

Geo-Skill Evolution: Transforming an Organization's Competitive Advantage Through Advanced Training in Geospatial Analytics

Authors: Justin W. Bennett, Michelle Murray, Rebecca Wilson

**College of Business Administration, Graduate Business Programs,
Doctor of Business Administration, University of Missouri - Saint Louis
(UMSL)**

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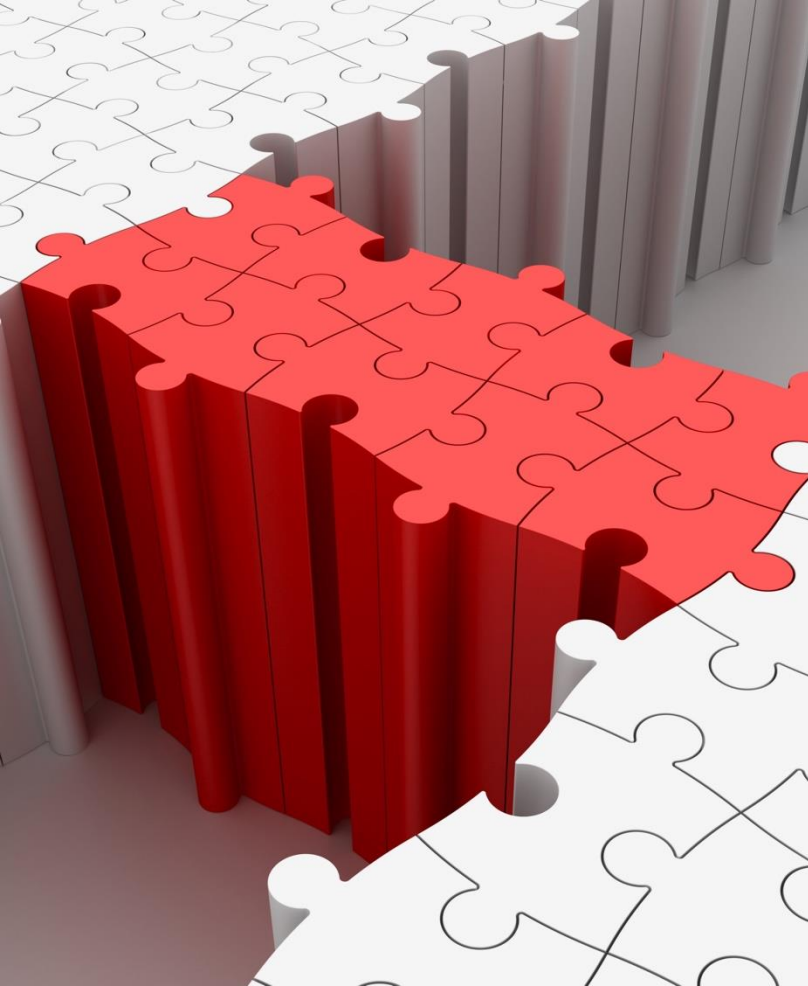
Introduction & Purpose

- The global geospatial analytics market was valued at \$79.06 billion (USD) in 2023 and is projected to reach \$262.73 billion by 2032 (Future Market Insights, 2023).
- Our research focuses on how individual characteristics such as prior experience, learning preferences, and job roles influence the efficacy of training methods.
- This study conducted interviews with twelve managers/supervisors, and through an inductive approach, identified eleven key themes from the perspective of managers regarding their preferred training methods for employees, particularly those with limited exposure to geospatial analytics skills in the workplace.

So...what is geospatial analytics anyway?

- Geospatial analytics encompasses the collection, analysis, and visualization of geospatial data from devices such as GPS, smartphones, location sensors, drones, and satellites (Fortune Business Insights, 2022).
- Geospatial analytics is a field experiencing rapid growth, harnesses the power of geographic information systems (GIS) to extract meaningful insights and patterns from spatially oriented data, thereby supporting management objectives (Supak et. al., 2015).
- The insights gleaned from spatial data can significantly enhance our understanding of various phenomena.





Problem of Practice

- Given the rapid growth in the geospatial analytics market, organizations need to invest in training strategies that enhance employees' skills efficiently.
- Geospatial data is inherently complex, given there are numerous geospatial standards, formats, and systems (Lee & Kang, 2015).
- Our research examines the impact of individual characteristics from the managers' perspective on the effectiveness of different training methods, focusing on one-on-one versus group training approaches using Environmental Systems Research Institute (ESRI) technologies.
- The goal is to provide insights to guide organizations to optimize training programs, foster employee development, and gain competitive advantages.

Research Question

- Given the variability in employee characteristics, such as prior experience, learning preferences, and job roles, which training method is more likely to increase employee proficiency in geospatial analytics?



Theoretical Framework

- Our research is anchored in the Technology Acceptance Model (TAM) (Davis et al., 1989), the Technology-Organization-Environment (TOE) framework (Baker, 2012), and the learning theories of Cognitivism and Constructivism (Ertmer & Newby, 2008).
- These theoretical perspectives provide a foundation for examining the factors that influence technology acceptance and for understanding how different training methods shape employee proficiency.
- By integrating insights from TAM and TOE, we explore the interplay between technology, organizational context, and environmental factors, while the principles of Cognitivism and Constructivism illuminate the cognitive processes and experiential learning that enhance technological skills.

Methods



- Design

- Adopted a qualitative case study approach to gain an in-depth understanding of the proficiency gained through one-on-one and group training in geospatial analytics.
- Developed questions tailored to assess employee proficiency before and after training.



- Data Collection

- Obtained IRB approval.
- Participants were recruited using social media and personal networks within the geospatial community.
- Used UMSL Zoom to conduct and record interviews; securely storing the interview for later processing.
- Target population included adults over 18 years of age, currently working in the geospatial field
- Participants must have been in a supervisory role for at least 6 months and within the last 2 years while having oversight of employees trained in ESRI technologies.

Methods Continued



- Sample

- Recruited 12 managers overseeing employees trained in ESRI technologies. All interviews were able to be utilized.



- Analysis

- Generated pseudonyms for interviewees to maintain confidentiality.
- Reviewed, cleaned, read, and reread Zoom transcripts, created exploratory notes, and formulated questions to identify connections between participants' experiences and insights.
- Utilized inductive coding in our analysis
- Emerging themes were formulated from authentic excerpts (direct quotes) and interpreted mentions using Quirkos (Quirkos, 2023).

Results

- The study found that managers emphasized the importance of continuous feedback and support during training.
- Group training provides general knowledge and fosters team bonding, while one-on-one training is effective for specific skills development.
- Adapting to learning preferences and individual characteristics of employees is crucial for effective training and tailored training leads to better outcomes.

Table 1	
<i>Study's Key Findings</i>	
Theme	Results
Feedback and support	Managers emphasized the importance of continuous feedback and support during training, which significantly enhances the learning experience and proficiency levels.
Group training and professional development	Group training sessions provide general knowledge and foster team bonding, which can be beneficial for professional development. However, it may not address individual learning needs as effectively as one-on-one training.
Learning preferences and individual characteristics	Acknowledging and adapting to individual learning preferences and characteristics is crucial for effective training. Tailored training plans based on these factors lead to better outcomes.
Role of one-on-one training in skill development	This method is particularly effective for developing specific skills and overcoming individual challenges due to its personalization. Employees receiving one-on-one training demonstrated significant improvement in their proficiency.
Challenges of data and technological changes	Technical issues and the need for updated software can pose significant challenges during training. Addressing these issues promptly is essential for maintaining the effectiveness of the training program.
Application of skills and knowledge gained	Practical application of newly acquired skills in real-world scenarios is crucial for reinforcing learning and ensuring long-term proficiency.
Project-based learning	This approach is highly effective in one-on-one training settings as it allows employees to apply their skills to specific tasks and projects, thereby enhancing their practical knowledge and proficiency.
Preparation for real-world challenges	Training programs that bridge the gap between theoretical knowledge and practical application better prepare employees to meet job requirements.
Importance of foundational knowledge	Building a strong foundation of basic geospatial knowledge is essential. Employees must understand fundamental concepts to develop advanced skills and effectively apply their learning in the workplace.
Role of ESRI technologies	Utilizing ESRI's tools and resources effectively supports the learning process and ensures that training remains relevant to industry standards.
Impact of learning management systems	These systems play a vital role in organizing and delivering training content, providing a structured and supportive learning environment.

Results - Key Metrics

- Proficiency assessment metrics, based on a scale of 1 to 5 with 1 being low and 5 being high proficiency, indicate an observed improvement in geospatial analytics proficiency.
- From the managers' perspective, the average proficiency before training was 2.29 for one-on-one sessions and 2.04 for group sessions. After training, these averages increased to 3.65 and 3.42, respectively; one-on-one training led to a proficiency gain of 59.39% while group training resulted in a 67.65% improvement in proficiency amongst employees.

Table 3

Employee Proficiency in Geospatial Analytics Before and After One-On-One and Group Training

Pseudonym Name	Before One-On-One Training	After One-on-One Training	Before Group Training	After Group Training
Ronda	2.5	4	3.5	3.5
Carl	2	4	2	3
Thomas	3	4	2	2
Emily	3	4	1	4
Lilly	3	4	3	5
Danny	1	3	1	3
Grant	1	3	2	4
Bob	2	3	1	2
Ben	2	3	2	4
Gunner	3	4	2	4
Jack	3	3.75	3	3.5
Brian	2	4	2	3

Results - Demographics

- The total managerial experience among our interviewees amounted to 99.1 years. On average, interviewees had been with their current employer for 8.26 years.
- The average duration of managing or supervising geospatial analytic staff was 11.96 years. Eighty percent of the interviewees held either a bachelor's or master's degree. On average, our interviewees have supervised 45 employees who have undergone one-on-one training.
- Furthermore, on average, our interviewees have supervised 59 employees who attended group training sessions.

Table 2

Geospatial Manager/Supervisor Characteristics & Demographics

Pseudonym	Years with Current Employer	Years as a Manager	Highest Education Level	# Employees Sent Through One-on-One Training (all years)	# Employees Sent Through Group Training (all years)	Percentage of Time Work Remote	Age (Years)	Race (Self-reported)
Ronda	17 years	12 years	Bachelors	250	75	60%	41	White
Carl	13 years	4 years	Masters	10	10	0%	46	White
Thomas	9 years	22 years	High School Diploma	50	24	60%	48	White
Emily	12 years	5 years	Masters	30	120	10%	43	White
Lilly	19 years	15 years	Bachelors	15	5	15%	50	White
Danny	0.5 years	20 years	Doctorate	6	6	25%	46	White
Grant	10 years	9.5 years	Bachelors	9	5	0%	37	White
Bob	0.6 years	22 years	Masters	65	65	20%	47	White/American Indian
Ben	1 year	18 years	Bachelors	30	270	90%	44	White
Gunner	8 years	8 years	Masters	8	30	10%	50	African American
Jack	4.5 years	4 years	Masters	18	72	10%	35	White
Brian	4.5 years	4 years	Bachelors	50	50	80%	29	White

Results – Authentic Excerpts & Word Cloud



Word Cloud for the Study Interviews (Quirkos, 2023)

Table 4 – Feedback and Support

Authentic Excerpts	Interviewee
“The feedback and support during the one-on-one training process was appreciated because it provided employees with the understanding of how they were performing in a new role.”	Ronda

Table 5 – Group Training and Professional Development

Authentic Excerpts	Interviewee
“I think [group training] is a more generalized basic tools and capability rather than specific, you know, to a project or an analytic capability that needs to be trained. I think it's more general and broader . . . but the course typically provides that general knowledge or understanding, so they feel more comfortable to be able to take the next steps”	Ronda

Findings

- A total of 808 authentic excerpts (direct quotes) and interpreted mentions were methodically mapped to 11 emerging themes.
- Managers emphasized continuous feedback and support for employees during training. This leads to improved training as well as synergies in prerequisites related to the skill level needed for the employee attending training.
- Practical application in real-world scenarios was crucial for long-term proficiency.
- In our examination of the interview data, our team distinguished between “gain in” and “gain of” proficiency in geospatial analytics.

Contributions to Theory

- Our case study contributes to theory by extending and integrating the existing theoretical frameworks of Technology Acceptance Model (TAM), the Technology-Organization-Environment (TOE) framework and learning theories of Cognitivism and Constructivism (Davis et al., 1989; Baker, 2012; Ertmer & Newby, 2008).
- Our study highlights the importance of tailored training methods, showing that personalized one-on-one training significantly enhances employees' comfort and proficiency with geospatial technologies. This extension of TAM underscores that individualized feedback and support are crucial for improving perceived ease of use and usefulness, leading to better technology adoption.
- By proposing a holistic training model that combines foundational knowledge, personalized training, project-based learning, and continuous feedback, the study offers a comprehensive strategy for organizations to enhance employee proficiency.

Practical Relevance & Conclusion

- The study provides practical insights for organizations to customize their training programs to optimize individual learning preferences and job roles.
- A multifaceted training approach, combining foundational knowledge, personalized training, project-based learning, and robust feedback systems, is most beneficial for achieving proficiency in geospatial analytics.
- Investing in comprehensive and adaptable training frameworks will help organizations navigate the complexities of the geospatial domain.
- A tailored approach can lead to innovation, achieving organizational efficiencies and cost savings as well as a competitive advantage.

Lessons for Practice

- Organizations should consider:
 - Combining one-on-one and group training; can address both individual needs and boost team collaboration.
 - Provide continuous feedback; critical for employees to understand their progress, adjust learning paths, and overcome challenges promptly.
 - Recognize individual learning preferences and characteristics; better engagement and skill acquisition for employees.
 - Use advanced tools and technologies
- This comprehensive approach will enhance employee proficiency and organizational competitiveness in geospatial analytics.



Future Research

- A qualitative case study interviewing employees to gain their perspective and experience related to proficiency gained.
- A quantitative longitudinal study on skills retention. This could track employees over time to measure how well they retain and apply skills acquired through one-on-one or group training.



Thank you! Questions?

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