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Administrative Units of Representation in Asset-Based Digital Consultations

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Abstract

Municipal participation systems can reuse a service register to assign submissions to persistent locations. We examine the consequences of publishing one preference per registered facility. In eight workshop districts, 192 participants chose an evening use for a library room and identified the litter bin nearest the usual start of their trip. Counting choices once per resident and once per bin yields opposite majorities in four districts. Replacing a single housing record by service records for three liners reverses the original facility majority in 16 of 40 possible replays, with every receipt and physical location held fixed. A resident can verify that the system recorded their preference accurately under each rule. Establishing what standing the preference had requires the version of the asset register used to produce the return.

Keywords: digital participation, administrative data, municipal asset registers, representation

1 Who appears in the return?

A municipal service desk may publish its workload as one open case per item of street furniture. A second report about the same litter bin updates an existing case. This is a reasonable way to keep two crews from being sent to empty one bin. A participation officer using the same export to summarize consultation responses receives one row per bin, irrespective of how many people filed a response there. Opening the row reveals every submission. Counting the rows gives the street furniture a franchise of its own.

We study this change of unit in a consultation about how to use an evening room in a neighborhood library. The alternatives were a quiet reading period and a period for conversation. Neither service would take place at a litter bin. The bins entered the consultation because they supplied permanent identifiers for points on a neighborhood map. A facility record could be queried at any date, had an owner who could correct it, and already had a printable label. These are substantial advantages for an office with no register of consultation venues. They do not settle how much weight to give a facility when the office counts the returns.

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Our study follows the same individual choices from privately marked slips to an asset register. We reconstructed the exports in a separate environment with consenting workshop participants. No account is required to submit a slip, and the proposed reading periods carried no public funds. We can specify which changes are due to a rule for counting and which depend on speculative responses by people who might discover the rule. Throughout the main comparison everybody’s choice stays fixed. We also examine a register correction entered after submissions close. It can reverse the recorded preference in a district without moving a single person or a single bin.

2 Institutional setting

Infrastructure studies have traced the effects of changing the categories in which an office can recognize work (Bowker and Star, 1999; Star, 1999). Here the category already exists. A litter bin in the register has a durable identity across repainting and an address that remains meaningful if a nearby shop closes. A member of the public can identify it from a printed strip even if the map is out of date. The practical attraction of importing this apparatus into another office merits attention. Treating reuse as a mistake on the part of a careless clerk would overlook the considerable effort needed to construct another list of serviceable places (Scott, 1998; Selvarot, 2021).

The usual geographic objection to counting by place concerns where a boundary falls. A street can have different representation on either side of a line drawn through it (Openshaw, 1984; Mirethe, 2018). In the study reported here each resident chooses the same alternative on the same side of every boundary in both exports. The office changes the key on which it aggregates rows and the rule it applies to those rows. A point with a small number of respondents then has exactly the same standing as a busy point. No assumption about residents deliberately choosing favorable points is needed for a reversal, although such a choice would be possible in a different deployment.

A facility can also divide without any change in population. Waste staff may regard a housing containing three removable liners as one asset while a contractor receives three work orders for it. Both representations can give the right answer to each office’s ordinary question. An office counting preferences has to choose between enfranchising the housing and enfranchising the liners. Administrative records of parent and child facilities handle this distinction inconsistently when a unit is replaced in situ (Ranveldt, 2020; Olivetier, 2017). We make it explicit in Section 6.

The participation literature distinguishes a person’s opportunity to speak from the authority to decide what is done with a submission (Arnstein, 1969; Fung, 2006). We ask a fairly narrow empirical question about the second stage. Could the staff member who issued a participation receipt explain exactly where that choice entered a published district result? A complaint tracker can return the complete text of a resident’s response and still make that question difficult to answer. Receipt verification establishes inclusion in the database. It says little about the subsequent power assigned to the record.

3 Workshop and records

Eight neighborhood associations each supplied a room, a local map and 24 adult participants who used a reading room in the district. Recruitment continued until 24 consented participants had deposited a slip in each room. We made no attempt to sample residents in proportion to household size or library use. A workshop with equal district sizes makes it possible to see the conse-

quences of the counting rule without also deciding how to weight districts. The 192 slips describe these eight finite groups. We report exact results for their reconstruction.

The room contained a map with five numbered litter facilities in familiar public locations. We selected installations whose housing, labels and register entry could be reconciled in a prior walk. A selection sheet folded along its center had two fields. On one face a participant selected the reading period or the conversation period. On the other the participant marked the facility nearest the ordinary starting point of their trip to the library. Participants could inspect an enlarged map with an assistant. They did not supply a home address. The sealed sheet went to an operator who keyed its two fields and returned a receipt bearing a random serial. A facility assignment in this study is thus the participant's report of a nearest place, with any distance ties resolved by the participant. It is identical in every replay.

Five facilities are enough to give an odd district majority on the asset return, provided all five return a choice. We neither assigned a quota per facility nor required an odd number of slips at each one. In fact every facility received at least one sheet and no facility had equal counts for the two alternatives. We specified in advance that a tied facility would return an abstention and that equal district returns would leave the choice open. A repeat with different slips might encounter both situations. Quiet reading appeared first on one half of the printed sheets in every room. People handled sheets individually, although recruitment through an association could produce correlated opinions.

Participants knew we would compare two accounting methods and saw the question about the library before the map. We did not describe the interior register hierarchy or show anybody an interim result. A live map that showed bin positions changing color as slips arrived could alter both attendance and the facility people reported as nearest (Orselin, 2022). The fixed-slip design measures the arithmetic effect of the export alone. Identifying a behavioral effect would require another sample or choices elicited under random assignment of live feedback.

A second operator counted the physical sheets by district and checked them against receipt serials. The operator then opened the assignment face of each sheet and reconstructed a five-row cross-tabulation. The first and second entries agreed on the district totals for the two alternatives. Two facility codes had been transposed within a district at first entry. The receipts identified the affected sheets and the second operator checked both against the printed map. We use the corrected register throughout. The intake retained no contact detail on a receipt, and participants could use their serial during the workshop to inspect or withdraw the recorded choice. The end-of-session tally contains 192 distinct serials.

4 Count rules

Let r_{dj} and c_{dj} be the counts for reading and conversation in district d at housing j. Under one return per resident the district difference is R_d. Under one return per housing it is H_d. Differences have different units. One can compare their signs but should not subtract one raw margin from the other. With $\operatorname{sgn}(0) = 0$ the definitions are given in Eq. (1).

$$R_d = \sum_{j=1}^{5} (r_{dj} - c_{dj}), \qquad H_d = \sum_{j=1}^{5} \operatorname{sgn}(r_{dj} - c_{dj}). \tag{1}$$

The housing return simulates a staff member consulting a dashboard of facility rows. Each row declares its local majority, and an export groups these declarations by district. It does not discard the underlying slips. An auditor can click on any housing and find its local minority recorded in

full, including the receipt numbers. Under Eq. (1) those receipts have no effect on the facility's return unless they change the sign of its difference. Systems that retain a full audit trail are therefore capable of changing the outcome without losing data (Ferielot, 2021; Kosmerek, 2023).

An alternative made available during analysis weights each housing's declared winner by the number of slips at the housing. It gives a busy facility more weight and seems close to a resident return. Its margin W_d appears in Eq. (2). A tie still receives zero, however many people took the trouble to submit equal numbers of preferences at that site.

$$W_d = \sum_{j=1}^{5} (r_{dj} + c_{dj}) \, \operatorname{sgn}(r_{dj} - c_{dj}). \tag{2}$$

For a local winner who leads by a single slip, Eq. (2) converts every local minority slip into one unit of support for the winner. Weighting the underlying fractions by turnout instead recovers the resident return exactly. This distinction is material in digital consultations that publish a priority and a visit count per location while keeping the original distribution behind a staff login (Tarevica, 2024). A public file containing only those two columns cannot in general recover a popular margin.

5 Findings

The resident return prefers quiet reading in five districts. The facility return prefers it in three. The difference between these aggregate counts conceals one reversal in favor of reading and three in favor of conversation. Table 1 gives the complete district-level results. The underlying 40 facility records are in Appendix A. Letter identifiers follow the order of workshop dates and bear no relation to the size of a district's majority.

Table 1: Quiet-reading choices out of 24 residents and five housings per district. Positive margins favor reading. The weighted margin is in reassigned resident votes.

District	Reading slips	Reading housings	Resident margin	Housing margin	Weighted margin
A	15	2	6	-1	4
B	14	2	4	-1	4
C	13	2	2	-1	2
D	9	3	-6	1	-2
E	15	3	6	1	10
F	9	2	-6	-1	-8
G	13	3	2	1	2
H	11	2	-2	-1	-2

The two collection keys disagree in four districts. The rate four in eight is a description of the recruited groups. A significance test using 192 slips as independent opportunities to obtain a district reversal would give a misleading measure of uncertainty. A district has one pair of returns, irrespective of its turnout. Nor do we have evidence to infer a rate for every district that trades in library time. A register with one facility and any positive turnout necessarily agrees with a resident return whenever it has a strict local majority.

Figure 1 gives the two reading shares in percentage units. For district A the 15 people choosing quiet reading are concentrated at the first two housings. In the observed return eight conversation choices are distributed across those three housings and one more is recorded at a housing that returns reading. A staff member presenting three declarations for conversation can therefore also give an accurate accounting of all 15 choices for reading.

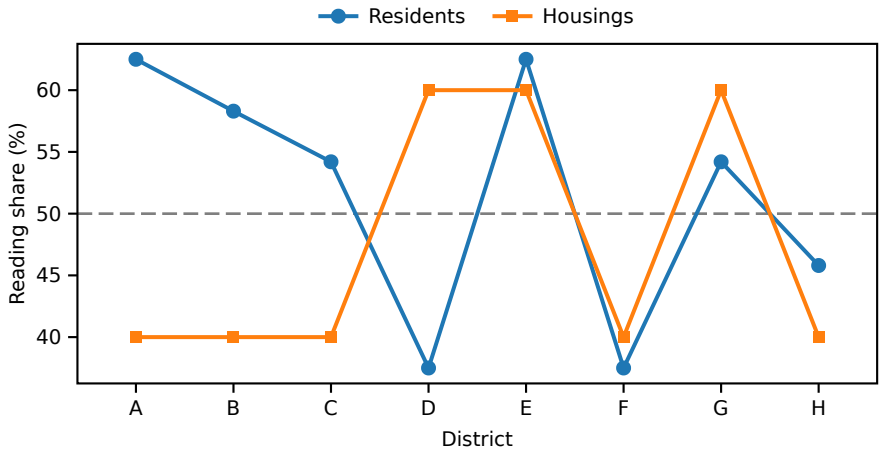


Figure 1: Share choosing quiet reading among residents and among housings, by district. The dashed line marks half.

Turnout weighting recovers the resident winner in all eight districts, including the four reversals. Its margin equals the resident margin in just three districts (C, G and H). District C illustrates the effect. At one housing eight people choose reading and one chooses conversation. The exported declaration for this site is worth one unit in the facility count and nine under turnout weighting. Across the whole district the turnout-weighted margin can be read in Table 1. It is possible for this approximation to return the same winner on these slips and yet tell a materially different story about the margin. In district A, for example, two sites account for all the weight placed on quiet reading by this rule.

Figure 2 displays the integer differences for all five housings per district. Using just their signs reduces the map to two colors. A public-facing map of that form is reasonably informative about the number of places where a proposal prevailed. A reader cannot use the same coloring to infer how many participants supported the proposal. The issue persists at arbitrarily high image resolution because it arises before map drawing (Metorin, 2019).

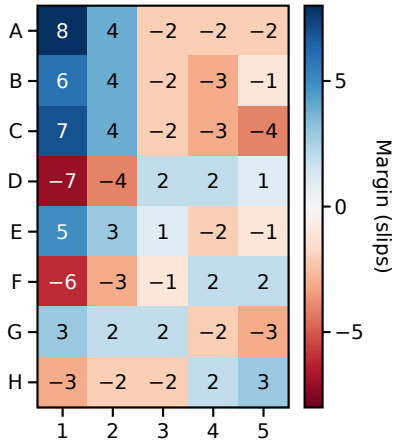


Figure 2: Local resident margins in slips, with positive values indicating support for reading. Column numbers identify housings within districts.

6 Maintenance after close

The service system allows a parent record to be replaced by records for its individually serviceable liners. We ran a retrospective correction on a copy of each district register. The operator selected one housing, kept its location and service history, and changed its accounting unit to a liner. Each liner view inherits the one document containing all the resident submissions attached to its housing. The reporting query emits one declaration per active asset identifier. This amounts to counting the same local majority once for each liner. It does not require copying slips in the intake table. The physical number of people, including those with valid receipts, is constant throughout the exercise.

With three serviceable liners the return margin after correcting housing j is given by Eq. (3). If instead the job merely renames a housing, this correction term is zero. Thus the result depends specifically on treating the new identifiers as additional participants. The service log needs all three identifiers because a crew may replace one liner without replacing the others.

$$H'_{dj} = H_d + 2\,\operatorname{sgn}(r_{dj} - c_{dj}). \tag{3}$$

All eight housing margins in Table 1 have absolute value one. Correcting either of the two housings on the losing side reverses the district majority. Correcting any of the three on the winning side increases its lead. There are 40 single-housing replays and 16 reversals. The 40 replays are an enumeration over administrative choices on one set of returns. They are not 40 observations of independent elections. The district with two losing sites supplies two reversing corrections even when the same service contractor maintains both sites.

The number of service units matters discretely. At two liners a losing housing can force an open result. At three it can return the other service. At four it can widen that lead further. Figure 3 gives the counts across the same 40 choices of housing. There are no open results in the original register. Reclassifying every housing in a district into an equal number of identical liners multiplies its original margin and restores its original preference. Recording the same physical construction on the same day can consequently reverse a district result at lunchtime and restore it by the end of a maintenance shift.

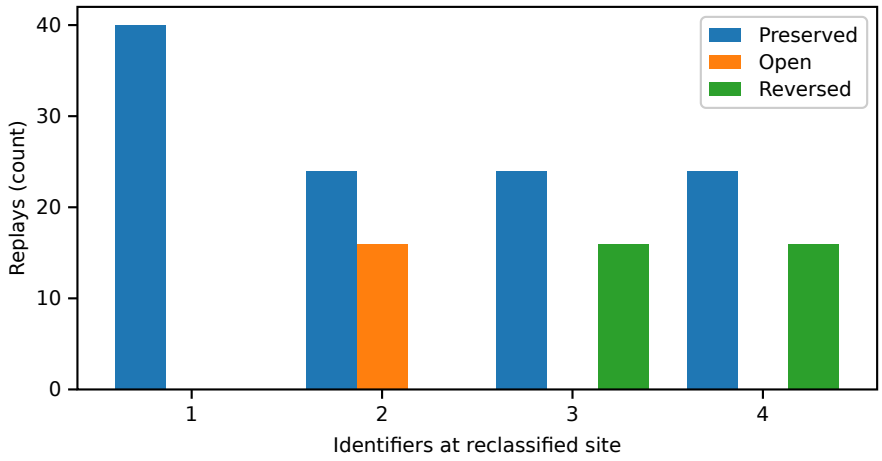


Figure 3: Outcomes after reclassifying one of the 40 housings. Other housings keep one identifier. Each series counts replays relative to their original facility return.

An office can avoid the change by designating the housing as the consultation unit and freezing its identifier list at close. That addresses revision history. It does not resolve the original disagreement between facilities and people. Deduplicating by geographic coordinates alone is also insufficient for a general register. Two separate housings can stand on opposite sides of the same post at the accuracy recorded in the location field. We kept distinct housing identifiers in that case, as the collections office would when sending two crews to two failures (Ivarnell, 2018). Deciding whether the post itself should receive a single vote would create a third electorate.

7 What the receipt certifies

In a closing exercise the facilitator returned the two result sheets to each association. Participants could follow a receipt into its housing record. The trace makes it possible to distinguish a lost slip, an incorrectly keyed choice and a difference arising at aggregation. A person choosing conversation at a reading-majority bin can verify both the recorded choice and the publication of a vote in favor of reading for that bin. Correcting the resident's record would be inappropriate in such a case. There is no data-entry error to correct.

If a participant objects, the available appeal depends on the vocabulary of the reused system (Bowker and Star, 1999; Tallandre, 2016). The service register permits a customer to challenge the location, ownership or service status of a litter housing. A customer can attach evidence that the liner has been removed. The customer cannot use those categories to challenge a local majority while agreeing about the contents of every source document. A second-level review of the export would need to identify the unit of representation and the comparator behind the declared preference. A screenshot certifying that the facility exists and is in service addresses a different question.

Our evidence comes from a replay with a fixed participation history. An association might reasonably prefer distributed geographic support to headcount when choosing service locations (Fenwickell, 2020). The district consultation here offers one room and two uses. Neither use can be installed independently at five sites. Our construction shows the conditions under which the two forms of support differ. The decision about which form of support should govern a room belongs in the stated consultation rule. An office might even wish to give every liner a return. The

participants would need to know that a change in waste collection could then reopen the choice of evening library service.

The board displayed only aggregate records at the closing exercise. Turning a housing into a public constituency can make a tiny local minority identifiable to neighbors who attended together. To reduce disclosure we report lettered districts and independently indexed sites. There is no map from a published cell to a public location. The associations retained the receipt lookup only for the duration of the workshop, under an agreement covering aggregate reuse. Publishing the lookup as evidence of transparency would not have been necessary to reproduce any calculation in this paper (Verduca, 2021; Simaric, 2022).

8 Limits and design consequences

Direct aggregation by person relies here on one receipt per participant, a condition secured by distributing paper at the room entrance. A web consultation may have one account per household or several anonymous submissions per person. For such a consultation the raw document count need not measure the population one intends to represent. A rule should name the intended unit and maintain the correspondence required to audit it. The result about liner subdivisions still holds whenever the same documents are inherited by multiple active asset views.

We use two alternatives. With several projects, a locally leading proposal could have less than half of all local choices. A register might also permit one facility to return several ranked priorities. Both changes would require an explicit aggregation rule for tied or split rankings. We could have expressed the study as a districting problem and searched for a partition more representative of the volunteers. That would remove the historical reason these particular places entered the consultation. No one drew the catchments to administer a library. Their original purpose was to schedule emptying.

On the copy of the register returned to the associations we kept the two exports under separate column names. The district secretary can reproduce a housing return from the last known service state and a resident return from the signed count sheet. There is no corresponding reconstruction if the office saves only the words “district preference” and the name of the winning room use. In that record the information needed to distinguish the inhabitants of a district from its inventory of bins has already been discarded.

A Facility ledger

Table 2 records each facility as a pair of counts in reading, conversation order. The site numbering is internal to a district and remains stable across replays. No physical relation between site 1 in district A and site 1 in district B is implied. The cells are sufficient to reproduce all three margins in the paper. They do not contain the geographic locations used for recruitment. The two corrected site assignments in Section 3 already appear in their final cells.

Table 2: Counts per housing as reading / conversation. Each row contains 24 slips.

District	Site 1	Site 2	Site 3	Site 4	Site 5
A	8 / 0	5 / 1	1 / 3	1 / 3	0 / 2
B	7 / 1	5 / 1	1 / 3	0 / 3	1 / 2
C	8 / 1	4 / 0	1 / 3	0 / 3	0 / 4
D	0 / 7	1 / 5	3 / 1	3 / 1	2 / 1
E	6 / 1	4 / 1	3 / 2	1 / 3	1 / 2
F	0 / 6	1 / 4	2 / 3	3 / 1	3 / 1
G	4 / 1	3 / 1	3 / 1	2 / 4	1 / 4
H	1 / 4	1 / 3	1 / 3	4 / 2	4 / 1

To reproduce the reclassification count, choose a cell and write its local majority on a separate line twice. Leave each of the five existing returns on the original sheet. Count all seven declarations. When the chosen cell belongs to the two-site minority the district now has four declarations on what used to be the losing side. The slip counts in the chosen cell do not enter this calculation a second time. The report is joining declarations to service units after the local sheet has been signed.

B Reconciliation of documents

A receipt in the prototype identifies one submission and one housing at close. An additional relation links that housing to all current service identifiers. We queried the former relation for the resident count. A join through the latter relation before forming local majorities can change the number of *rows* even when the number of distinct receipt identifiers remains exactly 192. A count of distinct receipts after the join would still produce 192, so that reconciliation by itself cannot validate the housing-level sum. An audit should say at which stage distinct identifiers were counted (Adrellis, 2023).

The reverse case is informative too. Suppose a housing is removed after close and its service identifier no longer appears in an inner join to current assets. A query on current service units can then drop all of its residents at once. This is a separate operation from the reclassification experiment, which preserves the parent document and yields at least one service view for every housing. A historical register with valid-from and valid-until dates would permit an office to ask which population of bins, on which particular evening, the consultation result described.

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