

A COLLABORATIVE BUSINESS MODEL FOR THE TOOL AND DIE INDUSTRY

September 30, 2002

**Manufacturing Systems Group
Center for Automotive Research — Altarum**

Sponsored by:
MICHIGAN ECONOMIC DEVELOPMENT CORPORATION



Introduction

The tool and die industry is the foundation for a healthy Michigan manufacturing economy. Michigan leads the nation in the number of tooling firms and workers employed by this industry.

The industry is currently at a crossroads in terms of remaining competitive. Problems that include 30 to 50 percent overcapacity, intense foreign competition and increasing demand for cost cutting are threatening the viability of Michigan's tool and die firms.

In 2000, Michigan's tool and die companies employed more than 30,400 workers in 1,099 establishments. Michigan lost 6.8 percent of its employees and 7.7 percent of its establishments in the tool and die industry between 1998 and 2000.

The Michigan Economic Development Corporation (MEDC) commissioned this study in response to the current issues facing the threatened companies and offer ideas to restructure and redevelop them to remain competitive.

Table of Contents

TABLE OF FIGURES.....	iv
GLOSSARY OF TERMS.....	v
I. EXECUTIVE SUMMARY	1
II. THE TOOL AND DIE INDUSTRY	3
A. CHALLENGES FOR THE TOOL AND DIE INDUSTRY SECTOR.....	3
B. STATE AND FEDERAL INVOLVEMENT	7
C. COMPETITIVE OBSERVATIONS	8
III. WHAT THE TOOL AND DIE SUPPLIERS NEED TO CONSIDER.....	13
A. BUSINESS PRACTICES OF “BEST” SHOPS	13
B. LEAN PRACTICES	14
IV. WHAT THE TOOL AND DIE CUSTOMERS NEED TO CONSIDER.....	20
A. COLLABORATIVE PRODUCT AND PROCESS ENGINEERING	21
B. DEVELOPMENT OF ANALYTICAL DESIGN METHODS	21
C. LEAN DIE STANDARDS.....	21
D. FUNCTIONAL BUILD.....	22
V. THE COLLABORATIVE BUSINESS MODEL	25
A. OBJECTIVE	25
B. DESCRIPTION OF TOOL AND DIE COALITION	27
C. INTEGRATOR COALITION	30
D. SYNERGISTIC BENEFITS AND COST IMPACT OF COLLABORATIVE MODEL..	33
E. IMPLEMENTATION ISSUES OF THE COLLABORATIVE MODEL	36
F. RECENT EXPERIENCES WITH THE COLLABORATIVE MODEL.....	37
VI. CONCLUSIONS AND RECOMMENDATIONS.....	40
A. ADOPTING LEAN PRACTICES.....	40
B. CREATING COLLABORATIVE RELATIONSHIPS	41

C. GOVERNMENT SUPPORT.....	43
VII. REFERENCES.....	44
VIII. COALITION APPENDIX.....	45
A. COALITION FOR THE ADVANCEMENT OF MICHIGAN TOOLING INDUSTRIES (CAMTI).....	45
B. MICHIGAN TOOLING ACT (FROM WWW.CAMTI.ORG)	45
C. FRAUNHOFER TOOL AND DIE PAPER ON PERFORMANCE.....	45
D. U.S. TOOLING COALITION (USTC) ANTITRUST POLICY (DRAFT GUIDELINES).....	45

Table of Figures

FIGURE 1 – MICHIGAN TOOL AND DIE EMPLOYMENT CYCLE.....	4
FIGURE 2 – COMPARISON OF ISSUES CRITICAL TO TOOL AND DIE COMPANIES IN 1975 VERSUS 2002.....	5
FIGURE 3 – BIG-3 RELATIVE DIE COSTS WITH HONDA.....	5
FIGURE 4 – COMPARISON OF ASIAN AND NORTH AMERICAN COMPANIES.....	9
FIGURE 5 - TRYOUT PRESSES PER CNC MACHINE TOOL.....	10
FIGURE 6. COMPARATIVE TIMING OF DIE CONSTRUCTION STEPS.....	11
FIGURE 7 - FACTORS ASSOCIATED WITH TOOL AND DIE SHOP PERFORMANCE.....	14
FIGURE 8 – THE FUNCTIONAL BUILD CONTINUUM.....	23
FIGURE 9– BASIC AND FULL SERVICE COALITION CAPABILITIES.....	27
FIGURE 10 – EVOLUTION AND EXPANDING ROLE FOR TOOLING COALITION.....	28
FIGURE 11– TOOLING COALITION ORGANIZATION.....	29
FIGURE 12 – ORGANIZATION FOR TOOLING COALITION OPERATING COMMITTEE.....	30
FIGURE 13 – INTEGRATOR COLLABORATIVE MODEL.....	32
FIGURE 14 – GENERAL COLLABORATIVE COALITION MODEL.....	33
FIGURE 15 – COST REDUCTION OPPORTUNITY THROUGH COLLABORATION.....	35

Glossary of Terms

Term	Meaning
ABC	Activity Based Costing.
Activity Based Costing	Accounting method for allocating overhead charges based on leasing equipment / space / overhead resources per unit time.
CAD	Computer Aided Design.
Captive shops	Tooling shops that are owned by the customer.
CAR	Center for Automotive Research.
CNC	Computer Numerically Controlled.
Die Design Standard	A standard that states how dies will be manufactured, for example, how many wear plates will be used, whether standardized screws will be used, etc. These standards can be generic for all dies or specific to particular part families, such as fenders. In the US, customers often dictate the standard to ensure dies are made that will run in the customer's presses.
Functional build	A method for determining when a die is acceptable for production based on its ability to produce a part that will result in an acceptable assembly.
Lean manufacturing	Practices and techniques designed to reduce waste in all its forms (e.g., cost, time, space, labor), including work-in-process inventory through single part production flow; wasted motion, space, and labor through more efficient work space layouts; fluctuating resource demands through leveling work flow, etc.
OEM	Original Equipment Manufacturer.
Setup	Task of placing a die in a precise position on a machine or press prior to operation.
SUV	Sport Utility Vehicle.

Term	Meaning
Synchronous Process Flow	A production line flow of materials through serial processes with all resources needed at every point in the process as the job arrives.
T&D	Tool and Die.
The Big 3	DaimlerChrysler, Ford, and General Motors.
Tryout	The trial and error process of making a part, checking a part versus its specifications, making changes to the die, and making the next part.
Unibody	Car design strategy where the car body provides the structure for the engine and transmission, as opposed to having a separate frame and chassis.
Value stream mapping	Technique to identify bottlenecks in the product process flow.
CAM	Computer Aided Manufacturing.
Patterns	Styrofoam shape of the die from which the casting is formed.
Castings	The cast block of metal from which dies are made.
2-D machining	Process of rough machining the two-dimensional part shape in the casting.
3-D machining	Process of fine machining the final three-dimensional part shape.
PPAP	Production Part Approval Process. The process by which the contracted dies are proven to be capable of producing parts that meet specifications.
Die lineup	Number and order of dies required to produce a particular part
Draw die	First die in a die lineup, which determines the part shape and does the greatest amount of forming.
Blank	Flat piece of metal that is placed in a draw die.
Blank die	Die that forms the blank.
Bearing surface	A metal supporting surface in a die.

Wear plate	A plate that allows the upper and lower die to move against each other.
Die insert	A separate metal piece that is inserted into the main die, usually to perform a special function, such a piercing a hole, or to create an especially hard area in the die.
Show panel dies	Dies that make parts that are externally visible to the customer on a car, such as a hood, fender, or door outer panel. Examples of non-showing parts are reinforcements, rails, engine compartments, safety belt anchors, etc.
Cpk	Process capability index that relates the tolerance of a dimension to the process mean and variance. If the process is centered 4 standard deviations from the closest tolerance limit, the Cpk is 1.33.
BIW	Body In White, the assembled car body including doors, decklids, and hoods prior to painting.