



# Analytic Modeling

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**GENERAL DYNAMICS**  
Mission Systems



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**Silos of information housed across the IC and DoD limits analysts and systems from taking advantage of big data analytics and realizing its full potential.**

**Executive Summary**

Today’s intelligence analyst is bombarded with an unprecedented amount of information from a wide range of disparate sources. These analysts don’t need another limited, off-the-shelf tool. What these analysts need is a comprehensive, integrated capability.

General Dynamics Mission Systems (GDMS) uses Human Centered Design (HCD) to create an Analytic Modeling capability that overcomes data overload and collapses the current silos of information that plague the tradecraft today.

This capability creates a digital environment that allows multiple agencies to engage with one another, securely sharing information and enabling automated processes that ultimately make the analyst’s job easier and the entire organization more efficient.

Analysts no longer need to spend the bulk of their time sifting through unrelated information and preparing reports and explanations. The GDMS Analytic Modeling capability reduces ramp-up time and provides a digital canvas for the analyst to display their cognitive processes and hypotheses.

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**This Is Your World On Data**

We live in a world of ever-increasing data. Sensors, satellites, cameras, radars, location aware devices and even social media contribute to the 2.5 quintillion bytes of data that are created every day.

At first glance, these new and increased sources of data are a boon for the Intelligence Community (IC). Never before have we had so much information about so many people, places, things and activities.

However, there is a downside to this deluge of data. The IC relies upon analysts to reliably turn information into actionable intelligence. And with lives often on the line, that intelligence needs to be delivered in timely manner. With that information streaming in at unprecedented rates from a wide range of disparate sources, analysts face an uphill battle against the challenges of variety, volume, velocity and veracity, known in the industry as the Four V’s. As the amount of data increases exponentially every day, without a new and novel way to analyze it, the Four V’s run the risk of becoming a distraction at best and overwhelming at worst.

It’s clear that with data itself changing, the way in which analysts transform that data into intelligence must also change. The model of individual analysts working alone to sift through ever-increasing stockpiles of data within stove-piped systems is no longer sufficient or efficient. It’s time for an evolution in intelligence analysis.

**The Evolution Of Intelligence Analysis**

The big data challenges within the IC are well known and have been acknowledged with recent policy shifts like the development of the IC Information Technology Enterprise (IC ITE) strategy by the Office of the Directors of National Intelligence (ODNI). Silos of information housed across the IC and DoD limits analysts and systems from taking advantage of big data analytics and realizing its full potential. There is an enormous benefit to collapsing those silos and allowing cross-agency access to technology, information, and resources.

Currently, the knowledge of an analyst is hidden away within text-heavy data sets, reports and even within the analysts own mind. The burden to communicate what they know and what they think falls squarely with the individual analyst.

The availability of big data and its enormous potential to revolutionize analytics also prompted multiple thought leaders in the IC to endorse Activity Based Intelligence (ABI) as a methodology. ABI builds upon the practices of Structured Observation Management (SOM) and Object Based Production (OBP) to provide context, seek and see patterns and more effectively generate intelligence from data. The National Geospatial-Intelligence Agency (NGA) has recently endorsed ABI as the methodology needed for analytic modernization based on its multi-INT approach and ability to discern patterns from massive amounts of data and thus provide context to objects and actions.

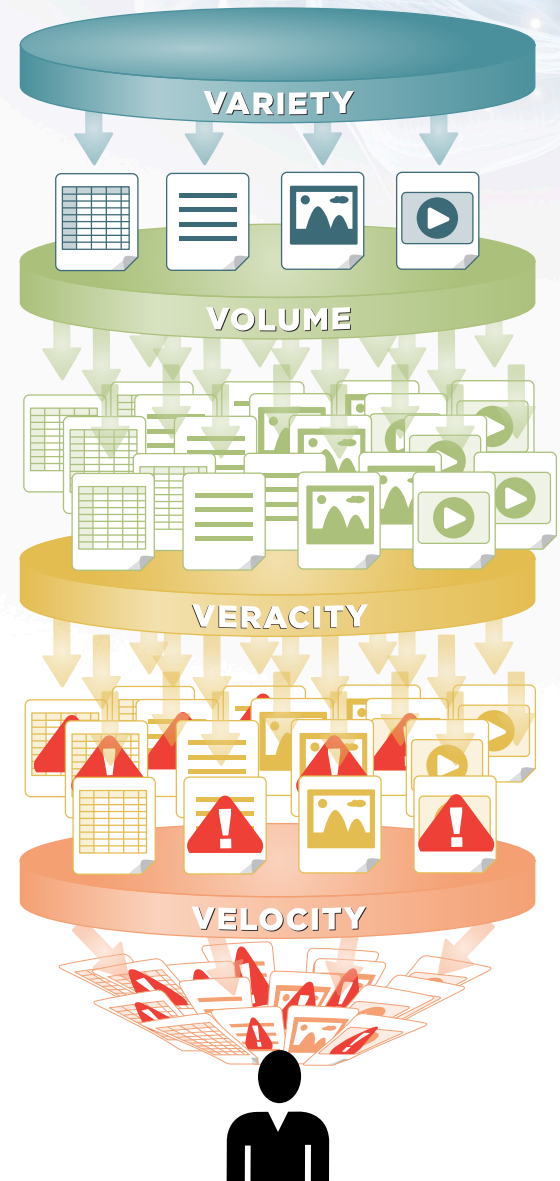
## The Evolution Drives The Analytic Modeling Revolution

These ideas of collaboration and context enabled by big data and available within IC ITE and ABI, have laid the groundwork for revolutionizing the way in which analysts do their jobs. That revolution is Analytic Modeling and as a tradecraft; it has been recognized by the ODNI and the NGA as a way to share knowledge and interrogate data in today's information rich environment.

The NGA defines Analytic Models as “representations of analysts understanding of adversary behavior relating to a Key Intelligence Question or intelligence topic. They capture and expose knowledge about what we know and what we think about adversary tactics, doctrine, and indicators, while highlighting associated gaps in our knowledge”. (Analytic Modeling Concept Paper, NGA, August 2014)

In plainer language, an Analytic Model is a visualization of what the analyst does – and does not – know. It's this idea of visualization that is key for collaboration and context and it's that collaboration and context that will enable the automation to ultimately create the efficiencies needed in today's analytic space.

Currently, the knowledge of an analyst is hidden away within text-heavy data sets, reports and even within the analysts own experiences. The burden to communicate what they know and what they think falls squarely with the individual analyst. This requires either lengthy verbal communication, which, depending upon lexicon variances, can lead to misinterpretations or misunderstandings, or time-consuming, manual report generation.



*The Challenge For Today's Analysts*



**Disparate users may have different views of the environment, based upon their focus, but they will all have the benefit of the context that comes from collaborative visualization.**

Analytic Modeling allows for externalized sharing in a visual and more analyst-consumable way. With the visual representation providing much needed context, the analysts are free to skip the “ramp-up” process and jump directly to discussions of assessments and hypotheses.

In addition, the visualization not only allows for effective sharing of what the analyst knows, it serves to highlight gaps in that knowledge. The analyst can more quickly identify the unknowns and directing analyst attention to areas where they can most provide value.

## Roadblocks To The Revolution

Every revolution has its roadblocks and Analytic Modeling is no different. Analytic tools fielded to date have fallen short of the needs of this nascent tradecraft. The tools are too rigid to keep pace with the rapid innovation that inherently accompanies the advances available from big data. Many tools are billed as collaborative, but they ultimately fall short as true collaborative technology because they only work within the context of their fielded environments and don't easily integrate across platforms and agencies.

## The Tradecraft Needs A Flexible Capability Not A Tool



General Dynamics Mission Systems (GDMS) believes analysts don't need to be burdened with another tool. Advancing the Analytic Modeling tradecraft requires not a tool, but a capability.

A tool implies an off-the shelf product with pre-defined parameters and restraints. A product meant to be used by any customer regardless of their unique needs.

GDMS approaches Analytic Modeling as an evolving capability - a whole new way of thinking about intelligence analytics.

## Invested For Success

In 2015, GDMS supported the ODNs ICIT transition activity, the Integrated Mission Thread. The activity was focused on testing

and proving how analysts can live and operate within an integrated, multi-INT environment. GDMS participated in the activity by working hand-in-hand with the analysts to deploy the Analytic Model Viewer (AMV) capability. This investment laid the groundwork for what is now a larger Analytic Modeling capability and an ongoing commitment to working with the analyst community in advancing the tradecraft.

**Security becomes an increasing concern. Because GDMS has a legacy of protecting our customers' most important information, multi-level security is built in to the model from the beginning.**

## **An Open Digital Ecosystem For Analysts**

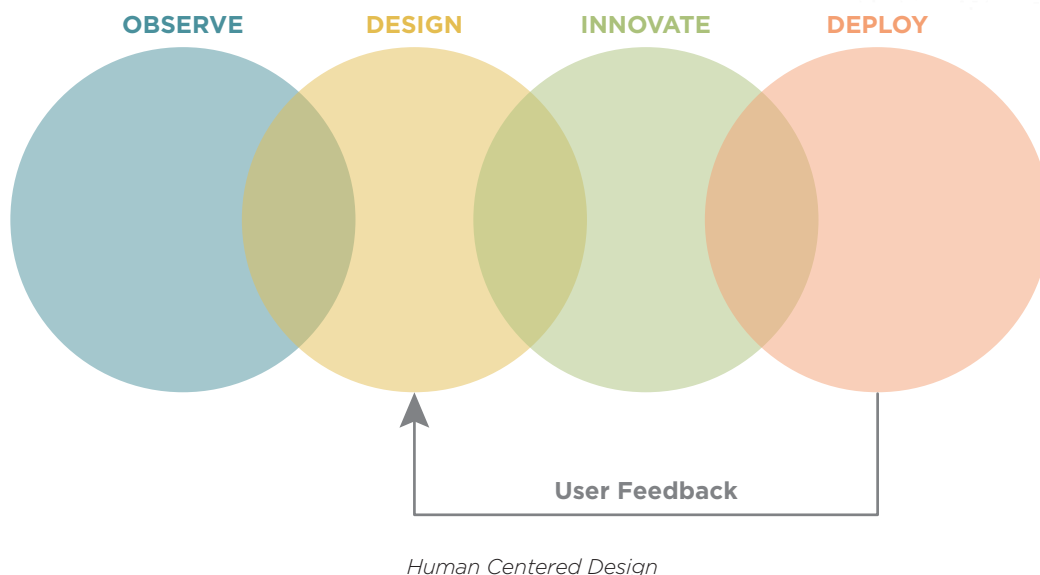
GDMS's Analytic Modeling approach enables a living, breathing, ever-changing ecosystem for intelligence analysts. This is a digital environment that establishes a common ground for analysts from multiple agencies and INTs, allowing them to easily engage with one another in a new form of "high-context" collaboration: more efficient, productive, and empowered.

Much like multi-player gaming, the collaborative, integrated environment provided by GDMS's Analytic Modeling capability allows each analyst to share their perspective with peers in other locations, agencies or INTs who are all operating within the same ecosystem. By design, these perspectives are different, but now can be coordinated. Disparate users may have different views of the environment, based upon their focus, but they will all have the benefit of the context that comes from collaborative visualization and will all be able to contribute to the development and of hypotheses.

## **Leveraging The Cloud On The Road To ABI**

In essence, GDMS is using a secure, cloud-based solution to enable the evolution of OBP and SOM to a methodology that relies more heavily on ABI by putting objects within the context of projected space and time.

By doing this, we provide the user an interactive canvas to actively compare and contrast their hypotheses and register questions asynchronously, improving collaboration not by relying on the current linear approach of analysts submitting requests for information, but by displaying the existing information needs.



With more and more contributors joining the environment for collaboration, security becomes an increasing concern. Because GDMS has a legacy of protecting our customers' most important information, multi-level security is built in to the model from the beginning.

Perhaps the most important benefit of analytic modeling is the potential for automated processes driven by collaboration within the ecosystem.

## Built For The Analyst Using Human Centered Design

GDMS approaches Analytic Modeling with the primary goal of meeting the needs of the intelligence consumer. That means engaging analysts to influence the form, fit and function of the capability.

As a leader in the Human Centered Design (HCD) process, GDMS begins by employing HCD principals to derive a list what an analyst needs from the model. A combination of interview, over the shoulder observation, concept decomposition, brief-backs, data analysis, and active listening allows us to identify inherent information and collaboration needs to deliver a user experience and user interface optimized for the needs of the analyst.

## Bringing Value To The Tradecraft

First and foremost, our goal is to create a user experience that overcomes the data overload and lack of collaboration that is seen in current OBP systems of record. Whereas previous tools have focused on getting information into a system, our focus is on creating a secure ecosystem that uses automation to reduce the cognitive burden on an analyst by extracting hypotheses out of the vast amount of data available.

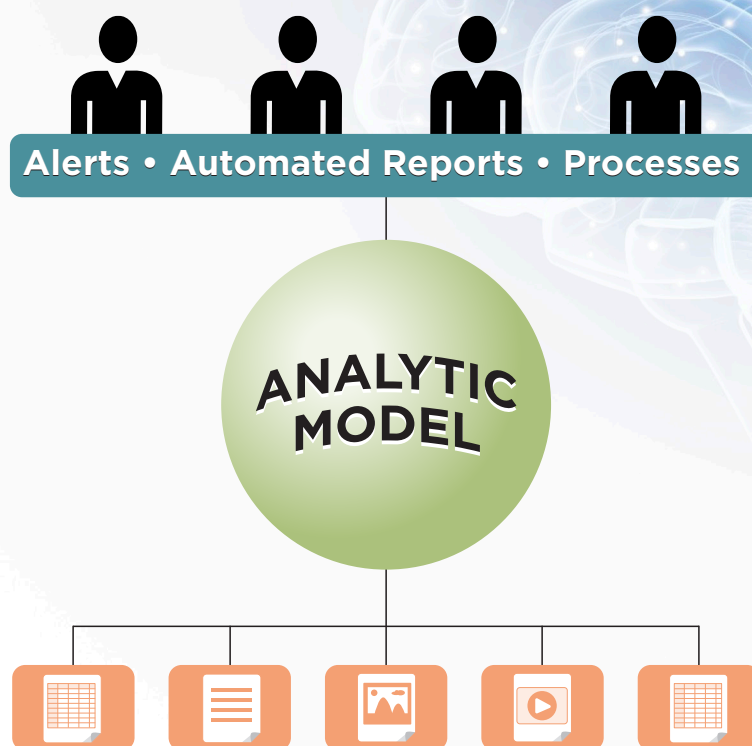
When working within the GDMS Analytic Model, analysts are able to observe how adversary objects move across time and geo-space, emphasizing the pattern of objects transactions and aiding analysts in the identification of the intent of the adversary activities.

The existence of this big picture view, leveraging the depth and breadth of the cloud, provides context that results in several very important benefits:

- 1. Reducing Ramp-Up:** An analyst no longer has to invest hours upfront explaining and reporting. Analytic Modeling allows them to jump forward to the more beneficial activity of discovery and the discussion of hypotheses. In addition, the cloud-based environment allows multiple analysts to securely participate in the discussion, eliminating the time-consuming need to have multiple independent conversations with multiple analysts.
- 2. Accelerated Expertise:** It's true that the purpose of an analyst is to observe and interpret intent. However it is the interpretation where independent expertise provides the most value. A visualization that provides higher order hypotheses in the context of OBP elements gives objects meaning, thus launching novices to a higher level of understanding more rapidly.
- 3. Finding & Addressing The Gaps:** Possibly just as important as what the analysts knows is what the analyst does not know. Visualization within the model highlights information gaps, thus providing the starting point for discussions.
- 4. Leadership Efficiency:** The benefits of GDMS' approach to Analytic Modeling expand beyond the analyst. Providing a visual overlay of all assigned, multi-agency collection & analyst resources empowers enterprise leadership to assess the quality of agencies' human and technical postures.
- 5. Automated Processes:** Perhaps the most important benefit of analytic modeling is the potential for automated processes driven by collaboration within the ecosystem. The collaborative efforts within the model will invoke higher order actions such as automation and machine learning, making analytic modeling the perfect medium for humans and machines to work together and learn from each other.



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## The Future Of Analytic Modeling

GDMS's Analytic Modeling capability is uniquely positioned to adapt and evolve with the dynamic changes inherent in a technology-driven world. What we're building today will take advantages of and enable the advances of the future.

Ultimately, Analytic Modeling will integrate seamlessly with the mission workflow. An analyst will perform all of their daily activities within the analytic environment linking objects within the models to intelligence data shared across the IC. This will provide broader context about the objects and provide near real time model status changes to analysts and decision makers.

In addition, collaboration will be empowered by and happen directly within the context of the shared knowledge represented in an Analytic Model, bringing together analysts, data scientists and technologists as a cohesive team. A team with the ability to leverage the direct application of expertise witnessed in analyst's externalized hypotheses, in the context of the observations they are based on.

As analysts arrive at hypotheses faster and more peers contribute to the discussion, the need for effective hypotheses management grows. The future state of Analytic Modeling will provide an environment that allows users to compare and contrast multiple hypotheses across the same set of data as well as track the evolution of the various hypotheses over days, weeks and months of analysis. More importantly, this hypotheses management function within the model will also be equipped to apply the decades of related critical thinking and reasoning research to inform or refute future hypotheses.

In short, the future of Analytic Modeling lies in the analytic environment as a living breathing ecosystem that evolves in real-time based upon hypothesis feedback from any user in any place at any time as well new data, as it becomes available anywhere in the world.



>> DATA <<