



Certified Modeling & Simulation Professional Program

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Professional Certificate Commission
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Why should you be a CMSP?

- CMSP as credential
 - Peers: community-recognized certification of expertise
 - Customers: qualifications discriminator for competitive proposals
 - Employer: professional certification for career advancement
- CMSP as learning experience
 - Preparation for and completion of CMSP enhances M&S knowledge
 - Renewal requirements drive continuous M&S learning
- CMSP as a bargain
 - I/ITSEC discounts

Modeling and Simulation Professional Certificate Commission

- The MSPCC, acting through its Board of Directors, is responsible to:
 - specify the education, experience, and knowledge standards for;
 - to create, maintain, and administer the business and technical process for;
 - and assess the qualification of candidates desiring to become a;

Certified Modeling and Simulation Professional

Vision

A worldwide community of Modeling and Simulation Professionals that values the accomplishments of individuals and provides an environment that:

- Encourages and stimulates individual professional growth in Modeling and Simulation
- Promotes the development and application of Modeling and Simulation

Mission

To develop and maintain a Certification Program for Simulation Professionals recognizing standard level of knowledge and functional competency for the certified professionals and the industry

Organizational Principles

- Transparency – Open process, clear values
 - Publicly available program data
 - Convincing evidence of compliance
- Quality – Traceability to requirements and body of Knowledge
 - Questions private
 - Requirements public
- Confidence – Certified Professional is knowledgeable
- Ethics – Clear standards endorsed and enforced

Goals

The CMSP Program Plan:

- **Establishes requirements for operations, organization, and products,**
- **Defines processes for product development, product evaluation, and operations and**
- **Provides visibility into the value and significance of the certification to third parties.**

Background - 2001

- **M&S industry and market rapidly maturing**
- **M&S not clearly identified as a profession**
- **No set of qualifications or functional competencies inherent in M&S**
- **Lack of guidelines governing M&S professionals**

The Modeling & Simulation Professional Certificate (M&SPC) Commission was established to address these needs

Training Programs

A version of the test was allocated to support development of certificate preparation training classes. Such classes have been developed and are currently available...

University-based Preparation Programs

- **University of Alabama – Huntsville offers a continuing education program whose tuition fee includes the certificate fee. The development of this program was sponsored by the Alabama Modeling and Simulation Council**
- **University of Central Florida annually offers a one day preparation class in association with the Industry / Inter-service Training and Simulation Conference. This course was developed under the leadership of Dr. Peter Kincaid, with support from CMSP program volunteers**

Conferences, Tutorials

- **Volunteers from the CMSP program quite frequently offer conference sessions and tutorials that range from program overviews to preparation tutorials**
- **This presence is growing**

Other M&S Education and Training (partial list)

- [ASU](#) Online Graduate Courses
- [DigiPen](#) Bachelor of Science in Real-Time Interactive Simulation
- [Georgia Tech](#) Certificate in Modeling and Computer Simulation
- [Southern Maryland Higher Education Center](#) Modeling and Simulation Masters Degree
- [UCF](#) Graduate Program in Simulation and Gaming Studies
- [Univ. of Cincinnati](#) Graduate Programs for Computational Simulation of Aerospace Structures
- [Univ. of Michigan](#) Modeling and Simulation Program
- [Virginia Tech](#) - Online Graduate Degree: Modeling and Simulation
- [Old Dominion University](#) Graduate and Undergraduate Programs in Modeling and Simulation
- [UAHuntsville](#) Graduate program, Continuing Education
- [Georgia Tech](#) Continuing Education
- [George Mason University](#) Continuing Education
- And others...








Operational Experience since 2001

- **The program has established a useful examination, and a workable program of operation.**
- **Certificates continue to be awarded on a regular basis**
- **The program has not been changed since it was established**

Why Change?

- **The program lacks well documented processes by which it can be updated and maintained**
- **The program processes lack the clarity and transparency needed to gain improved credibility and acceptance in the broad M&S community**
- **Services to existing certificate holders were not well addressed in the original plan**

Coordinated Strategy

Strong ethics	<ul style="list-style-type: none"> ▪ Statement released, adopted by many professional organizations 	
Cooperative professional organizations	<ul style="list-style-type: none"> ▪ Fledging efforts to increase cooperation – joint conferences, Sim-summit membership 	
Well defined Body of Knowledge	<ul style="list-style-type: none"> ▪ Program initiated 	
Common education programs	<ul style="list-style-type: none"> ▪ Program being developed 	
Professional certification programs	<ul style="list-style-type: none"> ▪ Program in place, acceptance issues 	
Available employment statistics	<ul style="list-style-type: none"> ▪ Proposal for M&S North American Industry Code Submitted 	
Defined research agenda	<ul style="list-style-type: none"> ▪ No program in place or planned 	

CMSP improvement strategy elements

The updated program must address:

- **Ethics**
- **Cooperation with BoK**
- **Cooperation with Societies**
- **Broad, international scope of M&S**
- **Cooperation with Universities**

Updated CMSP Program

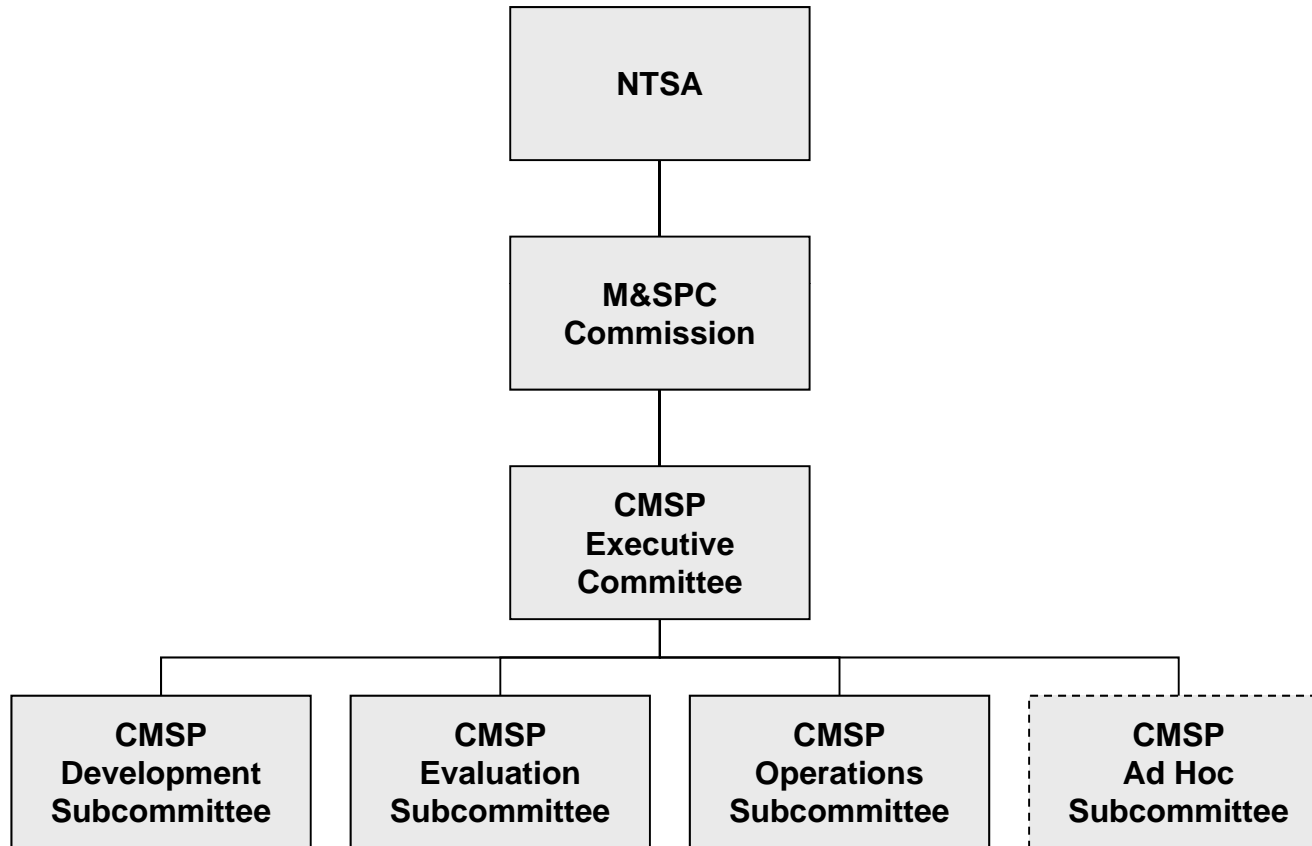
- **Driving requirements**
- **Examination structure**
- **Program Organization**
- **Program Processes**
- **Program Business processes**
- **This program is a professional certificate program – not an education certificate program**
- **The MSPCC adopted, and adapted, ASTM E2659-09, a standard set of requirements for a certificate program**
 - **Consistent with ISO/IEC 17011 - accreditation standard for certificate issuers**

Test Topic Areas

Test questions are categorized into one of more of 14 topic areas:

- 1. History of M&S**
- 2. M&S practice /ethics**
- 3. M&S fundamental concepts**
- 4. Related communities-of-practice and disciplines**
- 5. M&S life-cycle**
- 6. M&S representation schemas**
- 7. Types of simulation implementation**
- 8. Tools, techniques, standards and resources**
- 9. Types of use of M&S**
- 10. Domains of use of M&S**
- 11. Management of M&S**
- 12. M&S workforce development**
- 13. M&S industrial development**
- 14. M&S business practice and economics**

CMSP Program Organization



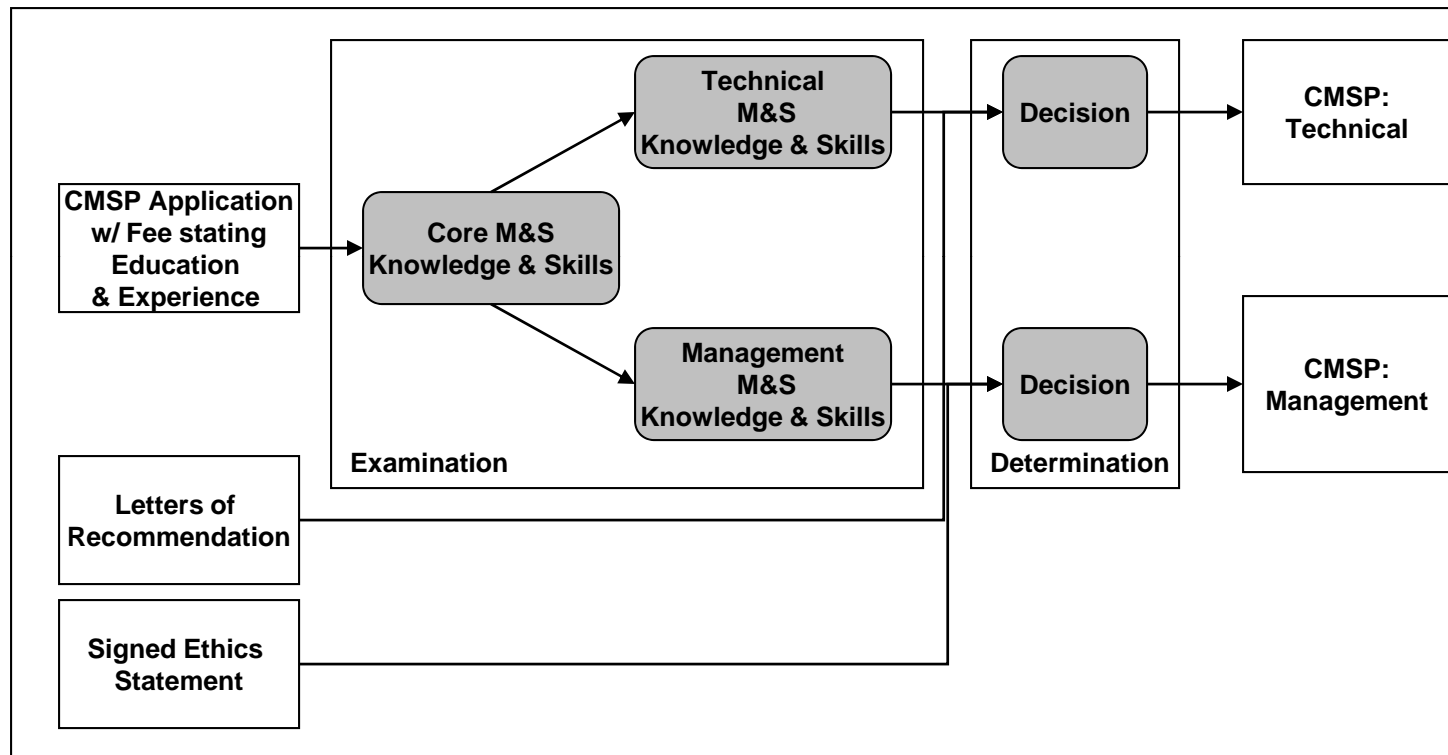
Business Practices - Summary

- To launch and sustain a user driven, broadly collaborative, persistent, and productive program of activity wherein members of the M&S community-of-practice may continue:
 - To identify and support M&S professionals,
 - To do so with an authoritative, consensus based M&S BoK,
 - Which establishes a set of operational competencies that define, de facto, the M&S profession and industry.
- The M&SPC Commission may enter financial and other agreements with sponsoring organizations for the purpose of promoting the CMSP program and its certifications. All such agreements will be publicly disclosed.
- The M&SPC Commission will enter no commercial agreement that creates an actual or perceived conflict of interest between the commercial agreement and the goals, mission, or practices of the M&SPC Commission or CMSP program.

Business Practices - Summary

- The M&SPC Commission intends to be financially self-sufficient and independent from the influence of any other government or private agency and to be responsive solely to the interests of the stakeholders.
- All committee members and officers of the commission will avoid situations that create a real or perceived conflict of interest between their activities and the goals, mission, or practices of the program. Members and officers are required to identify all such actual and potential conflicts at the time of their appointment and again annually during their time of service. Measures taken to abate such conflicts may range from simple acknowledgement and disclosure, to recusal, to resignation or removal from office.
- The M&SPC Commission does not require candidates, committee members or officers to hold membership in any organization or group to qualify for the certification. The requirements for a candidate to be certified as an M&S professional are exactly as defined in this document and no additional requirements, constraints, or preferences are to be applied.

Initial Certificate Award Process



Examination Practices

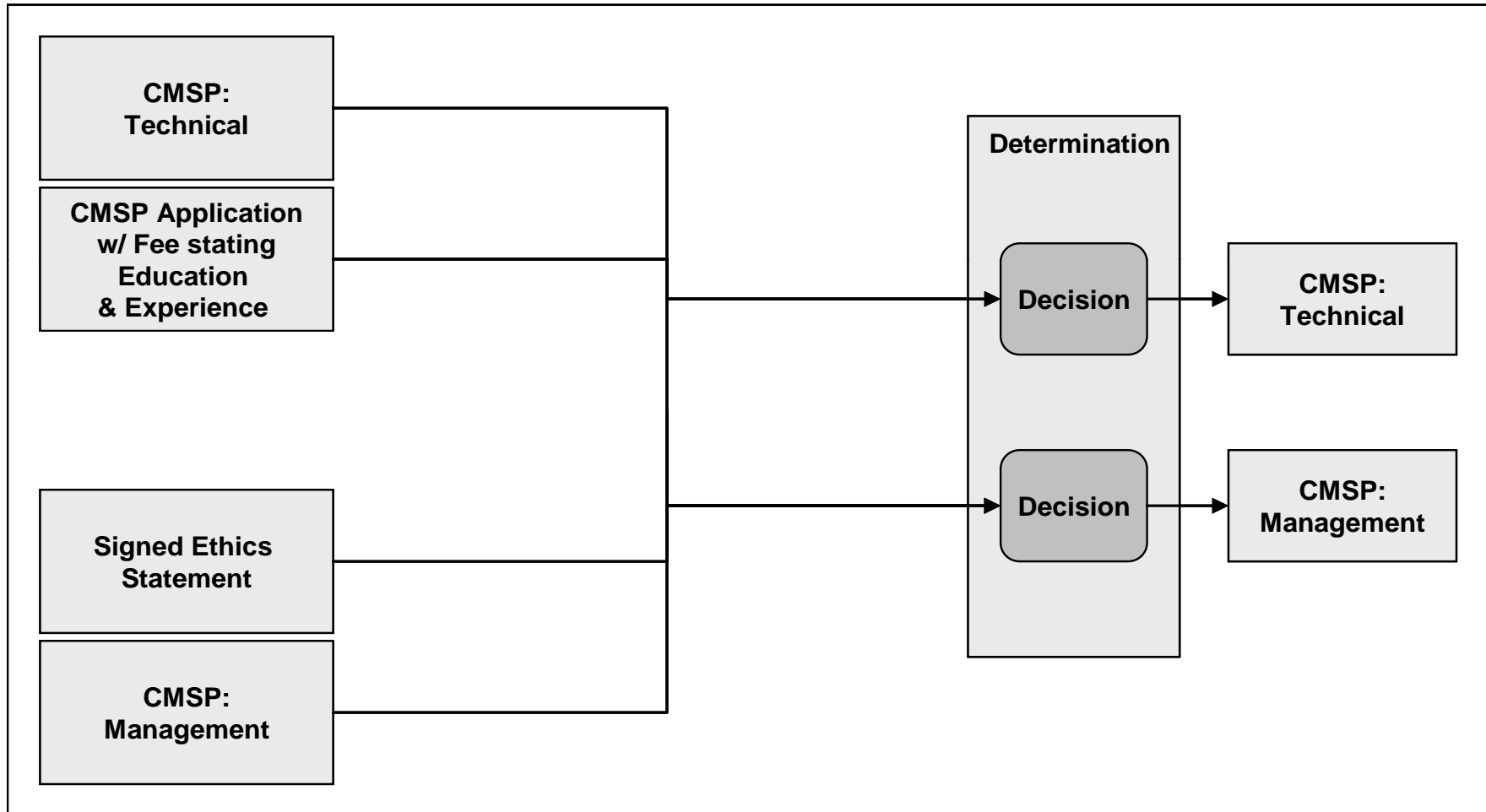
- **There are two forms of the certification: technical and management**
- **Initial award of certification requires successful completion of an examination as part of the requirements**
- **The examination is designed to measure mastery of specific knowledge and skills**
- **The examination for the CMSP Technical Certification measures mastery of knowledge and skills within two areas: core and technical**
- **The examination for the CMSP Management Certification measures mastery of knowledge and skills within two areas: core and management**

Certification Holder Practices

- **The program recognizes holders of the CMSP certification as stakeholders**
- **The program does not qualify holders for employment or indemnify employers of certification holders**
- **The certification is granted for a period of four (4) years**
- **Holders of the Certification may renew their certification via submittal of a renewal application and fee, subject to demonstration of:**
 - 1. Formal re-subscription to the M&S Simulationist Code of Ethics**
 - 2. Documentation of a minimum of 275 Recertification Units**

Appropriate recertification activities include formal education, participation in technical conference or seminars, publications

CMSP Certification Renewal Process



CMSP Recertification Requirements

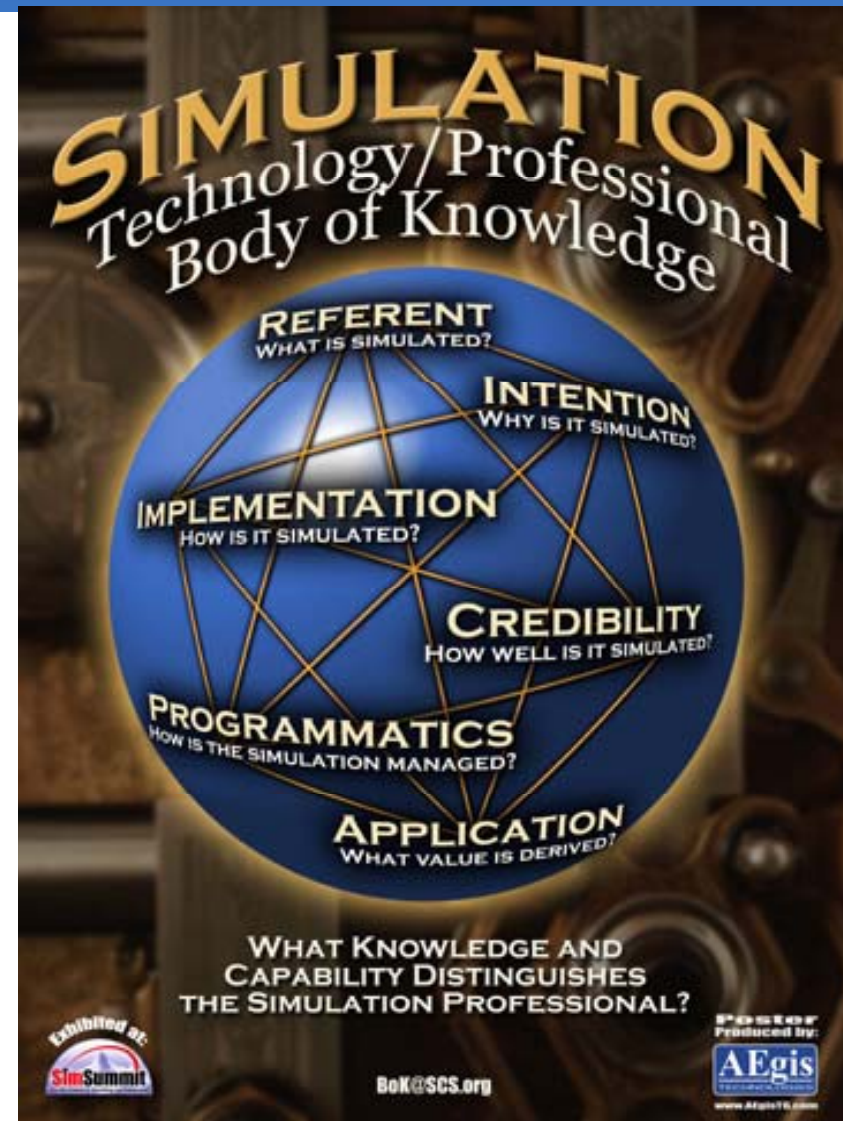
- **Requirements/Guidelines**
- **Employment**
- **Publications**
- **Professional Society Participation**
- **Education**
- **Conferences**
- **Continuing Education Units**

CMSP Recertification Requirements/Guidelines

- 1. 275 recertification units (RU) are required over 4 years to re-qualify actively employed certification holders. Retired certification holders require 20 RU to re-qualify.**
- 2. Four years after receiving certification or recertification, certification holders must apply for recertification.**
- 3. Unless otherwise specified, one cannot earn double points by applying any single activity to more than one category. For example:**
 - a) A person whose regular duties include teaching can get points for either "Employment" or "Teaching", but not both.**
 - b) A full time employee who takes a company-offered/sponsored course on company time as part of regular duties can only get points for "Employment" (not "Education" too).**
 - c) Credit, however, can be earned for part-time work. (i.e., a research associate can earn credit for teaching a class).**

Simulation Body of Knowledge

http://www.sim-summit.org/BoK/BoK_HomePage.htm



BoK Description

- The Body-of-Knowledge for M&S (M&S BoK) is the domain of knowledge (information) and capability (competency) that serves to provide identity to the M&S Community of Practice (COP)... and subsequently the M&S profession, industry, and market.
- The M&S BoK-Index is a semantic index to the BoK Domain-Knowledge-Elements (KE), and their relationships
- The BoK Index Guide is an introductory guidebook on the need, intent, requirements, development, and application of the BoK-Index

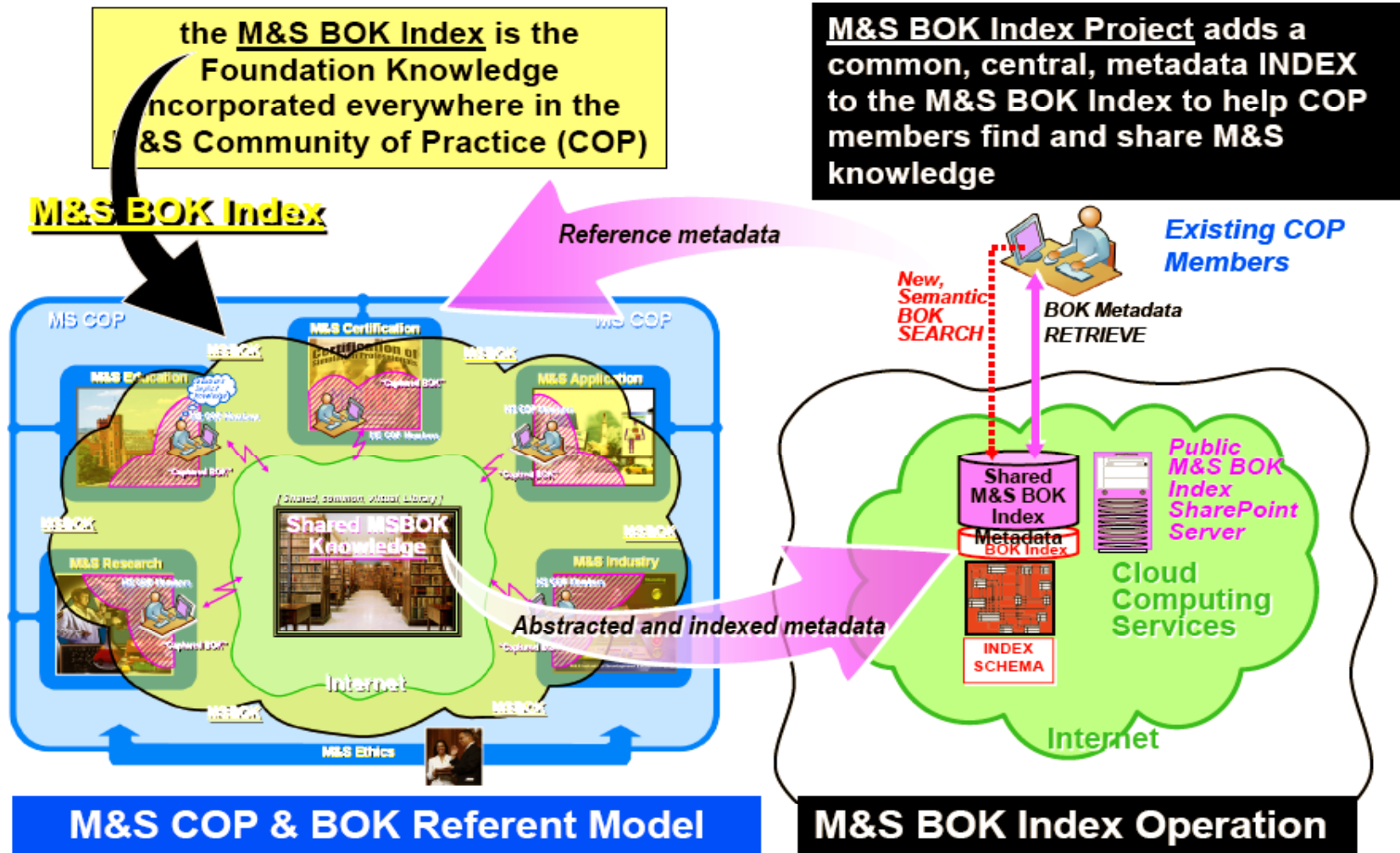
Value of BoK Index (1 of 2)

- **Technology**
 - **Simulation researcher -suggests the range of areas (critical technologies, grand challenges) toward which his efforts may profitably directed**
- **Professional development**
 - **M&S professional -provides a comprehensive view of his professional development and employment alternatives**
 - **M&S training and education provider -gives an indication of topical areas wherein instruction and training are likely desired**
 - **M&S professional certification authority -delineates the domain over which certification determination needs to be supported**

Value of BoK Index (2 of 2)

- **Industrial development**
 - **M&S industrial development agent -illustrates the range over which the technology offers value**
 - **Professional societies -identifies M&S constituencies to whom they may direct their actions**
- **Business**
 - **M&S product and service provider (sellers) within industry or government -provides a menu of potential market domains in to which particular product or service offerings may be targeted**
 - **M&S asset investment agent (buyers) in government or industry -identifies investment options available for consideration**

Concept of Operations



BoK Core Areas

- M&S: [Perceptions](#) From Different Perspectives
- M&S: Science/methodology
 - - Data
 - - [Models](#)
 - - [Experimentation](#)
 - - [Model behavior](#)
- M&S: Life cycle for experimentation
- M&S: Life cycle for experience
- M&S: [Technology](#)
- M&S: [Infrastructure](#)
- M&S: [Reliability](#)
- M&S: [Ethics](#)
- M&S: [History](#)
- M&S: [Lessons learned](#)
- M&S: [Trends and challenges](#)
- M&S: [Enterprise](#)
- M&S: [Maturity](#)
- M&S: [Terminology](#)

Is There a Need for a Code of Ethics?

- **To some, codes of ethics serve no good purpose whatever:**
 - **Because ethics should be open-ended and reflective, while relying on a code of ethics is to confuse ethics with law.**
 - **Further, it is a mistake to assume that there are special ethics for professionals that are separate from the ethics of ordinary human beings within a moral society. Professionals have no special rights or duties separate from their rights and duties as moral persons, and therefore codes of ethics are pointless and possibly pernicious.**
- Iva Smit

Is There a Need for a Code of Ethics?

- **The people supporting the use of codes of ethics postulate that codes of ethics can:**
 - **Serve as a collective recognition by members of a profession of its responsibilities**
 - **Help create an environment in which ethical behavior is the norm**
 - **Serve as a guide or reminder in specific situations**
 - **Enrich a profession in the process of developing and modifying the code**
 - **Protect professionals from certain pressures and serve as a solution to coordination problems**
 - **Serve as an educational tool, providing a focal point for discussion in classes and professional meetings**
 - **Indicate to others that the profession is seriously concerned with responsible, professional conduct**

▪ Iva Smit

How will a code of conduct change common practices?

- **A code of conduct, of course, will not automatically change common practice**
- **Only if there is an understandable penalty on misbehaving will such a code have any influence**
 - **However small the penalty is, e.g., membership of professional society being rescinded after warning**
- **The other side of this is that as soon as the public starts up malpractice cases for professionals acting against the Code(s) of Conduct, the professionals will, in general, hurry to conform**
- **It must be noted, however, that even in professions where this occurs already (medical doctors, accountants, etc.) there still are (groups of) individuals that do not toe the line**
- **Human nature and "money is the root of all evil," I presume. In some cases, you need a federal (or global?) authority to force people to behave (case in point: the SEC in the US)**

Simulation-related Ethical Questions

- **What is your responsibility ...**
 - **If users violate the limitations of a simulation?**
 - **If developers lack sufficient information to build a simulation?**
 - **If managers accredit by fiat?**
- **As a final ironic thought, simulation is the most common tool used to study ethics**

A Simulation Code of Ethics

<http://www.scs.org/ethics/scsEthicsCode.pdf>

1. PERSONAL DEVELOPMENT AND THE PROFESSION

As a simulationist I will:

- 1.1 Acquire and maintain professional competence and attitude.**
- 1.2 Treat fairly employees, clients, users, colleagues, and employers.**
- 1.3 Encourage and support new entrants to the profession.**
- 1.4 Support fellow practitioners and members of other professions who are engaged in modeling and simulation.**
- 1.5 Assists colleagues to achieve reliable results.**
- 1.6 Promote the reliable and credible use of modeling and simulation.**
- 1.7 Promote the modeling and simulation profession; e.g., advance public knowledge and appreciation of modeling and simulation and clarify and counter false or misleading statements.**

A Simulation Code of Ethics, continued

2. PROFESSIONAL COMPETENCE

As a simulationist I will:

- 2.1 Assure product and/or service quality by the use of proper methodologies and technologies.**
- 2.2 Seek, utilize, and provide critical professional review.**
- 2.3 Recommend and stipulate proper and achievable goals for any project.**
- 2.4 Document simulation studies and/or systems comprehensibly and accurately to authorized parties.**
- 2.5 Provide full disclosure of system design assumptions and known limitations and problems to authorized parties.**
- 2.6 Be explicit and unequivocal about the conditions of applicability of specific models and associated simulation results.**
- 2.7 Caution against acceptance of modeling and simulation results when there is insufficient evidence of thorough validation and verification.**
- 2.8 Assure thorough and unbiased interpretations and evaluations of the results of modeling and simulation studies.**

A Simulation Code of Ethics, continued

3. TRUSTWORTHINESS

As a simulationist I will:

- 3.1 Be honest about any circumstances that might lead to conflict of interest.**
- 3.2 Honor contracts, agreements, and assigned responsibilities and accountabilities.**
- 3.3 Help develop an organizational environment that is supportive of ethical behavior.**
- 3.4 Support studies which will not harm humans (current and future generations) as well as environment.**

A Simulation Code of Ethics, continued

4. PROPERTY RIGHTS AND DUE CREDIT

As a simulationist I will:

4.1 Give full acknowledgement to the contributions of others.

4.2 Give proper credit for intellectual property.

4.3 Honor property rights including copyrights and patents.

4.4 Honor privacy rights of individuals and organizations as well as confidentiality of the relevant data and knowledge.

A Simulation Code of Ethics, continued

5. COMPLIANCE WITH THE CODE

As a simulationist I will:

5.1 Adhere to this code and encourage other simulationists to adhere to it

5.2 Treat violations of this code as inconsistent with being a simulationist.

5.3 Seek advice from professional colleagues when faced with an ethical dilemma in modeling and simulation activities.

5.4 Advise any professional society which supports this code of desirable updates.

Key Organizations

<http://www.scs.org/>

<http://www.simprofessional.org/>

<http://www.sisostds.org/>

<http://www.acm.org/tomacs/>

Key Links

- **The simulation code of ethics**
 - www.scs.org/ethics/scsEthicsCode.pdf
- **Background material**
 - http://www.site.uottawa.ca/~oren/SCS_Ethics/ethics.htm
- **Online Ethics Center for Engineering and Science**
 - <http://onlineethics.org/reseth/>
- **A simulator for investigating ethics**
 - <http://seeri.etsu.edu/Ethics/EthicalSimulator/1024/index.html>

Summary/Conclusion

- **The M&S community needs a professional certificate program**
- **This program needs to be well coordinated and accepted by those inside and outside the community**
- **We have a viable program today**
- **We have a plan to improve it in place**
- **We have a lot of work to do!**



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M&SPC Board of Directors

- M&SPC Commission Board of Directors has overall responsibility for the CMSP Program
- M&SPC Commission is the actual certification issuer
- Board meets quarterly
- Provide policy direction
- Assign action items to address identified issues

Executive Committee Functions

(1 of 3)

1. Administer the program according to this program plan,
2. Review the efficiency and effectiveness of this program plan, utilizing information provided by the evaluation committee and other sources,
3. Identify areas for improvement as potential changes to this program plan and take action to change the plan and improve the program,
4. Review results of program audits and reviews and take positive action to address identified issues and concerns,
5. Submit changes to this plan to the Board of Directors for approval prior to any change of operations,
6. Award and revoke certifications in accord with program policy, as described in this plan,
7. Maintain minutes of its meetings and forward them to the Board of Directors,
8. Designate officers as needed to perform these functions,

Executive Committee Functions

(2 of 3)

9. Prepare for board approval an annual program budget, including a fee structure that is fair, reasonable and consistent with that of other, similar programs,
10. Lead the board chartered committees and Executive Director to execute the program. The Executive Committee retains responsibility for all decisions made by the committees and therefore the power to overrule those decisions,
11. Designate the chairs of the committees and ensure that such nominees are professionally qualified,
12. Conduct an annual review to ensure all committee and committee members remain professionally qualified. It is preferred that committee members and officers are holders of the certification, but as a minimum they must be widely recognized as authoritative and respected practitioners of the M&S profession,
13. Approve standing and ad hoc committee membership as nominated by the committee chair,
14. Meet virtually or in-person at least once per month. A majority of the Executive Committee constitutes a quorum,
15. Maintain minutes of its meetings and forward them to the board,

Executive Committee Functions

(3 of 3)

16. Provide program direction to the Executive Director who performs day to day operations of the program,
17. Implement the policies established by the Board of Directors to award and revoke certifications,
18. Establish an Ethics Subcommittee to both enforce the program's ethics and conflict of interest policies and provide anonymous support to members with ethics questions or concerns. Possible actions to address ethics questions or concerns include:
 - a) **Direct responses to person(s) raising the question or concern explaining the Ethics Subcommittee's disposition,**
 - b) **Direct responses to the persons affected by the complaint explaining the complaint and disposition and**
 - c) **Changes if any to the status of the certification of any parties.**
19. Provide responses to complaints or concerns, normally via an ad hoc committee appointed to investigate and make actionable recommendations to the Executive Committee and
20. Prepare and maintain Executive Committee charter for board approval that acknowledges all of these responsibilities; identifies the team membership and identifies any internal assignment of roles and responsibilities,

Common Functions of Standing and Ad Hoc Committees (1 of 2)

- All committees may form internal teams and recruit members as required to accomplish their responsibilities. The committee chair ensures each member is professionally qualified. Committee membership is subject to review and approval by the Executive Committee
- At least the leadership of every committee will meet at least monthly and prepare progress reports for the Executive Committee and Board of Directors
- All committees will provide updates to the program artifacts for which they are responsible, as defined in section 6, in accord with the quadrennial program cycle described in section 3.3 of this plan, or as required

Common Functions of Standing and Ad Hoc Committees (2of 2)

- All committees will prepare and keep current a charter document for approval by the Board of Directors that acknowledges all of these responsibilities; identifies the team membership and identifies any internal assignment of roles and responsibilities, including any internal team structure
- All committees will conduct their operations in accord with the then current version of the program governing documents. If a program document contains requirements that the committee can not, or feel they should not, execute; the committee will provide recommended changes to the document prior to release (preferable) or in the form of a Problem Report/Change Request as described in the program configuration management plan

Development Committee Functions

1. Develop and maintain a bank of examination questions and answers as required to populate the examination structure,
2. Develop examination structure and method by which questions from the question bank are composed to develop specific examination instances. This method must:
 - a. provide a trace from the candidate to the examination instance given to a candidate,
 - b. ensure examination questions are traceable to the M&S BoK content [reference 2] and
 - c. Allocate questions to examination instances and types (e.g. core, technical or management),
3. Perform coordination with M&S BoK [reference 2] development community members to ensure BoK development meets CMSP program needs,
4. Recommend for Executive Committee approval the areas of M&S BoK selected by the committee to represent the needs of the stakeholders in depth, breadth and structure of the knowledge to be assessed by the examination questions,
5. Prepare, process, provide status of and respond to change requests / problem reports,

Development Committee Functions

6. Coordinate, obtain Executive Committee approval for and implement approved changes in design, requirements, processes, or other artifacts.
7. Develop and maintain requirements for the CMSP program products (Appendix C). Coordinate changes with other committees and obtain Executive Committee approval prior to release,
8. Ensure that each requirement identifies the verification technique to be used by the evaluation committee to establish the product's compliance with that requirement,
9. Upon approval, release all changes to Operation Committee and support implementation as required and
10. Develop, maintain and publish a plan describing and controlling the program's configuration management process which:
 - a. Supports both periodic and as required configuration audits to be performed by the evaluation team,
 - b. Provides a means to document the then current program baseline by identifying the governing program documents by title, version and release date,
 - c. Insures that the current released version is conveniently and publicly available and
 - d. Provides a managed, traceable, auditable process for program document changes to be requested, implemented and released.

Evaluation Committee Functions

1. Review all program artifacts, including this plan, to ensure that they satisfy the stated requirements, in accord with the provided verification method. For program artifacts that do not satisfy their requirements, prepare clear Problem Report /Change Requests to enable the Development Committee to recognize and correct the problem,
2. Provide updates to the program artifacts for which they are responsible in accord with the quadrennial program cycle described in paragraph 3.3 of this plan, or as required,
3. Support Executive Committee review in support of any appeal,
4. Conduct special examination of candidates as requested by the Operations Committee, including review of requests for waiver of any program requirements and requests for a third testing opportunity,
5. Provide written feedback to any candidate's appeal, indicating the resolution of the appeal, the basis for resolution and (if the appeal is rejected) specific steps the participant may take which would be likely to lead to the candidate earning the certification in the future,
6. Evaluate specific preparatory courses against the provided standard for those courses where the provider has requested M&SPC Commission endorsement and

Evaluation Committee Functions

- 7. Conduct a quadrennial review of the overall program to ensure that it is providing value and operating in accord with its vision, goals, principles and plans, such that:**
 - a. A formal report of the results of the review is provided to the Board of Directors,**
 - b. Written feedback as to the cause and recommended solution of any evaluation findings to the Development Committee,**
 - c. All aspects of the program are reviewed over the four year period, meaning the quadrennial review may be broken into four annual reviews,**
 - d. The assessment of the program's value constitutes an internal audit of the program assessing the compliance of the program processes, practices and artifacts with the provisions of this document and all other program governing documents – especially the program's satisfaction of its stated goals and objectives,**
 - e. The evaluation assesses, as a minimum:**
 - i. Certification holder statistics including number of exams passed/attempted, number of holders executing/requiring renewal and penetration into the target population,**
 - ii. Survey of stakeholder's prior and emerging needs and the program's ability to meet them and**
 - iii. Evidence of the certification program's value.**

Operations Committee Functions

1. Accept and process initial or renewal applications,
2. Ensure the confidentiality of applicant's personally identifiable information, in accord with the sponsoring organizations' privacy policies,
3. Maintain all program data so that it can not be lost, stolen or damaged; either by natural events, accidents, or malicious attacks, in accord with the sponsoring organization security policy,
4. Assess (prescreen) applications against program requirements to ensure the application meets the program's requirements, and that the applicant appears to be qualified,
5. Reject applications with clear omissions and errors,
6. Refer a random sample of and any questionable applications and waiver requests to Evaluation Committee,
7. Issue proper examination instance (e.g. an examination composed from the question bank, according to the examination structure, that complies with the applicants specified options) to the applicant and track response (new only). Maintain traceability between applicant and examination instance(s),

Operations Committee Functions

8. Accept and score completed examinations (new applications only),
9. Assess documentation of Recertification Units against the requirements (renewal applications only),
10. Refer completed application and results to evaluation committee if compliance with program requirements is not clear or as a random sample,
11. Maintain records of examinations attempted and completed (including exam version) and certifications issued, for at least 5 years after expiration of certification, or determination of failure to qualify,
12. Provide feedback to applicant,
13. Provide means for candidate to appeal to Evaluation Committee and, should they desire to do so, to escalate their appeal to executive committee and to entire Board of Directors,
14. Issue certification to successful applicants,
15. Provide means for certification holders to ask ethics questions and place ethics complaints,

Operations Committee Functions

16. Refer requests for ethics support & enforcement to the of the Executive Committee Ethics Subcommittee and facilitate a prompt, thorough review and ensure the privacy of holder is respected,
17. Operate and maintain the M&SPC Commission website, database and information system providing means for applicants to apply for, qualify for and receive certification in accord with the top level design and requirements provided by the Public Relations Committee and approved by the Executive Committee,
18. Accept and document comments, complaints and suggestions from all stakeholders and forward to Executive Committee,
19. Administer program and provide assigned member services,
20. Collect and report metrics,
21. Keep membership, certification and test records,
22. Establish and maintain online a publicly available record of the status of certification holders (e.g. name of certification holder, type of certification, award date, expiration date),
23. Collect and refund fees.

Operations Committee Functions

24. Keep careful, complete and auditable records of all monies received or expended,
25. Perform configuration management of program documents, including this plan, the configuration management plan, the approved certification form, etc., in accord with the configuration management plan, such that
 - a. The current program baseline and the set of documents that define it are maintained.
 - b. Changes to the documents are managed to ensure traceability is maintained to the documented reason for each change,
 - c. Each document is identified by title, version, and date,
26. As needed, contract with external agencies to perform committee duties subject to NTSA financial processes and procedures and retaining full responsibility for CMSP quality, content, or scope in the M&SPC Commission and
27. Ensure compliance with the Americans with Disabilities act by referring any candidate who is physically unable to utilize the standard form of the exam to the Evaluation Committee for special examination.

Public Relations Committee Functions

1. Provide communication to certification holders and to the M&S community,
2. Issue and distribute news releases,
3. Create and distribute handouts, posters and exhibits,
4. Solicit and support accurate, high quality informational, tutorial and technical presentations regarding the program in forums attended by members of the M&S community and
5. Provide the requirements for and top level design of the program website. This website is the principal mechanism by which the program satisfies its many requirements for public disclosure, allows the public to verify the valid and current holders of the certification and describes the qualifications and behaviors that can be expected of certification holders.

CMSP Recertification Employment

Category	Explanation/Examples	RU Credits (Max 60/year)
Full Time	Employment must be relevant to BoK. No employment RU may be earned during periods of unemployment.	5 RU/month
Part Time		5 RU/month prorated on the basis of hours worked per week divided by 40 hours.

CMSP Recertification Publications

Category	Explanation/Examples	RU Credits (Max 60/year)
Peer Reviewed Journal	Credit for paper may be claimed once during recertification period. Work must apply to BoK	
First Author		15
Second Author		10
Third Author		5
Online Transactions, Magazine		3

CMSP Recertification Education

Category	Explanation/Examples	RU Credits (Max 60/year)
Instructor	Courses must apply to BoK. Course must be completed during the recertification period. Students of on-site work sponsored/related training may not earn RU, since this is considered part of normal "employment."	
College course (including audited)		10 per 3-semester credit course
Non-college course		2 per 8-hour day
Student		
College		5 per 3-semester credit course
Non-college course		1 per 8-hour day

CMSP Recertification Conferences

Category	Explanation/Examples	RU Credits (Max 60/year)
Attendance	Courses must apply to BoK. Course must be completed during the recertification period. Students of on-site work sponsored/related training may not earn RU, since this is considered part of normal "employment."	1 per conference day
Publishing/Presenting		
Primary Author, Presenter or Panel Member		8 per paper
2 nd or 3 rd Co-author/Co-presenter		2 per paper
Best Paper or Keynote Speaker		Additional 2

CMSP Recertification Conferences

Category	Explanation/Examples	RU Credits (Max 60/year)
Organizing Committee	Courses must apply to BoK. Course must be completed during the recertification period. Students of on-site work sponsored/related training may not earn RU, since this is considered part of normal "employment."	
Conference Leader /Chair		20
Conference / Executive (Sub) Committee Leader		15
Conference / Executive Committee Leader		10
Conference Subcommittee Member		3

CMSP Recertification Continuing Education Units

Category	Explanation/Examples	RU Credits (Max 60/year)
CEU from Accredited Agency	Any training which applies to BoK, which is eligible for CEU credits, but not described above. Note that 1 CEU = 10 contact hours for IACET	2 per CEU

Examples of Deeper Ethical Issues in the Use of Simulation

- It is possible that training simulators make soldiers ignore the preciousness of a human being's life. In virtual, killing innocent people does not cause the sense of sin or severe penalties such as dismissal, court-martial, and execution. That is, the soldiers do not feel guilty as reality even though the soldiers shoot civilians in the simulation, and they are trained killing enemies as quickly as possible without consideration. There is a high possibility that it applied to a real combat.
- Also, soldiers may ignore the preciousness of their lives. In simulation, there is no serious penalty for the players' deaths. As a result, soldiers may become careless about their lives. People say that soldiers' lives belong to their countries, but they are also humans who have families, and there is no life which is not precious.
- The simulators can have an affect on children. Simulation technology has been originated from commercial video games of which main users are children. However, as the simulation technology is developed by the military, there is a possibility that children will use similar product in the future. Now, well-developed military training simulator is expensive. However, as time passes, it will spread out like personal computers which was expensive in the past. Then, children whose thinking faculty has not developed completely will be violent and will not have the mind respecting the preciousness of a human being's life.

Hosun Yoo

Complexity, Simulations and Ethics Symposium (1 of 6)

- Advances in science and technology often introduce ethical challenges. After all, everything that can be done is not necessarily something that should be done. Hence, as technology expands the realm of the possible, it requires us to extend our critical assessment regarding the ethical limitations to human action and what should not be done. This has been true with the development of nuclear weapons, biomedical engineering, computers, biotechnology, and more. It is thus to be expected that new developments in the simulation and design of complexity should in their turn raise ethical issues. To put the point another way, ethical problems have always been considered complex. They become even more so when we are dealing with the science and engineering of complexity. This article will explore this new region of interaction between science, technology, and ethics by reporting on a symposium that we organized at the 2001 AAAS annual meeting in San Francisco, and then discussing current ethical trends in the field.
- The symposium, titled Complexity, Simulations, and Ethics, examined the ways that we can take lessons learned from existing approaches to research ethics and apply them specifically to complexity simulations. The ensuing discussion included questions regarding whether this relatively new field of scientific inquiry might raise new and special ethical issues or responsibilities and whether ethical issues should be included in complexity simulations. The symposium included representatives from the sciences, engineering, the social sciences, and the humanities.

Complexity, Simulations and Ethics Symposium (2 of 6)

- Sergio Sismondo (Queen's University, Canada), a philosopher and social scientist, began by noting how computer simulations cut across traditional scientific boundaries. As he puts it, "simulations occupy an ill-defined space between experiment and theory." Whereas experiments produce either reliable or unreliable data, and theories are judged as true or false, simulations tend to be thought of in more pragmatic terms as more or less useful. At the same time, because of their complexity - especially insofar as they model complexities - the computer programs on which simulations rest contain a multitude of unclarified assumptions and often unrecognized bugs, the adequacies and inadequacies of which are exceptionally difficult to discern. "Complex science is nothing new. But computer simulation is novel in having some of the local and idiosyncratic features of experimentation even while it looks like theory." What this means is that our trust in a simulation must in fact rely on "trust in the skills of people who have created it" more than any comprehensively tested program.

Complexity, Simulations and Ethics Symposium (3 of 6)

- Aerospace engineer Stephen M. Batill (University of Notre Dame) continued the discussion by distinguishing three interrelated complexities: the complexities of “large, collaborative groups representing many disciplines” that design complex systems; the complex systems themselves; and the complexities of interactions between these systems and the world. Complexity in the design process is the result of “the curse of dimensionality,” which grows with the level of detail used to describe a system. Using the aeronautics industry as an example, he describes the complexity and uncertainties posed in the design of a plane. In the design process, engineers try to predict the behavior of systems prior to their realization. To achieve this end they commonly use “computer-based models and simulations intended to represent some of the most complex phenomena that science can describe.” But there is always a degree of uncertainty associated with the information provided by such simulations.
- Characterizing and quantifying the uncertainty of simulations “is a key element in developing information of value to the engineer in the design decision-making process.” On the one hand, this very characterization has its limitations. On the other, social expectations regarding the powers of technology have increased at the same time that tolerance for failure has decreased. “This introduces new ethical issues into the design process related to the engineer’s ability to use uncertain information to provide an assessment of the risk/cost versus the benefit to society for new technology development.”

Complexity, Simulations and Ethics Symposium (4 of 6)

- Biologist Joseph Berry (Stanford University) extended the questioning by considering some of these issues in relation to what might be termed a live-in simulation, Biosphere 2. For him, “models are powerful tools for dealing with complex systems” that run the “danger of misinforming or misleading if the input data, parameterizations or model structure have important errors.” As a result, modelers have special responsibilities “to use the best available science and to be candid about the limitations of any particular model.”
- But another problem is that precisely because of their complexity, simulations are easily criticized or dismissed when their results turn out to be counter-intuitive or contrary to strong economic interests - a phenomenon that has been well illustrated by reactions to climate change models. This is where Biosphere 2 offers a new approach. A large-scale model or simulation such as Biosphere 2 can serve not only as a testbed in which scientists can assess the adequacy of models for various earth system processes, but also as a demonstration site through which the non-scientific public may come to have more confidence in the models and thus not so easily dismiss unpalatable implications. With 40,000 visitors a year touring Biosphere 2, this simulation presents real opportunities for scientific education of the general public.

Complexity, Simulations and Ethics Symposium (5 of 6)

Finally, Carl Mitcham (Colorado School of Mines), representing the interdisciplinary field of science, technology, and society studies, argued that although simulations of complexity may not require the development of any new ethics, they do call for deeper integration than have heretofore been achieved of research ethics and engineering ethics. Research ethics in science is primarily concerned with process: doing research in the right ways. Engineering ethics, by contrast, is primarily concerned with product: designing efficient or safe products, processes, or systems. Simulations of complexity bridge the traditional science/engineering divide by serving as large-scale virtual experiments (simulations) mounted on complex engineering products (computers). As with the case of Biosphere 2, these simulations also may have important policy implications for the society at large; the questions they address are not simply issues of knowledge for its own sake. As such, they engage not only research and engineering ethical issues, but even the politics of science.

Carl Mitcham and Sanyin Siang

Complexity, Simulations and Ethics Symposium (6 of 6)

Critical reflection on the ethical dimensions of complex computer modeling and simulations of complexity is something about which some members of the computer professional community have also become aware. As a member of the symposium audience, Billy Grassie (editor of the “Meta” Listserv on science and religion) commented on the <http://www.meta-list.org/> listserv: “Scientists, engineers, economists, and policy makers often take... simulations too literally, committing what A.N. Whitehead once labeled ‘the fallacy of misplaced concreteness.’... Forget the debate about utilitarian ethics, deontological ethics, or virtue ethics, we are losing moral agency in our growing collective inability to predict the consequences of complex systems.”

Carl Mitcham and Sanyin Siang