The VMI Top
Trends in Visualization Optimization
January 2012
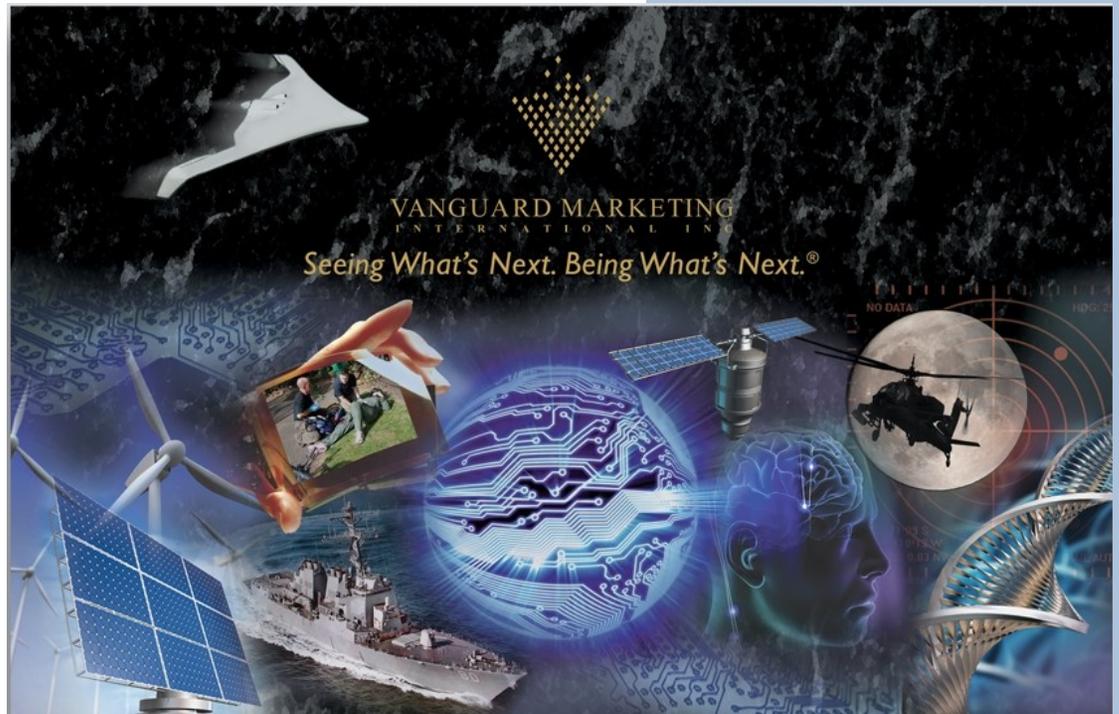
Seeing What's Next. Being What's Next.®

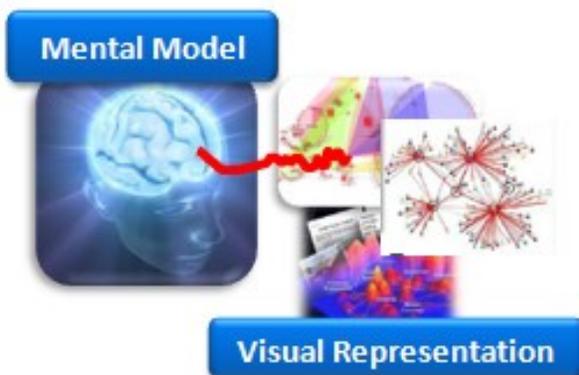# Top Trends in Visualization Optimization

What Thought Leaders are saying about leading trends in Visualization Tools and where they see the industry going in the coming years.

About the Research

Over the last few months, VMI has conducted extensive research and interviews with over thirty key opinion leaders and influencers across a variety of emerging visualization industries, ranging from technologists, academics, researchers and solution developers. These thought leaders became part of VMI's "Topical Community" and provided us with cross industry-level insights and perspectives. We thank them for their contributions to the body of knowledge and to this Top Trends briefing.

Introduction

Visualization is a process of discovery, leveraging human cognition and pattern recognition. While traditional analytical tools such as spreadsheets and statistical models focus on answering simple "Yes" or "No" questions, visualization promotes understanding and the leveraging of intuition. It essentially enables the understanding of the "Who, What, When, Where ___and Why___" behind increasingly complex problems facing today's analysts. However, there are emerging visualization pitfalls which include attention overload, visual fatigue and "paralysis by analysis." Therefore, the critical question to ask regarding improvements in visualization is, "How can the analyst take advantage of the benefits of visualization's discovery process while becoming more effective and more efficient for longer periods of time?"

#1 Finding in Visualization Optimization

In order to maximize an analyst's effectiveness, visualization tools should endeavor to optimize the alignment of an analysts "mental model" with the "visual representations" of the data. This alignment maximizes analyst cognition and minimizes many of the pitfalls of current visualization solutions as described above.

Optimization of visualization solutions can be achieved through emphasis on and improvements in five key areas when developing visualization tools:

- User Interface Interaction—for drilling down, interacting, and collaborating
- Human Machine Interface—for efficient, 6-sense-like input and output
- Human and Cognitive Factors—for aligning mental and visual interplay
- Display Technology—3D (glasses free) vs. 2D; tracked vs. untracked
- Convergence with Analytics— Intuitive decision systems and recommenders

Top Trends

While VMI uncovered numerous key trends impacting emerging visualization solutions, a few key findings stand out:

#1 Avoid the "Uncanny Valley" in visualization tools

While poorly designed visualization tools are unlikely to cause feeling of revulsion, they will cause the analyst to do something nearly as bad—turn the feature off.

- An Uncanny Valley-like effect from visualization tools can occur due to a variety of factors including but not limited to color, pixel density, perspective and even bandwidth lag.
- Uncanny Valley-like frustrations can be the undoing of even the best designed visualization architectures. If these issues are not overcome, significant adoption of the tool will not be achieved.

#2 The bar has changed in Human Machine Interfaces

Yesterday's emerging solutions have quickly become the new standard and emerging interfaces will change the way analysts use visualization tools.

- The last five years have seen accelerated cross-industry adoption of new human machine interfaces including touch screens, gesture control, facial recognition and natural language algorithms in voice control.
- As emerging Human Machine Interfaces continue to mature, incumbent interfaces of the last 40 years, the mouse and keyboard, will quickly become obsolete.
- Incremental improvements of these interfaces are occurring across industries and are being used in new and innovation applications, including soft-biometrics and advertising.
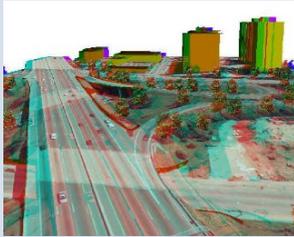
#3 3D may be useful for some analysts, but technology must improve

Improvement in graphics quality and interface tools must first be made before increased adoption will take place.

- ROI for the analyst is still very much in question.
- 3D is best for situational/environmental understanding, but it needs more photorealism and higher pixilation to be an effective visualization tool.
- There is an unmet need for a 3D display that multiple analysts can walk around and view from many angles. Auto stereoscopic (tracked) displays will some day be the holy grail of display technologies.
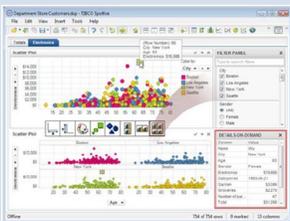
#4 No programming skills required

Intuitive user interfaces are putting visualization representation development directly into the hands of the analyst rather than the IT department.

- Analysts need to be able to develop visualization tools on the fly, with no prior programming knowledge.
- The gaming industry continues to be the leader in the development of intuitive, user-defined visualization dashboards and programming tools.

#5 Mobile is the next frontier in visualization

Significant advances in mobile hardware have disrupted the way mobile devices are being utilized by analysts in the field.

- Analysts' ability to both receive and input data have improved considerably as a result of advances.
- The new expectation for mobile is seamless integration across platforms and direct integration with next-generation command centers.
- Notable advances include integration of tracked 3D visualization tools for advanced mobile situational awareness and augmented reality overlays, and improvements in the ruggedness of mobile tools.
- Adoption of 3D interaction on mobile devices continues to grow. With hundreds of millions of dollars being invested in R&D, advancements in realism will be driven by gaming and e-commerce in the near future.

Surface computing collaboration

#6 Advanced analytics continue to converge with next generation visualization tools.

Analytics are becoming ubiquitous along the 'information' value chain.

- Advanced analytical tools such as sentiment analysis, visual overlays and advanced visual analytic algorithms help minimize analyst fatigue when using visualization tools.
- Recommender analytics will become standard for next steps in uncovering who, what, where and why.
- 'Robotic Eye' overlays on visuals feeds analytics by taking an image and pulling out select necessary information. Therefore, the analyst can drill down critical issues much more quickly.

Conclusion

In order to maximize an analyst's effectiveness, visualization tools must optimize the alignment between the analyst's "mental model" and the "visual representations" of the data. This alignment maximizes analysts' cognition and minimizes many of the pitfalls of current visualization solutions, including attention overload, visual fatigue and "paralysis by analysis". Optimization will be enabled by key improvements and emerging technologies in the areas of User Interface Interaction, Human Machine Interface, Human and Cognitive Factors, Display Technology, and Advanced Analytics.

Current generation visualization tools exist primarily in core analysts industries such as business analytics, defense & security, and networking. VMI concludes that future, more optimized visualization tools will have far reaching implications in establishing not only the Who, What, What, Where *but the Why* across all industries.

Again, we would like to thank our thought leaders (VMI's Topical Community), without who's help this paper would not be possible. Their insights continue to deliver great value to our research and allow us to provide you with a cross industry perspective.

While this briefing has covered stand out trends, if you are interested in gaining further insights into our findings, we would be happy to arrange a telecom to discuss them in further detail. Please give us a call at 480-488-5707.

The VMI Team

About VMI

Founded in 1992, in Phoenix, Arizona, Vanguard Marketing International's longstanding mission is, "to be widely recognized for clear cutting edge thinking and delivery of actionable results that make a difference for our clients." VMI's methodologies and expertise gives us the ability to analyze markets and design processes that produce disruptive, innovative, low-risk strategies and action plans. VMI works on an ongoing basis with many of its clients to ensure that they address changing market needs, capitalize on important industry trends, and maintain brands, which clearly differentiate their company and innovations throughout the investment community and prospective markets.

About Beyond Line of Sight

The objective of the Beyond Line of Sight methodology is to identify emerging trends or validate previously identified trends in selected industries and markets. Trends are posted and maintained on the VMI trend database. There are many applications for the data but the primary purpose is to enable VMI to map trends across industries and markets over time.

Most people believe that when they observe a trend it is the first it has ever appeared but in fact trends evolve and migrate across industries and markets over decades. As a result, one industry may have ten years experience with a trend while another is just beginning to feel its effects. By connecting trends and business models across industries and time we gain understanding of what the future holds for our clients with a high degree of probability.

As a follow-up, the reader is encouraged to review Vanguard Marketing's website and published white papers on selected topics related to VMI's core competencies at:

<div align="center">http://www.e-vmi.com/html/papers.html</div>

<div align="center">For more information or to contribute to this or other white papers: Call 480-488-5707</div>