Integrating Artificial Intelligence (AI) as Evidence for Public Organization Decision-Making?

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Center for Science, Technology and Environmental Policy Studies
Arizona State University

Study Motivation

- Information Demand for Decision Making and Organization Actions
  - Public organizations process – gather, interpret, and synthesize – information and evidence to reduce the uncertainty and ambiguity of decision-making in a complex context (Daft and Langel, 1986; Jennings Jr and Hall 2012).
- AI Merits in Public Organization Decision Making
  - As an information source: E.g., Generative AI.
  - Improving information processing capacity: adopting machine-learning techniques to analyze large datasets (Vogl et al., 2020; Son et al., 2023)
- Generative AI widely available but challenges Public Organization Decision Making (e.g. misinformation, decision bias)

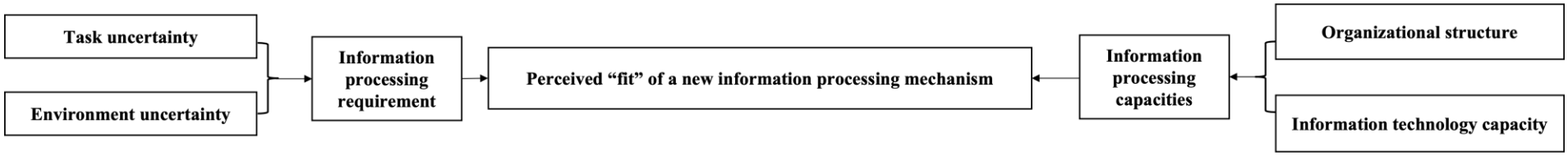
Research Questions

- To what level do diverse public organizations perceive Generative AI as a credible tool for informing decision-making?
- What factors affect organizational perceptions of information credibility of Generative AI?

Theoretical framework

Theory

- Information processing theory (IPT) (Daft and Weick, 1984; Daft and Lengel, 1986)
  - The "fit" of a new information processing mechanism is a function of information requirement as well as existing information processing capacities.



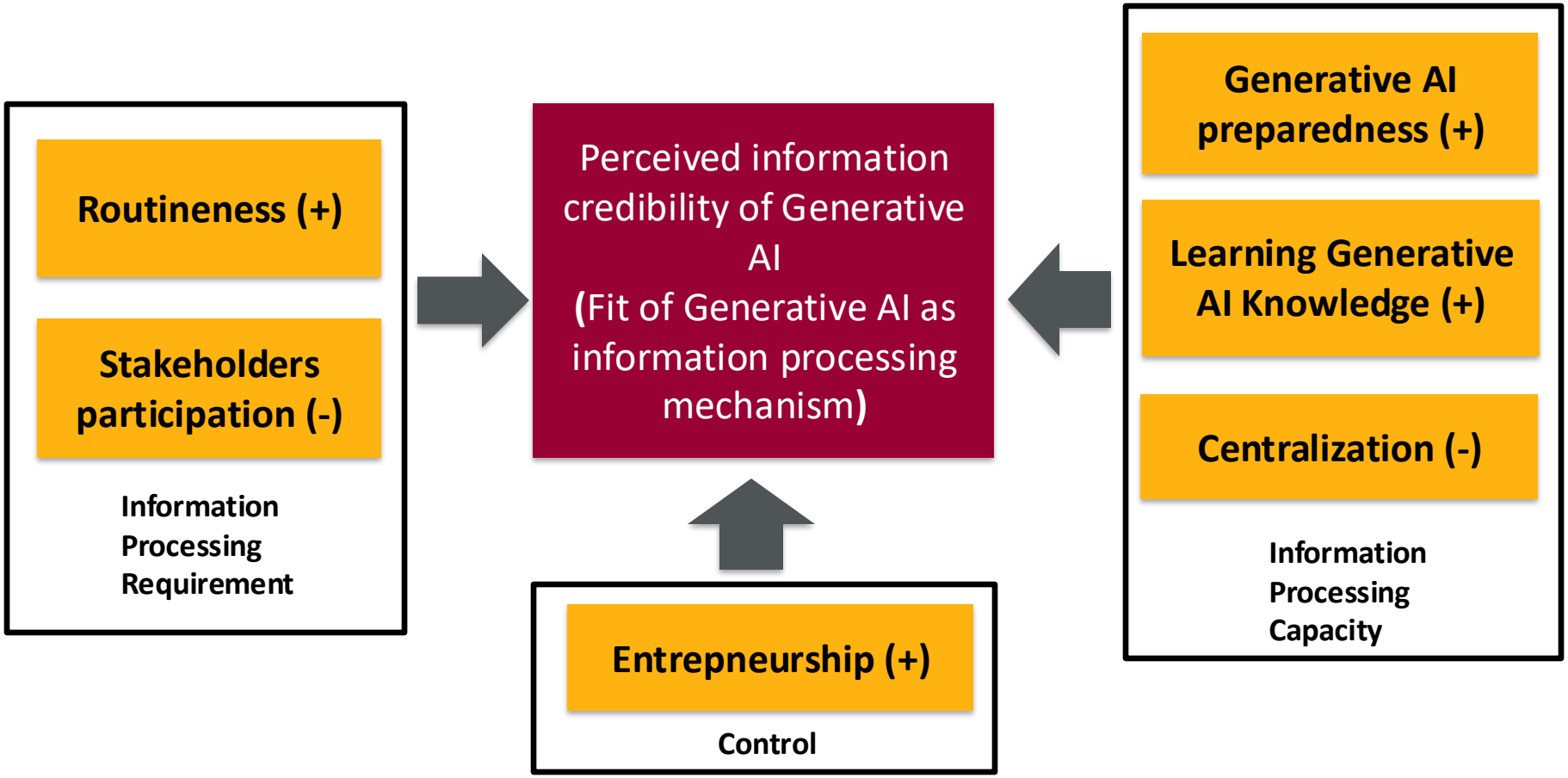
(Adapted from Daft and Weick, 1984)

- Uncertainty is the inability of an organization to predict the disturbances of its works and environment (Barthélemy and Quélin 2006).
- Organizational structure is a type of characteristics that formally organize and coordinate elements and units within organizations, which affect managerial control of organization (Ouchi, 1977).
- Technology capacity is the ability of organization to use the technologies it has in effective ways (Welch and Feeny, 2014).

Empirical Model

- Operationalizing outcome variables: Perceived fit of information process mechanism → Information credibility of Generative AI in decision making
  - Perceived believability of information from Generative AI to inform organizational decision-making, judgements, and actions (Coursey, 1992).
- Operationalizing predictors:
  - Information Processing Requirement
    - Task uncertainty → Routineness (Perrow, 1967)
    - Environment uncertainty → Community stakeholder participation in public organization decision making (Duncan, 1972; Downey, Hellriegel, and Slocum, 1975)
  - Information Processing Capacity
    - Organizational structure → Centralization (Pennings, 1973)
    - Information technology capacity → Generative AI preparedness and learning generative AI knowledge
  - Controls
    - Entrepneurship: risk-seeking orieted and innovative organization for change and adapt (Hartley, Sørensen, and Torfing, 2013; Thompson, 1965)

Empirical Model



Data

Data

2024 National Survey of 650 US Local Governments

- Small Size Cities (population from 25k to 100k): A proportionally representative sample (N= 396)
- Medium Size Cities (population from 100k to 300k): full sample (N= 254)
- Department directors from six common city departments
    - Community and Development, Finance, Parks and Recreation, Police, Public Works, Human Resources
- Pretest survey: N=300 (randomized sampling from the sample frame)
- Formal survey: N=3383
- Complete respondents by June 17 (launched at June 6), 2024:
    - Overall: n= 111, Response Rate= 3.0%
    - Pretest: n= 15, Response Rate= 5%
    - Formal: n= 106, Response Rate= 3.1%

Results

To what level do public organizations perceive AI to be a credible tool for informing decision-making?

Does the use of Generative AI increase or decrease the following for the work your organization does? (N=128)

Frequency (%)	Decreases a lot	Decreases some	Neither increases nor decreases	Increases some	Increases a lot	Don't know
Quality of information used for decision-making	0	5 (3.9%)	32 (25%)	24 (18.8%)	5 (3.9%)	62 (48.4%)
Equity decision outcomes	0	4 (3.1%)	40 (31.2%)	11 (8.6%)	2 (1.6%)	71 (55.5%)
Decision bias	0	3 (2.3%)	38 (29.7%)	11 (8.6%)	2 (1.6%)	74 (57.9%)
Misinformation	1 (0.8%)	3 (2.3%)	28 (21.9%)	22 (17.2%)	5 (3.9%)	69 (53.9%)

- Most respond 'do not know' on how Generative AI affects organization decision-making.
- Most others report that Generative AI neither increases or decreases information quality or decision-making quality.

Logistic Model Results

What factors affect organizational perception of information credibility of Generative AI?

		Overall Information Credibility	Information Quality	Equity Decision Outcomes	Decisions Bias	Misinformation
Information processing requirement	Routineness	-0.086	-0.102	-0.214	-1.302	0.002
	Community stakeholders engagement	-0.187	-0.274	0.044	-1.409	-0.595
Information processing capacity	Organizational preparedness for Generative AI	0.273	0.319	0.147	-0.883	0.296
	Learning knowledge about Generative AI	0.225	0.194	0.614	**2.347***	1.150
	Centralization	-0.288	0.014	-0.134	-0.874	-0.788
Control	Entrepreneurship	0.049	0.243	0.771	1.954	-0.385
n		98	98	98	98	98
McFadden's Pseudo R-squared		0.037	0.046	0.106	0.311	0
Log Likelihood		-55.533	-52.069	-32.561	-9.244	-14.369
AIC		125.066	118.138	79.121	32.488	42.738

Significance levels: * < 0.1; ** < 0.05; * < 0.01**
Coefficient is log-odd

Discussion

Interpretation

- Learning knowledge about Generative AI positively affect how public organizations perceive the fit of using Generative AI as a source of information to reduce bias in decision-making.
- Non-significant results
  - Small sample size and small statistical explanatory power
  - Lack of variation on responses.
- Potential endogeneity between information credibility of Generative AI and organizational actions for this technology.

Furthering IPT

- Learning from others on advanced information technology affects its perceived information credibility.

Practical implication

- Practitioner are lagged behind the burgeoning of Generative AI.

Next steps

- Preliminary and exploratory result of an ongoing survey.
  - Waiting for more data
- Common-source bias check
- Non-respondent analysis check

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Thanks for listening!

Any comments and suggestion are welcome :)

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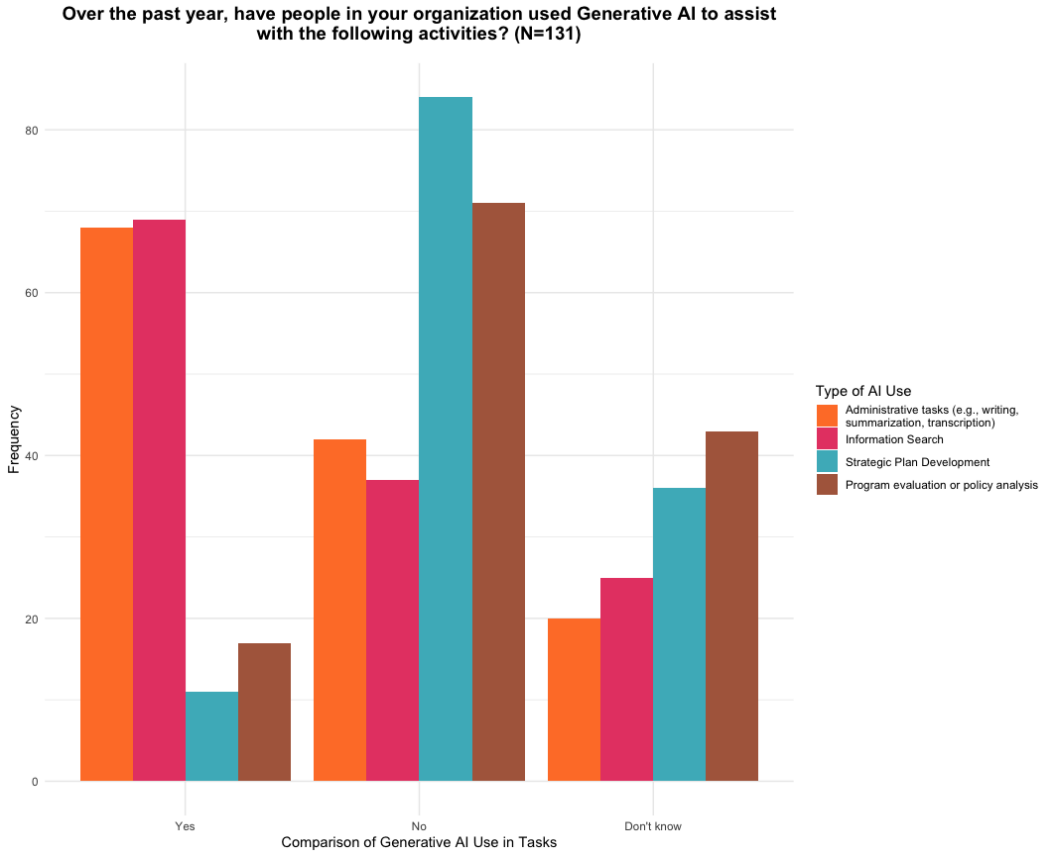
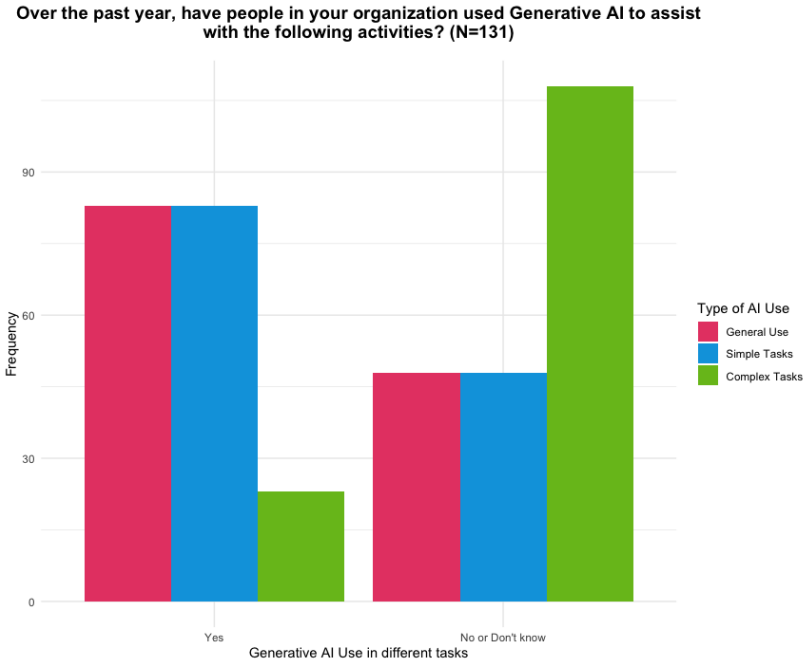
Descriptive results: Generative AI Use



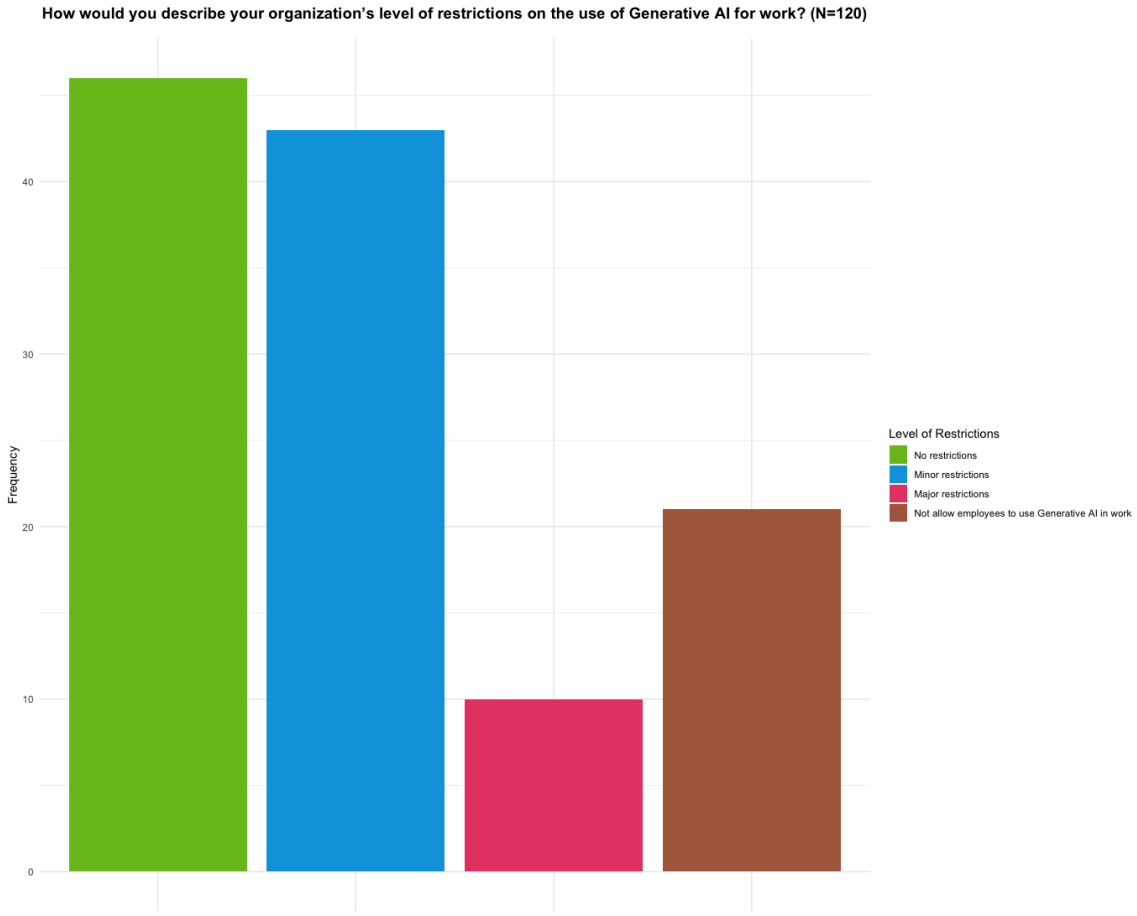


Most public organzations used Generative AI for simple tasks (i.e. administrative tasks and information search).

Only a few public organizations used Generative AI for complex tasks (i.e., strategic plan development and program evaluation or policy analysis)

A notable amount of public managers do no know the use of Generative AI in their organizations.

Descriptive results:
Restriction for Generative AI Use

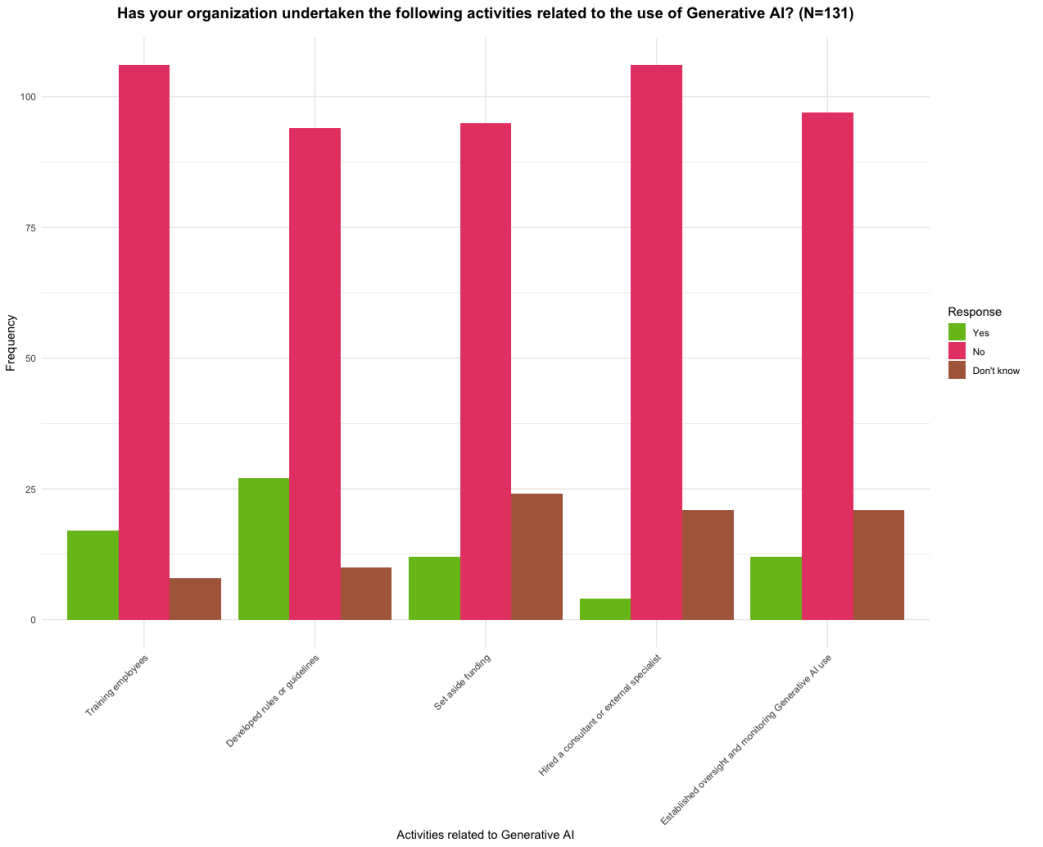


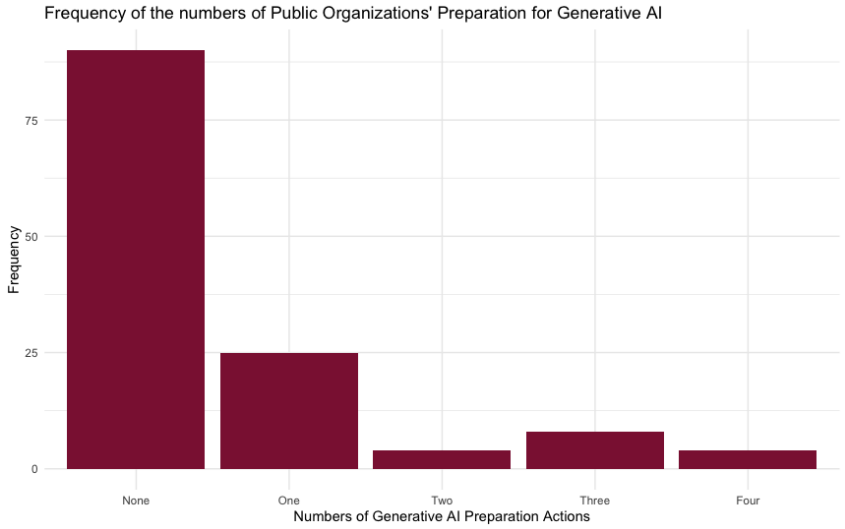
More than 30% public organzations do not have restrictions for Generative AI use in work.

More than 30% public organzations have minor restrictions.

Around 25% public organization have major restriction or do not allow their employees to use Generative AI in work.

Descriptive results:
Preparedness for Generative AI





Most public organzations did not do any things to prepare for Generative AI.
A small amount of organizations did one things (e.g., training employees or developing protocol.)
A few organizations did multiple things to prepare.

Outcome Variable: Information Credibility of Generative AI in Decision-Making (Binary variable)

Survey question: Does the use of Generative AI increase or decrease the following for the work your organization does?
(1=Decreases a lot, 2=Decreases some, 3=Neither increases nor decreases, 4=Increases some, 5=Increases a lot)

Quality of information used for decision-making (A binary variable with 1 = "Increase some" or "Increase a lot", 0 = other responses)

Equity decision outcomes (A binary variable with 1 = "Increases some" or "Increases a lot, 0 = other responses)

Misinformation (A binary variable with 1 = "Decreases some" or "Decreases a lot", 0 = other responses)

Decision bias (A binary variable with 1 = "Decreases some" or "Decreases a lot", 0 = other responses)

- **Overall Information credibility for decision-making**. An binary variable with 1 indicating respondents report "Increase some" or "Increase a lot index" in one of the four items.

Outcome Variable: Information Credibility of Generative AI in Decision-Making

Survey question: Does the use of Generative AI increase or decrease the following for the work your organization does? (1=Decrease a lot, 2=Decrease some, 3=Neither increases nor decreases, 4=Increase some, 5=Increase a lot)

Quality of information used for decision-making
Equity decision outcomes
Misinformation (reversed coding)
Decision bias (reversed coding)

- **Information credibility for decision-making correctness**. An index indicating the perceived level of Generative AI in increasing the correctness decision-making by calculating the mean for the answers to these survey items "Quality of information" and "Equity decision outcomes" (Cronbach's Alpha = 0.70)

- **Information credibility for decision-making error**. An index indicating the perceived level of Generative AI in decreasing the error in decision-making by calculating the mean for the answers to these survey items "Misinformation" and "Decision bias" (Cronbach's Alpha = 0.56)

- The higher the index is, the greater the information credibility is.

Predictor: Organizational experience of Generative AI

Survey question: Over the past year, have people in your organization used Generative AI to assist with the following activities? (Yes, No, Don't Know)

Administrative tasks (e.g., writing, summarization, transcription)

Information searches

Strategic plan development

Program evaluation or policy analysis

- Dummy variable. If public organization used Generative AI for any one of these activities, then code it as 1, otherwise, code it as 0.

Predictor: Organizational preparedness for Generative AI

Survey question: Has your organization undertaken the following activities related to the use of Generative AI? (Yes, No, Don't Know)

Offered training to employees on AI use

Developed rules or guidelines for AI use

Set aside funding for AI planning and integration

Hired an AI consultant or external specialist

Established oversight and monitoring of AI use by employees

- Continuous variable. A index of summing the numbers of Generative AI-related activities.
- The higher the index is, the greater preparedness for Generative AI.

Predictors

Survey question: In your opinion, to what extent do the following factors limit your organization's effective use of Generative AI? (Not at all - To a very great extent)

Insufficient financial resources
Lack of clear standard operating procedures or policies guiding Generative AI use
Lack of information on how to use Generative AI
Actions are taken without adequate knowledge about Generative AI
Insufficient financial resources
Lack of IT personnel
Lack of access to external expertise
Risks of using Generative AI

- **Organizational Uncertainty about Generative AI:** Continuous variable. A index of calculating mean of responses to three items: Lack of clear standard operating procedures or policies guiding Generative AI use, Lack of information on how to use Generative AI, and Risks of using Generative AI (Cronbach's Alpha = 0.85). The higher the index, the greater uncertainty the organization has on limiting their Generative AI use.
- **Resource Vulnerability to Generative AI:** Continuous variable. A index of calculating mean of responses to three items: Insufficient financial resources, Lack of IT personnel, Lack of access to external expertise. (Cronbach's Alpha = 0.83). The higher the index, the greater vulnerable the organization is on their Generative AI use because of lacking of resources.
- **Knowledge Vulnerability to Generative AI:** Continuous variable. Using the exact response from item: Actions are taken without adequate knowledge about Generative AI.

Predictor: Organizational ambiguity for Generative AI

Survey question: How accurately do the following statements describe your organization's approach to using Generative AI? (Not accurate at all – Very accurate)

Generative AI is such a complex and challenging technology, it is hard to know what needs to be done to use it effectively.

Depending on who you ask in this organization, there are different and even conflicting perspectives on how to effectively use Generative AI at work.

Employees in this organization are clear about what Generative AI is and what to do about it (Reversed coding).

- Continuous variable. A index of calculating the mean of responses for all these items. (Cronbach's Alpha = 0.57)
- The higher the index is, the greater organizational ambiguity for Generative AI.

Predictors: Learning knowledge

Survey question: How often does your organization rely on the following to know more about Generative AI? (Never - Always)

Staff expertise in your organization

Experts in state or federal agencies (e.g., National AI Advisory Committee, National Institute of Standards and Technology)

Consultants or hired contractors

Professional association materials and information

Technical reports, publications in academic journals

Your organization's knowledge based on past experience with advanced technologies and softwares

Staff expertise in other local governments and organizations

- **Learning indigenous knowledge about Generative AI:** Continuous variable. A index of calculating mean of responses to three items: Staff expertise in your organization, Your organization's knowledge based on past experience with advanced technologies and softwares, and Staff expertise in other local governments and organizations (Cronbach's Alpha = 0.85). The higher the index, the greater indigenous knowledge the organization learn for understand Generative AI use.
- **Learning extraneous knowledge about Generative AI :** Continuous variable. A index of calculating mean of responses to four items: Experts in state or federal agencies, Consultants or hired contractors, Professional association materials and information, and Technical reports, publications in academic journals, . (Cronbach's Alpha = 0.83). The higher the index, the greater extraneous knowledge the organization learn for understand Generative AI use.

Organizational Characteristics

	Please indicate your level of agreement or disagreement with each of the following statements about your organization. (Strongly Disagree – Strongly Agree)	
Organizational characteristics	Routineness (Cronbach's Alpha = 0.65)	People here do the same job in the same way every day [r].
		One thing people like around here is the variety of work.
		Most jobs here have something new happening every day.
	Entrepreneurship (Cronbach's Alpha = 0.83)	Employees in this organization are rewarded for developing innovative solutions to problems.
		This organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.
		Most employees in this organization are not afraid to take risks.
	Centralization (Cronbach's Alpha = 0.85)	Even small matters have to be referred to someone higher up for a final answer.
		Top management exerts strong control over this organization.
		Managers in this agency have a lot of decision-making autonomy [r].
		In general, a person who wants to make their own decisions would be quickly discouraged in this organization.
		There can be little action taken here until a supervisor approves a decision.
	Politics (Cronbach's Alpha = 0.79)	People in this organization attempt to build themselves up by tearing others down.
		There are "cliques" or "in-groups" in this organization that hinder the effectiveness around here.
		People in this organization discourage others from voicing contrary ideas.
	Size	Numer of full-time employees work in the department.

Organizational Characteristics

	Over the last year, how often did the following stakeholders participate in your organization's decision making? (Never – Always)	
Stakeholders engagement in decision making	City government stakeholders engagement (Cronbach's Alpha = 0.60)	Mayor's office
		Other city government offices or departments
	Professional stakeholders engagement (Cronbach's Alpha = 0.67)	Consultants or paid experts
		Professional groups or associations
	Community stakeholders engagement (Cronbach's Alpha = 0.78)	Nonprofit groups or organizations
		Neighborhood associations
		Local residents

Bivariate correlation table

	Generative AI experience	Generative AI Preparedness	Generative AI Resource vulnerability	Generative AI ambiguity	Generative AI local knowledge	Generative AI extraneous knowledge	Routineness	Entrepreneurship	Centralization	Politics	City government stakeholders engagement	Professional stakeholders engagement	Community stakeholders engagement
Generative AI experience	1												
Generative AI Preparedness	0.19*	1											
Generative AI Resource vulnerability	-0.08	-0.21**	1										
Generative AI ambiguity	0.13	-0.16	0.16	1									
Generative AI local knowledge	0.26**	0.35***	-0.24**	-0.13	1								
Generative AI extraneous knowledge	0.29**	0.23	-0.1	-0.17	0.64***	1							
routineness	0.06	0.05	-0.16	-0.12	0.1	0.01	1						
entrepreneurship	0.06	0.16	-0.18	-0.18	0.34***	0.1	0.44***	1					
centralization	0.02	-0.06	0.31**	-0.02	-0.13	-0.02	-0.46***	-0.5***	1				
politics	0.15	-0.06	0.24	0.14	-0.16	-0.11	-0.31	-0.37***	0.56***	1			
CityEngagement	0.11	-0.17	-0.15	0.08	-0.09	-0.05	0.06	-0.17	0.09	0.12	1		
ProfessionalEngagement	0.14	0.17	0.25	-0.09	0.14	0.21*	-0.12	-0.08	0.15	0.09	0.27***	1	
CommunityEngagement	0.19	0.13	0.02	0.05	0.15	0.18	0.05	0.09	-0.01	-0.04	0.28***	0.45***	1

Significance levels: * < 0.05; ** < 0.01; *** < 0.005;