



Automated Support Tools for Verification, Validation, and Accreditation

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Why Conduct VV&A?

- **Establishes credibility**
- **Reduces risk**
- **Enhances user confidence**
 - **improved system performance and reliability**
 - **more predictable and accurate behavior**
- **Complies with DoD Policy**



Need for VV&A Tools

- Perception that VV&A takes too long and costs too much
 - no “tried and true approach”
 - no way to know “how much is enough.”
- DoD M&S Master Plan: need to develop “standardized automated tools to support VV&A.”
- As noted at the SIMVAL99 conference:
 - the community is not exploiting existing technology as much as desired *and* has not given adequate attention to the benefits of tools and technologies
 - management and practitioners unaware of existing tools and technologies
 - the community needs a comprehensive survey of tools and technologies *and* a central repository to document tool use or to serve as a resource



Objective of this Report

MSIAC Vision

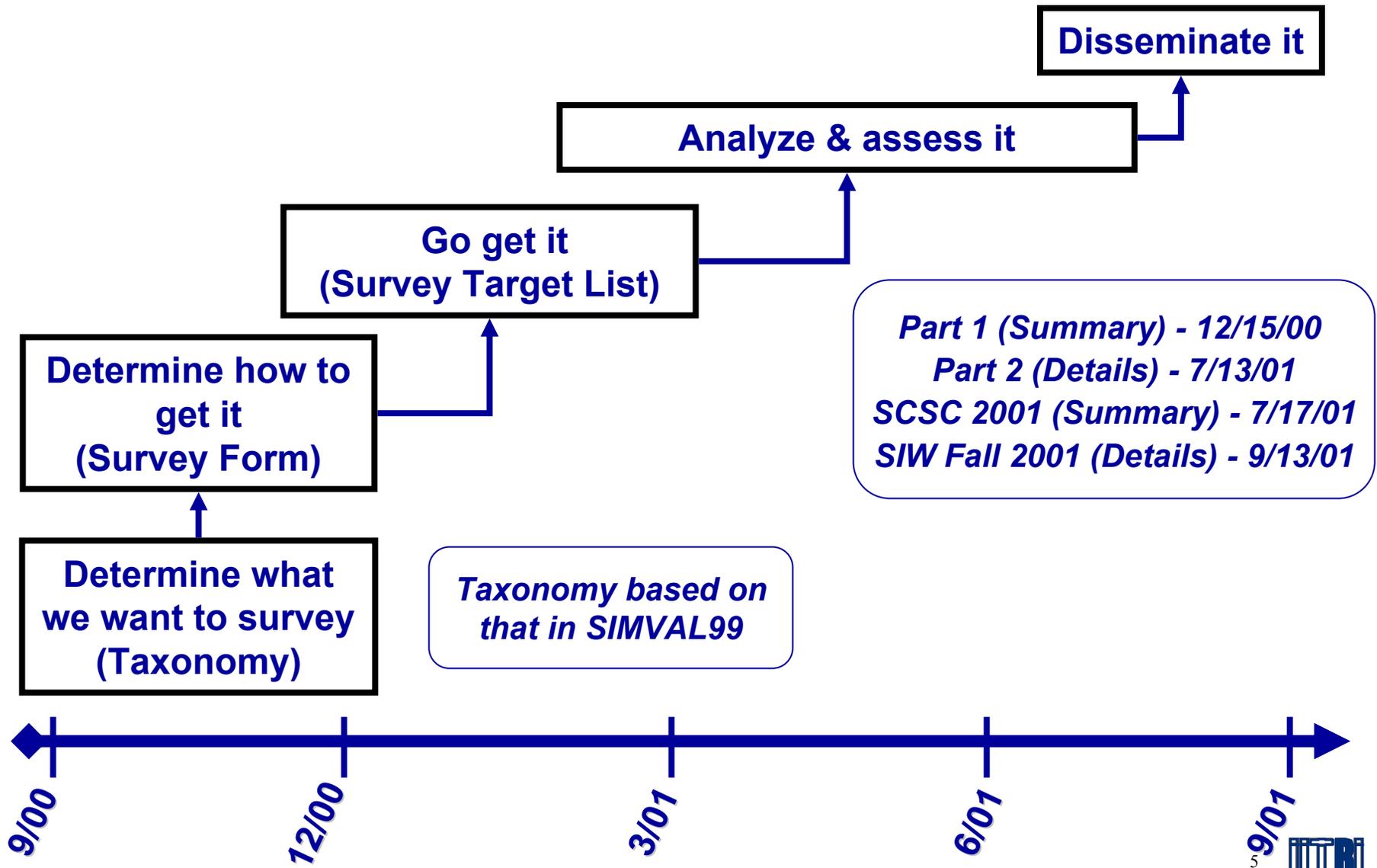
M&S Community Needs

**State of the Art Report:
*VV&A Automated Support Tools***

- **Assess the breadth of existing tools for VV&A and their applicability**
- **Identify gaps in coverage and/or quality**
- **Provide recommendations for the types of tools that will be needed in the future**



Approach





Survey Targeting

- **VV&A-focused organizations**
- **Government and commercial organizations that might use or create VV&A automated support tools**
- **Group e-mail lists and e-mail reflectors within the M&S community**

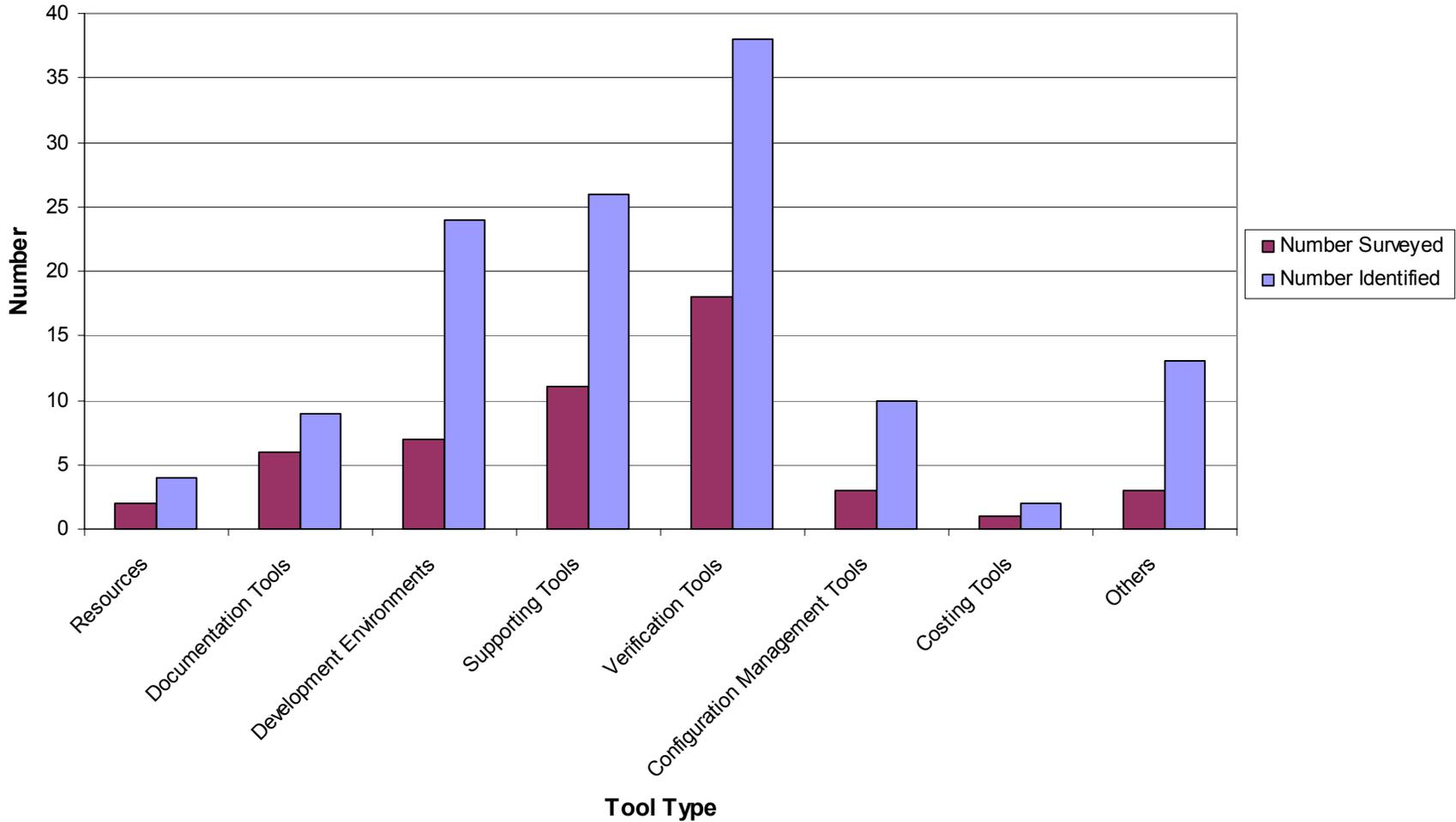


Tool Types

- **Resources**
- **Documentation tools**
- **Development environments**
- **Supporting tools**
- **Verification tools**
- **Configuration management tools**
- **Costing tools**
- **Others**

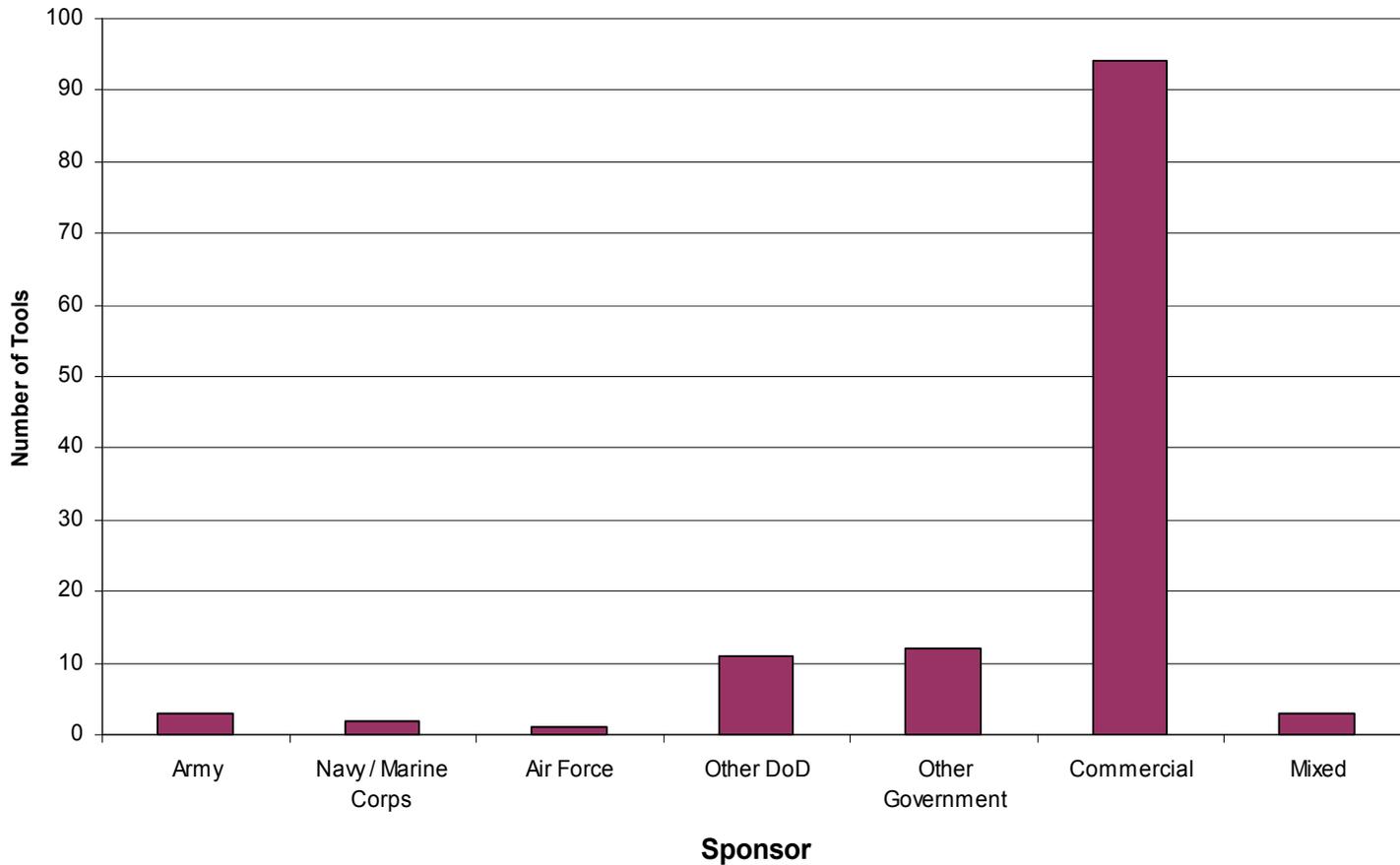


Tools Surveyed/Identified By Type





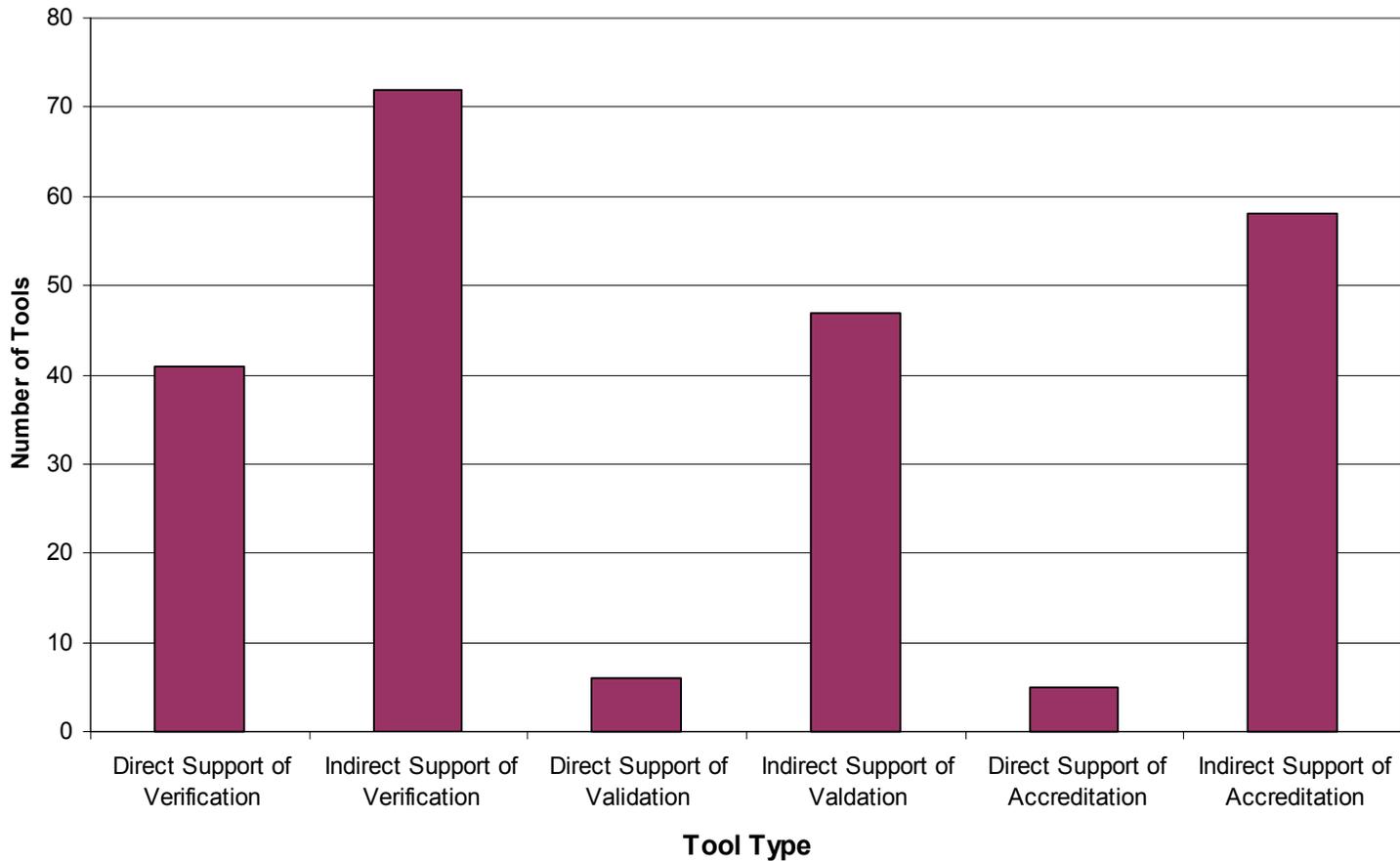
Tools Identified By Sponsor





Tools Identified By Use

Tools may have multiple uses





Resources

Websites and repositories containing references, policies, toolsets, and information useful to VV&A practitioners

- **Some intended only for one model or simulation but concept can be generalized**
- **Some intended for use with multiple models or simulations**
- **Technology and utility demonstrated, coverage not complete (and may never be)**
- **All resources government funded**
- **Example – JASA Library of Accreditation Information**



Documentation Tools

Planning/Documentation Aids

Assist accreditation authorities or V&V agents in performing their duties

- Very promising and rapidly maturing
- Government developed
- Most significant tools in report
- Examples – V&V Manager's Toolkit, DON VVA Turbo tool

Software Documentation Tools

Products intended to automate preparation of quality software documentation

- COTS
- Example - Surveyor



Development Environments

Software development environments

General-purpose tools to enable quality software team development

- COTS
- Examples – Code Wizard, KhorosPro

Modeling tools / Simulation development environments

Construct models/simulations from simple components

- Useful for expressing conceptual models
- Care needs to be used in selection of tool
- Example – Artisan Real Time Studio

Federation development tools

Used to assist creation of HLA-compliant federations

- Little information available
- Example – Distributed Simulation Interface Framework



Supporting Tools

Visualization tools

- Useful for “look and feel” validation
- Can sometimes display problems mathematical analyses miss
- Mature, although development continues
- COTS technology, government tools for special purposes
- Axum, Mak Stealth

Mathematics / Statistics packages

- COTS tools for analysis of input and results
- Examples – Matlab, Statgraphics Plus



Verification Tools

Requirements management, specification, and tracing tools

Capture and track information to assure and document project compliance to a wide range of requirements and standards

- Several COTS tools available have been used for software and non-software projects
- Example – DOORS

Automated software testing, measurement, and debugging tools

- Wide variety of COTS tools for different applications
- Examples – Jtest, Ferret

Simulation testing tools

Specialized tools to test simulations (usually distributed simulations)

- Need to assure capture of information not exchanged or not exchanged via HLA RTI
- Example – Temporal Verification Framework



Configuration Management Tools

Configuration management tools monitor and track changes to ensure that conflicts do not arise and that contents (software, hardware, communications) and functions are well-defined

- **Several COTS products available for different applications**
- **Example – Neuma CM+**



Costing Tools

Software costing tools

Estimate costs of software development

- Useful for planning software V&V costs
- COTS and government tools exist
- Example - CostModeler

Costing tool testbeds

Developed to test software costing tools

- Useful for testing VV&A cost models
- Specialized VV&A costing tools exist, both standalone and as part of planning aids



Others

Compilation tools - COTS

Reliability evaluation tools – government – E.g., PREDICT

Database checkers and design tools - COTS, GOTS

Optimizers for simulation inputs

- Tool useful for uncertainty analysis
- License available
- Example - DAKOTA

Floating point error analysis tools - COTS, academic, government

Software analysis tools - COTS, GOTS

Error collection and analysis tools - GOTS



Overall Conclusions

- **Automated tools are needed for supporting VV&A: there are already many tools that can be adopted or adapted**
- **These tools satisfy many of the requirements for supporting VV&A**
- **No single tool satisfies all of the requirements for support of verification or accreditation**
- **The scope of automated tools that support validation is limited**



Recommendations

- **Develop more automated support tools for VV&A**
 - **Adopt or adapt tools from the software industry**
 - **Develop new types of automated support tools for VV&A**
- **Integrate existing tools into the VV&A and M&S development processes**
- **Establish a central repository of automated support tools for VV&A**
- **Future surveys should be tailored for commercial recipients**



Summary

- The state of the art report is online
- We would like to list additional tools in conference report
- MSRR can also list tools
- We want and need your inputs!

Contact the MSIAC:

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