Web	Inbound Phone	Outbound	Inbound Web	Inbound Phone	Outbound	Inbound Web	Inbound Phone
Total contacts	4,333,226	2,640,350	1,665,773	7,841,484	1,334,414	274,514	12,174,710	3,974,764	1,940,287
Mean	20,733.14	10,116.28	6,382.27	25,025.66	4,263.30	877.04	38,896.84	12,698.93	6,199.00
Median	17,503	9,864	6,343	1,873	4,456	835	16,510	12,037	6,949
SD	11,466.95	3,754.19	1,491.84	118,126.02	2,346.56	272.64	119,054.03	5,992.42	2,844.68

The statistics vary strongly for both services. Whereas roughly 4 million outgoing letters translate in an equal number of inbound customer contacts for the Parental leave scheme, twice the outgoing letters for Pension yield roughly 1.6 million incoming contacts. Similarly, the standard deviation of outbound letters for Pension is much higher than that of Parental, suggesting a much higher seasonal fluctuation of this service. The figure below (**Error! Reference source not found.1**) shows the weekly fluctuation in the number of contacts for the Pension service (on a logarithmic scale with base 10). This highlights the annual peak in outgoing letters. The figure also shows smaller peaks in inbound contacts but does not immediately make clear whether that is caused by the outbound contacts.

Figure 1: Outbound and inbound Contacts 2013-2018 for Pension



3.2. Preliminary Results

Next, we briefly present preliminary results. We first discuss the model parameters (Table 2), followed by the model estimates (Table 3).

Table 2: Model Parameters

	Parental			Pension			Total		
Dependent	Inbound Web	Inbound Phone	In phone (web)	Inbound Web	Inbound Phone	In phone (web)	Inbound Web	Inbound Phone	In phone (web)
Std Error	1031	790.7	924.2	982.6	182.7	184.8	1830	1012	996.4
Df	145	145	197	247	247	248	247	247	248
Adj. R2	0.8751	0.6971	0.6074	0.8221	0.5517	0.5414	0.9075	0.8736	0.8776
F	24.95	8.866	7.628	24.03	7.133	6.98	49.87	35.45	37.31
p	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000	<.000

The model parameters show each of the models to be significant at $p < .000$. However, they vary in the (adjusted) variance (R2) they explain. Furthermore, the models tend to explain Inbound Web traffic better than Inbound Phone traffic and the impact of Inbound Web on Inbound Phone traffic. Nevertheless, all models produced significant results, and were used to calculate model estimates.

Table 3: Model Estimates

Model estimates (β s)									
	Parental			Pension			Total		
Dependent	Inbound Web	Inbound Phone	In phone (web)†	Inbound Web	Inbound Phone	In phone (web)†	Inbound Web	Inbound Phone	In phone (web)†
(intercept)	4156***	2429***	3200***	-379.6	1056***	1054***	4711***	4687***	5024***
Total Out	0.0153	-0.0045	-	-0.0001	0.0001	-	-0.0001	0.0007	-
In Web	-	0.4270***	0.2832***	-	0.0481***	0.0500***	-	0.2383***	0.2745***
In Phone	0.7254**	-	-	1.391	-	-	0.7787***	-	-
T -1	0.0192	-0.0239*	-0.1276*	0.0036***	0.0002	0.0211	0.0039**	0.00053	-0.0756*
T -2	0.0239	-0.0349**	-0.0663	0.0032***	0.0004**	-0.0278*	0.0041**	0.00018	-0.0350
T -3	0.0215	-0.0213*	-0.1013	0.0000	0.0005***	-0.015	0.0011	0.00096	0.0067
2014	-3103***	1317***	1064***	2334***	-127.8***	-85.34	-285.2	-340.0	-365.1
2015	1765***	-1036***	-280.2	4263***	-247.1***	-169.36*	6723***	-2530***	-2106
2016	2910***	-760.3	352.9	5526***	-377.9***	-274.45**	9318***	-2551***	-1885
2017	-	-	-662.3	4877***	-367.4***	-280.58**	11560***	-3013***	-2283
2018	-	-	-	4909***	-463.5***	-376.52***	1864*	-6101***	-6355
† model without mail as a predictor and Inbound Web traffic as the main independent.									
*sign at $p=0.05$, ** sign at $p=0.01$, *** sign at $p=0.001$									

The first of these estimates is the predictive value of outbound communication on any of the dependent variables, and in none of the models, we find significant estimates. This means that overall, the total outbound communication does not appear to impact inbound communication directly. However, when looking at the year (and week) level, we find that the coefficients increase in size and significance for most periods. This suggests that the impact of outbound on inbound

communication is short term. We also find an influence of one inbound channel on the other channel. This suggests that cross-channel traffic always happens, regardless of service or period of outgoing communication. Second, we look at the effects of the delays, and here we do find significant, yet inconsistent, results. The results in the table suggest, on a global level, that outgoing communication causes incoming web traffic (after a delay) and that an increase in (inbound) web traffic translates in a decrease in (inbound) phone (also after a delay). However, this varies per service and calls for a deeper analysis to help understand what triggers this.

3.3. Future Studies

We are currently planning to expand the study presented here with a qualitative in-depth component to explain why citizens contact public authorities. This will be an *explanatory sequential mixed method study* (Creswell, 2014). The quantitative analysis presented here constitutes the first phase of the study. In the second phase, we will analyze the results from 100 observations and in-situ interviews (50 from pensions and 50 from parental leave) conducted in call centers in 2017. The analysis of channel traffic was used to guide the timing of and inform the data collection for the second phase. We collected data during peak call periods: Shortly after the submission of the annual pension letter and during a week where UDK paid out parental leave benefits. Hereby we seek to gain insight into the reasons citizens provide for calling, and the relationship between channel modes. Finally, we plan to use the results from this study to develop an new omni-channel strategy, which covers both outbound and inbound channel traffic and update the previous MCM strategy by Ebbers, Pieterse and Noordman (2008).

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