

PSM Demand & Supply:

- **Business/Industry Need PSM Grads**
- **U. Michigan: First Complexity Masters**

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NRC Committee: *Enhancing the Master's Degree in the Natural Sciences*

Dean Dialogue: *Growing the Professional Science Masters*

CGS Summer Workshop for Graduate Deans and New Deans Institute

July 8, 2007

Topics

- Professional Science Masters graduates: outstanding leaders for technical organizations
- What I do / “**Business Analytics**” recognized, growing
 - ❖ Ford Research & Advanced Engineering
 - ❖ Central Michigan University Research Corporation
- Clear demand for PSM grads
- Leadership for economic development
- University of Michigan masters proposals: Center for the Study of Complex Systems

PSM's – Technical Leadership Development

- Excellent **technical depth** and developed **leadership skills** are hard to find in an individual, but essential in many careers:
 Medical laboratory director Zoo/aquarium director
 Bank loan portfolio manager Fringe benefit plans manager
 Manufacturing operations mgr Business location consultant
- PSM's are an appropriate source of talent whenever *technical + leadership* are needed together.
- Needs for such people grow as **complexity** increases.
- They are vital for American global competitiveness.

PSM's today – a young educational movement.

Tomorrow – a quiet revolution in commerce and society.

Expectations will grow – PSM's will be gateway credentials – a great achievement.

Ford Recognizes Need for Analytics

- My applied research for Ford provided *business analytics*:
 - ❖ Mathematics and computing applied to business problems.
 - ❖ Data mining and math modeling for internal “customers” in Ford business operations – today for “Way Forward” projects.
 - ❖ Pioneering group began in 1997, grew to 20, credited with about \$2B in benefits to Ford.
 - ❖ The group finds **much more demand** for help than it can satisfy.
Large areas of the Company remain untouched.
- Another ~80 analytics staff manage portfolio risk for Ford Motor Credit Corporation; conduct marketing research; etc.
- Former FMCC CFO David Cospers described MSU Industrial Mathematics (MSIM) students as
“differently wired minds”
that he wanted salted throughout business operations. Future:
MSU, other math PSM grads → Ford analysts

Some Questions Addressed at Ford R&A

- How do vehicles' residual value impact the Company?
- **Balancing vehicle supply/demand through flexible manufacturing investments.**
- Efficient vehicle sequencing for assembly.
- **Commodity costs management in dynamic markets.**
- Variance in warranty results.
- **Predicting Extended Service Plan program costs early in the process, from warranty data.**
- Warranty records include text comments from dealers – clustering them maps warranty issues to engineering groups.
- **Marketing insights from text analysis of web/internet comments about the Company.**
- Many more.

Central Michigan Univ. Research Corporation

CMU-RC, a CMU-owned non-profit created in 2002, applies university resources and expertise to help develop regional business and industry.

- ❖ Smart zone and business incubator with focus on nanotechnology.
- ❖ **Business insight services.**
- ❖ Short courses, forums, conferences, seminars.
- ❖ <http://www.cmurc.com/>

Business Insight Services

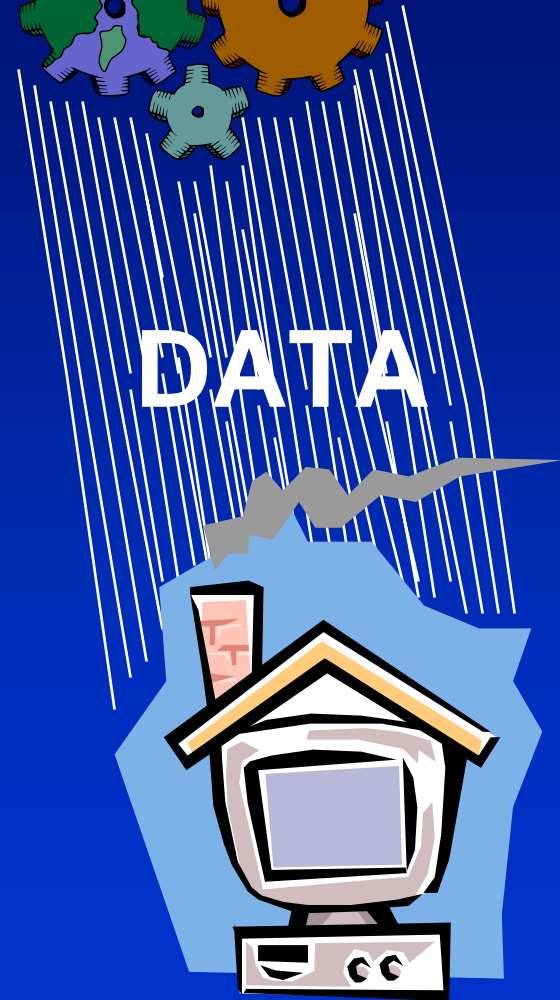
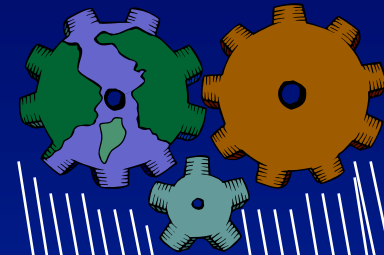
- CMU-RC applies data mining and mathematical modeling, completing **projects for corporate clients**, on a business schedule, securely and confidentially.
- Project-specific teams mix CMU-RC analytics staff with faculty and students.
- Partnerships with **SAS, IBM** and **ESRI** provide hardware and software tools for success.

Data-Driven Business?



“profitable”

“Nimble”

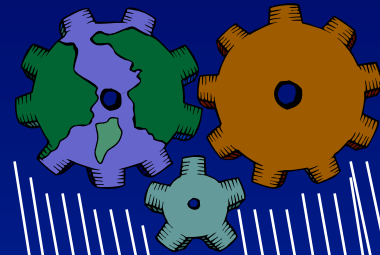
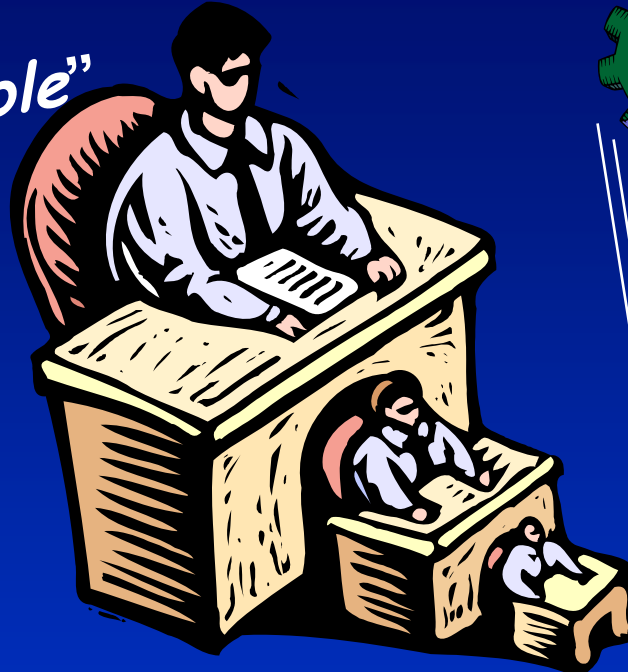


Yes, Data-Driven!



“profitable”

“Nimble”



DATA

**Analytics
Helps Guide
Decisions**



Clear Demand for PSM Grads

Many employers are ready for PSM grads today:

- PSM **internships and sponsored projects** bring these students to employers' attention → hired.
- Industry / business advisors often assist with placement.
- MSU MSIM graduated 7th class in '07. Placement history:
 - ❖ Four graduates with one Michigan actuarial firm.
 - ❖ Others with: large industrial firms, large insurance companies and smaller companies (including a non-profit & a university).
 - ❖ About 80% choose employment, 20% Ph.D. programs.
 - ❖ Most placed in Great Lakes states, majority in Michigan.
 - ❖ Starting salaries average mid-\$50's.

<http://www.math.msu.edu/Academic%5FPrograms/graduate/msim>

Leadership for Economic Development

From Michigan: the Cherry Commission Report

- In 2004, a panel of 40 leaders including representatives from **business and labor community K-12 and higher education executive and legislative branches of government** studied pathways to Michigan's economic future.
 - Lt. Governor John D. Cherry headed this commission.
 - Reference: <http://www.michigan.gov/ltgov> (menu at left)
 - Download report: <http://www.cherrycommission.org/>
- **Vital finding**: Michigan must **double** its percentage of career-age citizens with (post-high-school) certificates, associates or bachelors degrees. That fuels economic development, global competitiveness and renewed prosperity.

Does not address graduate education – but its clear:

- **Better-credentialed workforce requires yet-better-credentialed leadership. That must double, too → PSMs.**

University of Michigan

Center for the Study of Complex Systems

- Renowned research group adding degree programs.
- Masters in **Complex Systems** and **Applied Complex Systems** (designed as a PSM) proposed.
- **World's first M.S. programs formed from**
 - ❖ **systems thinking**
 - ❖ **complexity methods**
 - ❖ **applied mathematics and computing****will train practitioners for career positions.**
- Integrative laboratory work
- Business awareness courses
- Strongly interdisciplinary
- Ford Motor Company and other industrial contacts helped shape curriculum. A major Ford division expects to sponsor selected employees as pioneering students in 2007.