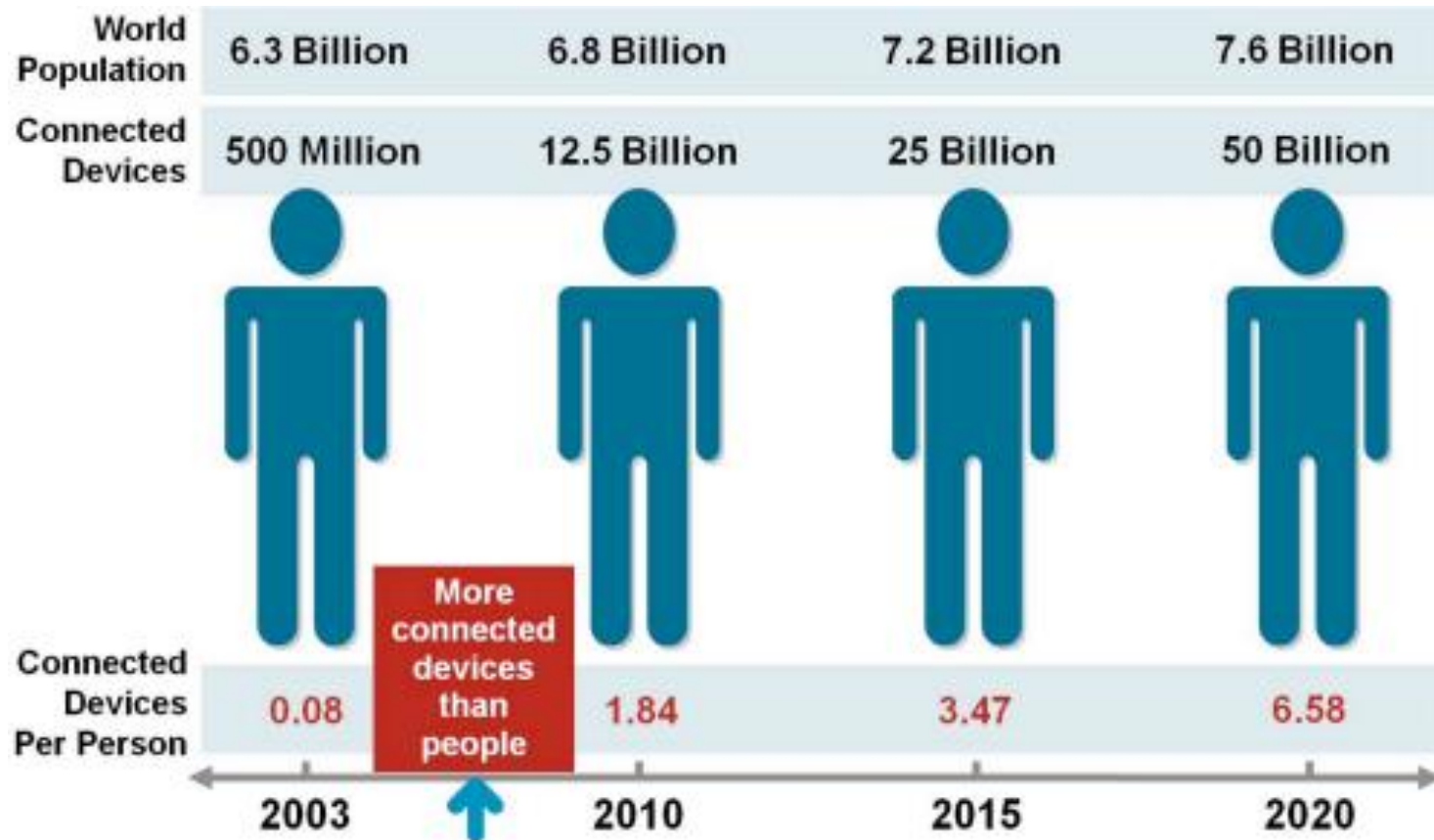# Research approaches in Locational Analytics and GIS: Findings from a SIGGIS survey

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University of Redlands, School of Business

SIGGIS Workshop

AMCIS 2016

San Diego CA

AGENDA

8:30-9:00 am   *PRE-WORKSHOP COFFEE and TEA*

9:00-9:15 am   Introduction to Workshop: Spatial Research Highlights (James Pick)

9:15-10:00 am   Research approaches to Locational Analytics and GIS:
                                Findings from a 2016 SIGGIS survey. (Rama Ramakrishna & Avijit Sarkar)

10:00-10:20 am   *BREAK – COFFEE and TEA*

10:20-10:50 am   Breakout groups to discuss missing research gaps in Locational and Spatial Analysis in the MIS
                                discipline   (Introduced and facilitated by Dan Farkas)

10:50-11:30 am   Keynote Presentation
                                Lauren Bennett, Spatial Analysis Product Engineer, Esri
                                GIS Methodologies, Spatial Statistics, and Space-Time: Practical Applications in Crime Analysis
                                and Sustainability

11:30-11:45 am   Discussion of Call for Papers for Special Issue on "Locational Analytics and Decision Support" of
                                the journal *Decision Support Systems*, with the guest co-editors. (James Pick & Avijit Sarkar)

11:45-noon   Workshop Summary. Key takeaways.
                                What spatial research in MIS have emerged?
                                What are next steps for participants? (Namchul Shin)

Internet of Things (IoT): Billions of Devices

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion

More connected devices than people

Connected Devices Per Person	0.08	1.84	3.47	6.58
	2003	2010	2015	2020

Source: Cisco IBSG, April 2011

Geo services global revenues are $150–$270 billion per year

Video games industry $25 billion

Geo services $150–$270 billion

Airline industry $594 billion

Oxera, 2013

Location Based Services and Real-Time Location Systems market expected to grow from USD 11.36 billion in 2015 to USD 54.95 billion by 2020 (MarketsandMarkets, 2015)

Infusion of GIS and Spatial Analysis in Business School Curricula (Ramakrishna, Sarkar, Vijayaraman, 2010)

- Survey Respondent – has research interest in Geographical Statistical Methods
  - Yes, you are on an interesting project here.
  - I am able to give you a real quick summary as to what happens in my school on GIS and spatial analysis: absolutely nothing.
  - The university does have a spatial analysis group outside the business school.
  - I have written a couple of papers on geographic topics, but these are not generally of interest to business.
  - Beyond that, I'm struggling to figure out what exactly are the meaningful questions in geography.

Background: SIGGIS Workshop at AMCIS 2014

- Observations about geospatial research in the IS/IT field (Pick and Shin, 2014)
  - With explosion of location detection in billions of mobile devices, sensors, etc. geospatial research with IS/IT approaches becomes much more practically important.
  - Although GIS is not well known in MIS research, increasing utilization of spatial and location-based applications during this decade by business, government, and consumers bodes well for its growing scholarly interest.
  - Paucity of geospatial research in leading MIS journals, compared to other contemporary IS/IT topics, such as data mining, social networking, and group collaboration.
  - More publications in the second level of IS/IT journals, in leading IS/IT conferences; some IS/IT-related articles have appeared in geographical journals.
  - Several barriers beginning to fall: corporate secrecy & limited training and educational emphasis.
  - Paucity of conceptual theory that is attuned to both the IS/IT field and geography, space, and location.
  - The early stage of GIS research in IS/IT and academic business literature offers great opportunity to pave new pathways in an exciting and long-term future of 21st century IS/IT.

2016 GIS and Spatial Analysis in Research Survey (SIGGIS)

- Wide-ranging survey: gauge the use of GIS and spatial analysis in Schools/Colleges of Business, Management, and Information Science for research and scholarship.

- 36 questions, 6 – 20 minutes duration approx.

- Administered twice to all AMCIS & ICIS, 2014, 2015 attendees (approx. 2,500 unique emails), AISWorld, INFORMS Digest (June 2016).
  - 121 responses.
  - 83 complete and usable responses.

Location Analytics & GIS Research: Adopters vs. Non-Adopters

Does your research involve questions in which location is meaningful? → Research Question

To what extent does your research involve data in which location is a component (addresses, latitude/longitude, etc.)? → Data

To what extent do you examine the location component in your research for meaningful patterns and relationships? → Extent of examining location

Location Analytics & GIS Research: Adopters vs. Non-Adopters

Does your research involve questions in which location is meaningful?

No	Yes, but my major research questions have a weak connection to location.	Yes, my major research questions have a strong connection to location.	Yes, location is very important in my research.
1	2	3	4

To what extent does your research involve data in which location is a component (addresses, latitude/longitude, etc.)?

None of my research has a location component.	Some of my main research data has a location component.	A majority of my main research data has a location component.	All of my main research data has a location component.
1	2	3	4

To what extent do you examine the location component in your research for meaningful patterns and relationships?

None of the time	Somewhat	Majority of the time	All of the time
1	2	3	4

Sum Score	Status	n	% Overall
3	**Non-Adopter**	11	13.25
4 - 8	**Beginner - Intermediate Adopter**	53	63.86
9 - 12	**Advanced Adopter**	19	22.89
TOTAL		83	100

8

❑ What is the profile (age, gender, tenure, etc.) of typical adopters of GIS and location analytics research?

❑ What is the profile (age, gender, tenure, etc.) of typical non-adopters of GIS and location analytics research?

Demographic Profile of Respondents

Country	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
USA	46	8	25	13
	55.42%	72.73%	47.17%	68.42%
Others	37	3	28	6
	44.58%	27.27%	52.83%	31.58%
Sample size	83	11	53	19

Gender	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Male	68	5	39	14
	81.93%	45.45%	73.58%	73.68%
Female	23	5	13	5
	27.71%	45.45%	24.53%	26.32%
Do not want to disclose	2	1	1	0
Sample size	83	11	53	19

Age	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Under 26	1	1	0	0
	1.20%	9.09%	0.00%	0.00%
26 to 35	22	4	13	5
	26.51%	36.36%	24.53%	26.32%
36 to 45	24	1	14	9
	28.92%	9.09%	26.42%	47.37%
46 to 64	29	5	21	3
	34.94%	45.45%	39.62%	15.79%
65 or older	7	0	5	2
	8.43%	0.00%	9.43%	10.53%
Sample size	83	11	53	19

- **Geography**
  - Intermediate adopters split evenly in US vs ROW.
  - Advanced adopters: USA-ROW 2:1.
- **Age**
  - Intermediate level adoption increases with age.
  - Advanced adoption peaks in the 36 – 45 category (early-mid career?).
- **Gender**
  - Per capita intermediate adoption (~57%) as well as advanced adoption (~20 – 21%) approx. equal for both men & women.

Academic Profile of Respondents I

Current appointment	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Faculty: Tenured	38	2	28	8
	45.78%	18.18%	52.83%	42.11%
Faculty: Untenured/Tenure-track	19	4	12	3
	22.89%	36.36%	22.64%	15.79%
Graduate Student	19	4	10	5
	22.89%	36.36%	18.87%	26.32%
Other: please specify (e.g. Post Doctorate)	7	1	3	3
Sample size	83	11	53	19

Years at current institution	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Less than 5	35	7	18	10
	42.17%	63.64%	33.96%	52.63%
6 -- 10	15	1	11	3
	18.07%	9.09%	20.75%	15.79%
11 -- 15	10	1	7	2
	12.05%	9.09%	13.21%	10.53%
More than 15 years	23	2	17	4
	27.71%	18.18%	32.08%	21.05%
Sample size	83	11	53	19

- Tenured faculty more than twice as likely to be intermediate adopters than untenured/tenure-track and doctoral students.
- Interestingly, both intermediate as well as advanced adoption declines between years 6 – 15 at an institution but picks up beyond the 15 year mark.

Academic Profile of Respondents II

Academic discipline	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
MIS /IS	69	9	48	12
	84.15%	81.82%	92.31%	63.16%
Information Science	11	1	6	4
	13.41%	9.09%	11.54%	21.05%
Computer Science	7	0	5	2
	8.54%	0.00%	9.62%	10.53%
OM/ SCM / Mgmt. Science	6	1	3	2
	7.32%	9.09%	5.77%	10.53%
Marketing	7	1	5	1
	8.54%	9.09%	9.62%	5.26%
Economics	5	1	4	0
	6.10%	9.09%	7.69%	0.00%
Other: please specify	3	0	2	1
	3.66%	0.00%	3.85%	5.26%
Sample size	82	11	52	19

Primary Research Interest of respondents

- **In almost all areas, intermediate adopters vastly outnumber advanced adopters (at least 2:1).**

- **One exception:** Decision Analytics and Support.

Primary research interests	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Big Data and Analytics	28	3	16	9
	33.73%	27.27%	30.19%	47.37%
Decision Analytics and Support	21	1	9	11
	25.30%	9.09%	16.98%	57.89%
E-Business and E-Government	18	0	16	2
	21.69%	0.00%	30.19%	10.53%
Human Behavior and IS	25	4	17	4
	30.12%	36.36%	32.08%	21.05%
Human-Computer Interaction	9	1	7	1
	10.84%	9.09%	13.21%	5.26%
IS Curriculum and Education	10	1	6	3
	12.05%	9.09%	11.32%	15.79%
Systems Development, Design	13	1	7	5
	15.66%	9.09%	13.21%	26.32%
IS Governance and Control	7	2	4	1
	8.43%	18.18%	7.55%	5.26%
IS in Healthcare	8	0	6	2
	9.64%	0.00%	11.32%	10.53%
IS Strategy and Organizational Impacts	13	3	10	0
	15.66%	27.27%	18.87%	0.00%
IS Theory Development	5	2	3	0
	6.02%	18.18%	5.66%	0.00%
IS Implementation, Adoption, and Use	14	2	10	2
	16.87%	18.18%	18.87%	10.53%
Managing IS Projects and Business Process Management	7	0	5	2
	8.43%	0.00%	9.43%	10.53%
Security and Privacy of Information and IS	11	1	9	1
	13.25%	9.09%	16.98%	5.26%
Sustainability and Societal Impacts of IS	11	0	5	6
	13.25%	0.00%	9.43%	31.58%
Other: please specify				
Sample size	83	11	53	19

Extent of Adoption: **Does your research involve questions in which location is meaningful? Check one of the following.**

Location is meaningful? (Research question)	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
No	13	11	2	0
Yes, but my major research questions have a weak connection to location.	36	0	36	0
Yes, my major research questions have a strong connection to location.	22	0	15	7
Yes, location is very important in my research.	12	0	0	12
Sample size	83	11	53	19

Extent of Adoption: **To what extent does your research involve data in which location is a component (addresses, latitude/longitude, etc.)? Check one of the following.**

Location is meaningful? (Research data)	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
None of my research has a location component.	17	11	6	0
Some of my main research data has a location component.	38	0	38	0
A majority of my main research data has a location component.	22	0	9	13
All of my main research data has a location component.	6	0	0	6
Sample size	83	11	53	19

Extent of Adoption: To what extent do you examine the location component in your research for meaningful patterns and relationships? Check one of the following.
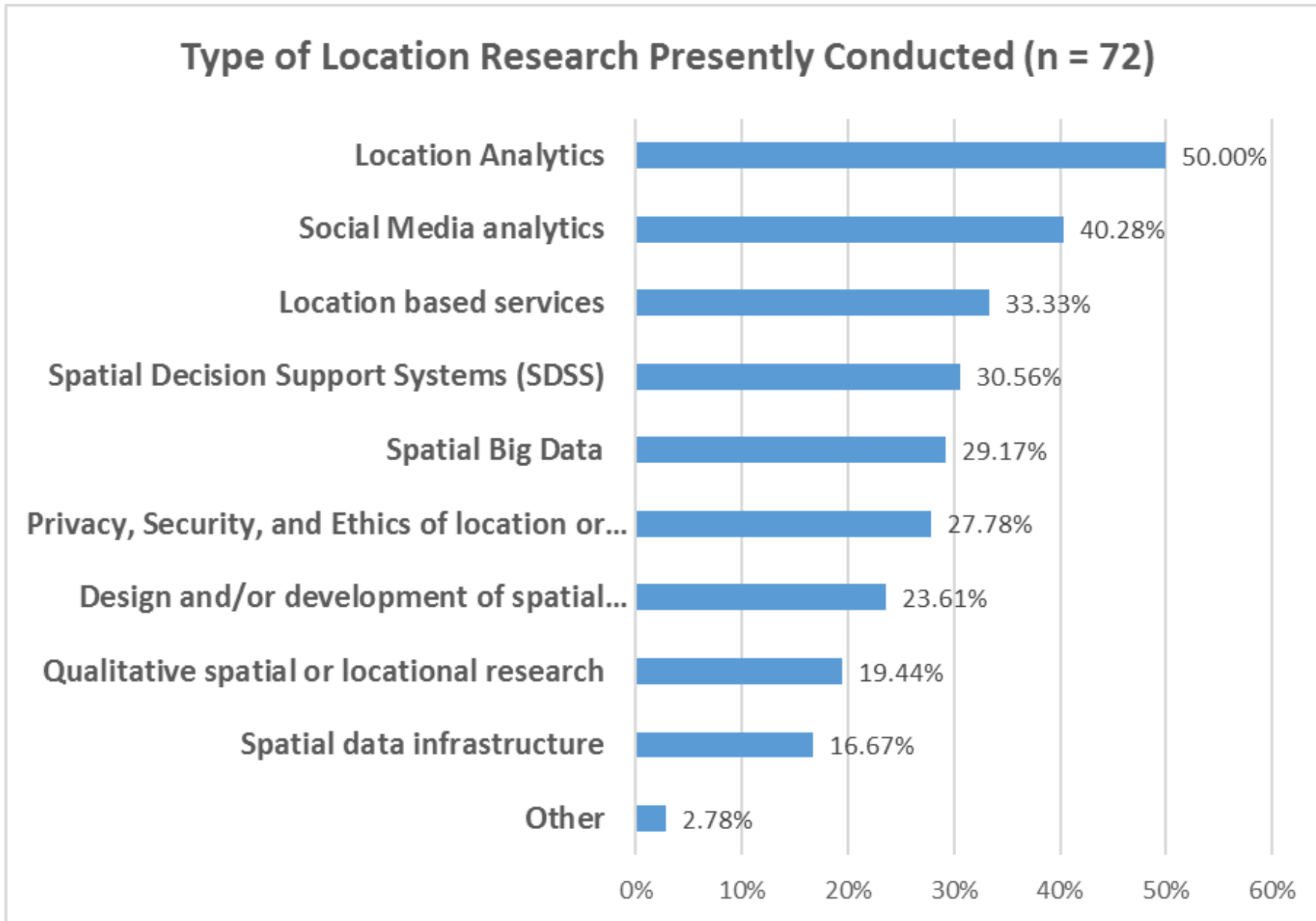
Location is meaningful? (Research analysis)	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
None of the time	19	11	8	0
Somewhat	42	0	41	1
Majority of the time	17	0	4	13
All of the time	5	0	0	5
Sample size	83	11	53	19

Key Takeaways

- **Intermediate adopters** for the most part are barely scratching the surface of research in Location Analytics and GIS.
  - For 2 out of 3, research questions have a weak connection to location.
  - For approx. 3 out of 4, <u>some</u> research data has location component.
  - 3 out of 4 <u>somewhat</u> examine the location component in research for meaningful patterns and relationships.

- **Advanced adopters**
  - For 6 out of 10, location is very important in research.
  - For 2 out of 3, majority (versus "all") of research data has a location component.
  - Almost 3 times more likely to examine location component in research for meaningful patterns and relationships a <u>majority of the time</u> versus <u>all the time</u>.

❑ What are some types of locational research that are (or may be) relevant to researchers?

❑ What are some areas where there are opportunities (i.e., currently not being studied)?

Type of Location Research

Type of Location Research Presently Conducted (n = 72)

- Location Analytics — 50.00%
- Social Media analytics — 40.28%
- Location based services — 33.33%
- Spatial Decision Support Systems (SDSS) — 30.56%
- Spatial Big Data — 29.17%
- Privacy, Security, and Ethics of location or… — 27.78%
- Design and/or development of spatial… — 23.61%
- Qualitative spatial or locational research — 19.44%
- Spatial data infrastructure — 16.67%
- Other — 2.78%

Other:
1. spatial algorithm design,
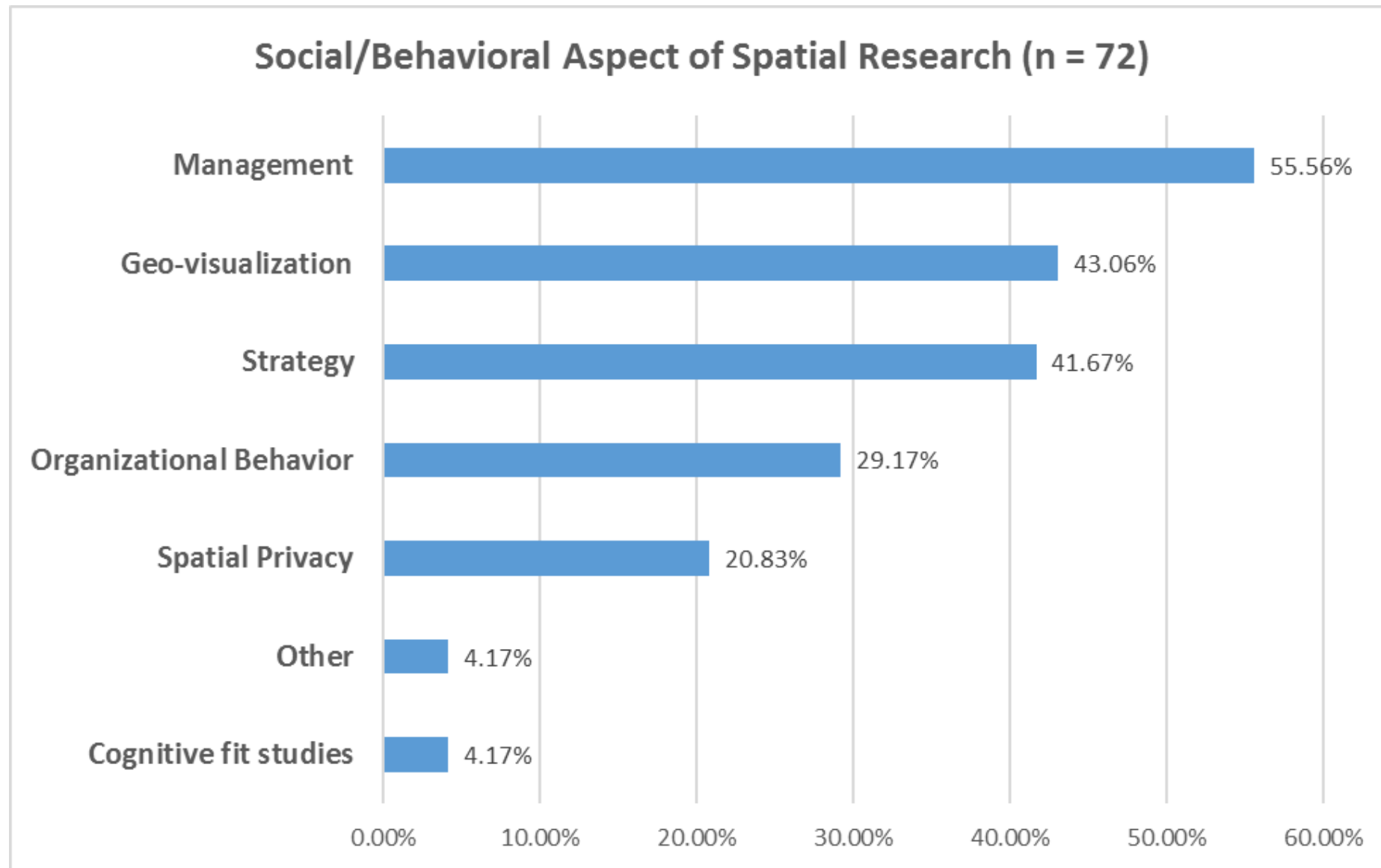2. location as controls or data slices

Type of Location Research: *Intermediate vs. Advanced Adopters*

- **For almost all types of location research with at least 20 adopters, intermediate adopters outnumber advanced adopters 3:2.**
- **One exception: SDSS.**

Types of locational research	Adopters – Intermediate	% of all Intermediate Adopters	Intermediate Adopters as % of all adopters of locational research type	Adopters – advanced	% of all Advanced Adopters	Advanced Adopters as % of all adopters of locational research type
Location Analytics	22	41.51%	61.11%	14	73.68%	38.89%
Social Media analytics	21	39.62%	72.41%	8	42.11%	27.59%
Location based services	15	28.30%	62.50%	9	47.37%	37.50%
Spatial Decision Support Systems (SDSS)	9	16.98%	40.91%	13	68.42%	59.09%
Spatial Big Data	13	24.53%	61.90%	8	42.11%	38.10%
Privacy, Security, and Ethics of location or place	16	30.19%	80.00%	4	21.05%	20.00%
Design and/or development of spatial information systems	9	16.98%	52.94%	8	42.11%	47.06%
Qualitative spatial or locational research	8	15.09%	57.14%	6	31.58%	42.86%
Spatial data infrastructure	7	13.21%	58.33%	5	26.32%	41.67%
Other: please specify	1	1.89%	50.00%	1	5.26%	50.00%
Sample size	53	100.00%		19	100.00%	

❏ What are some social and/or behavioral aspects of spatial research that are (or may be) relevant to researchers?

❏ What are some areas where there are opportunities (i.e., currently not being studied)?

❏ What are some of the spatial theories that researchers are familiar with?

Social/Behavioral Aspect of Spatial Research

Social/Behavioral Aspect of Spatial Research (n = 72)

Category	Percentage
Management	55.56%
Geo-visualization	43.06%
Strategy	41.67%
Organizational Behavior	29.17%
Spatial Privacy	20.83%
Other	4.17%
Cognitive fit studies	4.17%

Other:
1. Climate change impacts,
2. none,
3. regulatory setting

Social/Behavioral Aspect of Spatial Research: *Intermediate vs. Advanced Adopters*

Social and/or behavioral aspects of spatial research	Adopters – Intermediate	% of all Intermediate Adopters	Intermediate Adopters as % of all adopters of social and/or behavioral aspect of spatial research	Adopters – advanced	% of all Advanced Adopters	Advanced Adopters as % of all adopters of social and/or behavioral aspect of spatial research
Management	27	50.94%	67.50%	13	68.42%	32.50%
Geo-visualization	17	32.08%	54.84%	14	73.68%	45.16%
Strategy	18	33.96%	60.00%	12	63.16%	40.00%
Organizational Behavior	16	30.19%	76.19%	5	26.32%	23.81%
Spatial Privacy	10	18.87%	66.67%	5	26.32%	33.33%
Other: please specify	4	7.55%	100.00%	0	0.00%	0.00%
Cognitive fit studies	2	3.77%	66.67%	1	5.26%	33.33%
Sample size	53	100.00%		19	100.00%	

Familiarity with Spatial Theories: *Intermediate vs. Advanced Adopters*

Spatial theories	Overall	Adopters – Intermediate	Adopters – advanced
Spatial autocorrelation theory & related theories from GeoStatistics	17	7	10
	23.61%	13.21%	52.63%
Spatial Econometrics	10	3	7
	13.89%	5.66%	36.84%
Spatial Information Theory	13	9	4
	18.06%	16.98%	21.05%
Spatial Optimization (Location-Allocation, Gravity Models, Location Quotient, etc).	17	10	7
	23.61%	18.87%	36.84%
GIScience Theories	7	2	5
	9.72%	3.77%	26.32%
GeoDesign Theories	4	2	2
	5.56%	3.77%	10.53%
Theories of Location	12	6	6
	16.67%	11.32%	31.58%
Sample size	72	53	19

Key Takeaways

- Across all social/behavioral aspects of spatial research, intermediate adoption more common than advanced adoption.

- Familiarity with spatial theories:
  - Commonly known theories:
    - Spatial autocorrelation & related theories from geostatistics;
    - Spatial optimization theory.
  - A larger proportion of advanced adopters indicate familiarity with particular spatial theories such as spatial autocorrelation and spatial econometrics compared to intermediate adopters.
    - Possibly explains their advanced status!!

Analysis and Data Processing Tools used in research

Are there differences in tools, *not GIS or location analytics tools*, used in research by adopters and non-adopters?
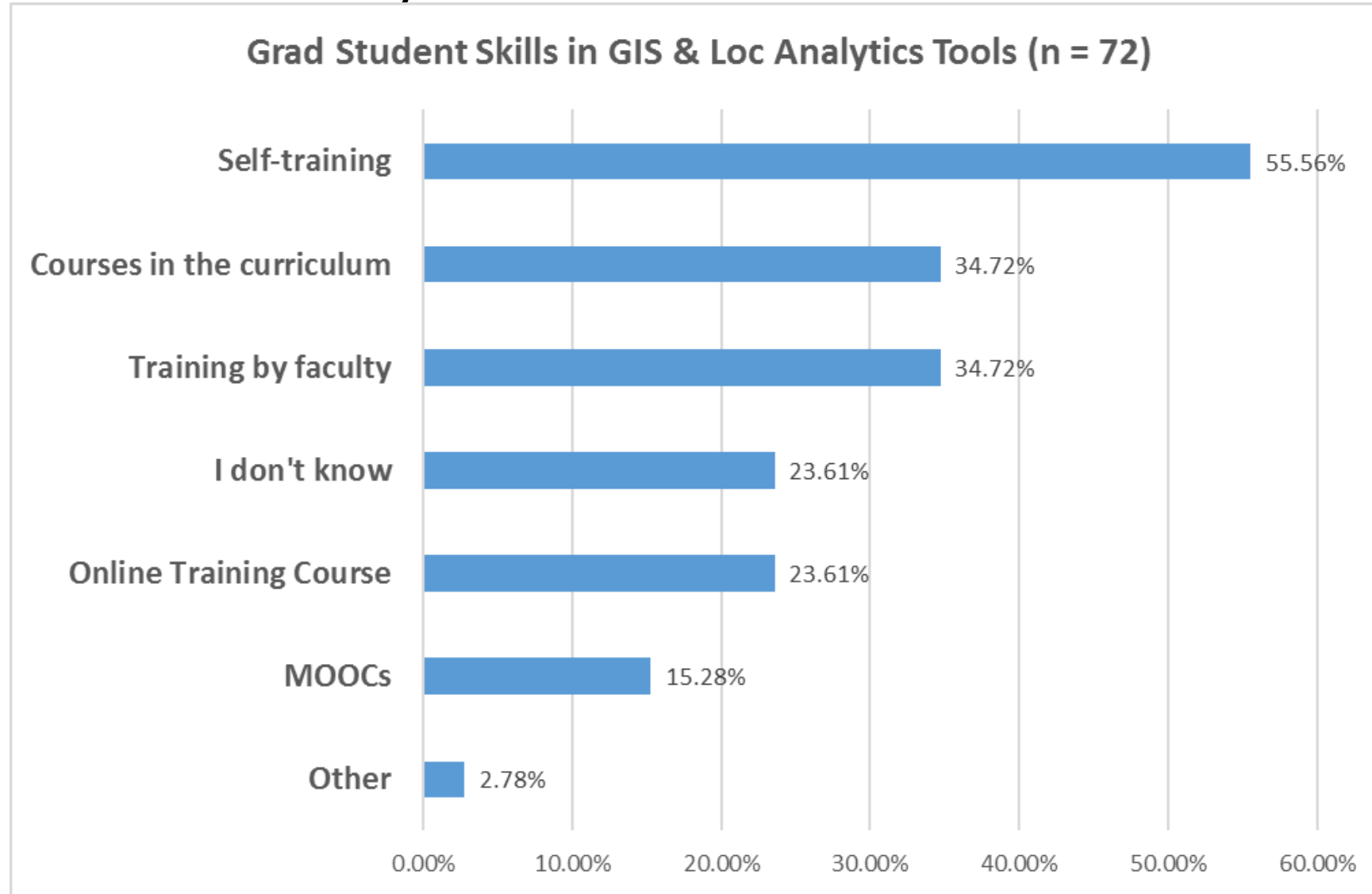
Analysis and data processing tools used	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Statistical tools and software (e.g., SPSS, SAS, Minitab)	64	9	40	15
	77.11%	81.82%	75.47%	78.95%
Business Intelligence/Analytics tools (e.g., IBM Cognos, Teradata, Tableau)	16	1	9	6
	19.28%	9.09%	16.98%	31.58%
Data Mining tools (e.g., R, Weka, Microsoft Azure, IBM Bluemix)	35	2	22	11
	42.17%	18.18%	41.51%	57.89%
Text Mining tools (e.g., specific NLP tools, Microsoft Azure, IBM Bluemix)	26	2	17	7
	31.33%	18.18%	32.08%	36.84%
Mapping, GIS, and Spatial Analysis tools (e.g., Esri's ArcGIS Desktop, GeoDA, Pitney Bowes MapInfo, Google Earth, QGIS or other open-source tools)	31	0	15	16
	37.35%	0.00%	28.30%	84.21%
Optimization tools (e.g., CPLEX)	8	1	3	4
	9.64%	9.09%	5.66%	21.05%
Simulation tools (e.g., AnyLogic)	12	1	6	5
	14.46%	9.09%	11.32%	26.32%
Qualitative Methods (e.g., Atlas.TI)	28	2	20	6
	33.73%	18.18%	37.74%	31.58%
Spreadsheets	53	6	32	15
	63.86%	54.55%	60.38%	78.95%
Sample size	83	11	53	19

Spatial Analysis & Data Processing Tools

Spatial analysis and data processing tools	Overall	Adopters – Intermediate	Adopters – advanced
Mapping and data visualization commercial software tools (e.g., Esri's ArcGIS Desktop, Pitney Bowes MapInfo, Google Earth, Google Maps, etc.)	36	20	16
Spatial Statistics software (e.g., GeoDa, R, etc.)	20	10	10
Public Domain mapping software (e.g., GRASS, QGIS)	13	6	7
Other: please specify			
None	20	20	0
Sample size	72	53	19

❑ How are the necessary skills in using the GIS and locational analytics tools acquired by graduate students doing research in the area?

Graduate Student Skills Development in GIS & Location Analytics Tools for Research

Grad Student Skills in GIS & Loc Analytics Tools (n = 72)

Category	Percentage
Self-training	55.56%
Courses in the curriculum	34.72%
Training by faculty	34.72%
I don't know	23.61%
Online Training Course	23.61%
MOOCs	15.28%
Other	2.78%

Other:
1. workplace training,
2. YouTube.com/GrantThrall

30

Graduate Student Skills Development in GIS & Location Analytics Tools for Research: *Intermediate vs. Advanced Adopters*

Graduate students gaining expertise in spatial analysis and data processing tools	Overall	% Overall	Adopters – Intermediate	% of all Intermediate Adopters	% of respondents whose grad students use this method for spatial training at Intermediate level	Adopters – advanced	% of all Advanced Adopters	% of respondents whose grad students use this method for spatial training at Advanced level
Self-training	40	55.56%	30	56.60%	75.00%	10	52.63%	25.00%
Training by faculty	25	34.72%	15	28.30%	60.00%	10	52.63%	40.00%
Courses in the curriculum	25	34.72%	14	26.42%	56.00%	11	57.89%	44.00%
Online Training Course	17	23.61%	9	16.98%	52.94%	8	42.11%	47.06%
I don't know	17	23.61%	14	26.42%	82.35%	3	15.79%	17.65%
MOOCs	11	15.28%	8	15.09%	72.73%	3	15.79%	27.27%
Other: please specify	2	2.78%	1	1.89%	50.00%	1	5.26%	50.00%
Sample size	72	100.00%	53	100.00%		19	100.00%	

❑ What is the association between importance of location in research question(s) and engagement with locations analytics and GIS research in the areas of:

a.   *Big Data and Analytics?*

b.   *Decision Analytics and Support?*

c.   *Human Behavior and IS?*

Primary Research Area: Big Data & Analytics

- n = 28 out of 83 (33.73%)
- Extent of interest: 1 = Low   3 = Moderate   5 = High
  - Moderate – High Interest in Big Data & Analytics (n = 28)
- Importance of Location in Research Qs: 1 = Low   3 = Moderate 5 = High
  - Moderate – High Importance to Location in Research Qs (n = 24)
- Non-adopters = 3

Association between importance of location in research question(s) & engagement with Location Analytics & GIS Research

			Does your research involve questions in which location is meaningful? Check one of the following.	To what extent does your research involve data in which location is a component (addresses, lat/long)	To what extent do you examine the location component in your research for meaningful patterns and relationships
Big Data and Analytics	Please rate your interest(s) in both columns. : For each chosen area, how important is location in the research question(s)? 1 being "Not Importa...-**Big Data and Analytics**	Pearson Correlation	.515**	.531**	.486**
		Sig. (2-tailed)	.005	.004	.009
		N	28	28	28
Human Behavior & IS	PLEASE rate your interest(s) in both columns. : For each chosen area, how important is location in the research question(s)? 1 being "Not Importa...-**Human Behavior and IS**	Pearson Correlation	.507**	.539**	.473*
		Sig. (2-tailed)	.010	.005	.017
		N	25	25	25
Decision Analytics & Support	PLEASE rate your interest(s) in both columns. : For each chosen area, how important is location in the research question(s)? 1 being "Not Importa...-**Decision Analytics and Support**	Pearson Correlation	.433*	.410	.408
		Sig. (2-tailed)	.050	.065	.066
		N	21	21	21

❑ What are some inhibitors and enablers of adoption of GIS and location analytics?

❑ Are there differences between adopters and non-adopters?

Extent to which leading journals in your area of research are receptive to publishing spatial / location-based research

Extent to which leading journals are receptive towards spatial/location-based research	Overall	Adopters – Intermediate	Adopters – advanced
1 (Not receptive at all)	1	1	0
2	14	11	3
3	10	9	1
4 (Moderately Receptive)	29	21	8
5	11	7	4
6	1	0	1
7 (Highly Receptive)	2	1	1
Sample size	68	50	18
Average		3.52	4.11

Reasons for little or no use of spatial analysis in research

Reason for not doing spatial analysis in research	Overall	Non-adopters
My research questions are non-spatial (i.e., they do not have a location component).	10	10
I have yet to figure out the spatial dimensions of my research.	2	2
I am unfamiliar with spatial analysis theories and methods.	3	3
I am familiar with spatial analysis theories and methods but unfamiliar with the technologies.	0	0
I have included spatial analysis in prior research with little or no benefit.	0	0
Spatial analysis has no impact on the actual publication possibility in my area of work.	2	2
I do not sense spatial analysis adds any beneficial insights in my area of research at the present time.	5	5
Not applicable	0	0
Sample size	22	22

Potential for GIS and spatial analysis to benefit research and scholarship

Potential for GIS and spatial analysis to be beneficial to your research and scholarship	Overall	Non-adopters	Adopters – Intermediate	Adopters – advanced
Yes	53	2	33	18
	67.09%	18.18%	66.00%	100.00%
No	9	5	4	0
	11.39%	45.45%	8.00%	0.00%
Yes, in the future but not at the present time	17	4	13	0
	21.52%	36.36%	26.00%	0.00%
Sample size	79	11	50	18

How do you suggest broader and deeper use of GIS and spatial analysis might be achieved in your discipline?

- A high-quality, business-focused GIS/spatial analytics journal
- Comprehensive graduate and undergraduate-level business teaching cases—By introducing GIS early in undergraduate courses
- Applying advanced analytics techniques
- The big issue is faculty. They don't know how important this is.
- In conjunction with BI and Big Data
- Free access to GIS software and support from vendors of GIS software
- Short workshops, webinars, tutorials
- A stronger focus on solutions

Broader and deeper use of GIS and spatial analysis: With GIS, Spatial, and Research

Broader and deeper use of GIS and spatial analysis: Without GIS, Spatial, and Research

Conclusions

- This research is just a beginning to understand the current status of, and potential for, research in GIS and locational analytics by IS researchers.

- Data analysis still preliminary, but some patterns seem to be emerging.

  - **Non-adoption**: (of) Location Analytics & GIS in research much lower than expected.

  - **Intermediate adopters**: Adopters predominantly at an intermediate stage but extent of adoption is low.

  - **Importance of location in research questions**: Considering location to be important in research questions in IS/MIS research areas bodes well for involvement with location analytics and GIS research in the 3 leading areas.

  - **Theory**: Knowledge of "spatial theories" appears to set advanced adopters apart.

  - **Role of journals**: Both intermediate as well as advanced adopters perceive journals' receptiveness to be low.

  - **Benefit of location analytics & GIS**: Do not sense spatial analysis to add beneficial insights in their areas of inquiry.

- More data & research are required needed to better understand this area and solidify findings.

Implications

- Research outlets need to develop a focus in this area of research.
- Inhibitors and enablers of research in this area needs to be identified by further research so that mechanisms can be developed to promote research in this area.
- Potential or opportunities for research is considerable.