The Tool, Mould & Die Sector
and the Automotive Industry

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During the last decades mould making became an important industry in Europe and worldwide. Moulds for injection of thermoplastic materials became more and more in demand, along the more traditional tooling alternatives. Toolmaking companies have shown an excellent capacity to adopt new advanced technologies (from both the metal and the plastic sides), as well as flexibility to adapt to the more sophisticated, competitive and global markets of their clients – mainly multinational corporations, or the first or second tiers of their advanced and complex supply chains.

But the industry is now at a turning point and new visions for the future are needed and expected. The industry needs to rethink its role in the global supply chain and to review its competitive positioning. A new agenda for the European tool, mould and die sectors is needed (1). The world has become more open and efficient; Companies are moving and developing according to these facts. Globalization created an extended need for interdependency and networking skills. Low cost production countries, namely Asian, and their manufacturing companies are transforming, at a speedy pace, from low cost production sites of automotive parts, components and tooling - to world-class competitors, with fully developed engineering, development and manufacturing capabilities (2).

Major (western) multinational players operating in Asia have been the engines of this evolution and will continue to play a major role in enhancing Asia's product design, development and manufacturing capabilities. So the challenging questions now are:

- What will be the short and long term implications for the Western industry, in terms of operating costs, intellectual property, product differentiation and localization issues, supply-chain challenges, import/export decisions, training requirements, and a host of other business and strategic decisions, as Asia's industry acquires enhanced product design, development and manufacturing capabilities (3)?

and

- What will be the effect to the European industry and the automotive business ecosystem? What needs to be done, namely by small players like mould and die companies and the other suppliers of the dominant players in the ecosystem?

We will address some of these questions later. Meanwhile we introduce an useful framework for strategic analysis, based on the business ecosystem concept.
A strategy for niche players in the automotive business ecosystem

The concept of business ecosystem has been suggested has a useful framework for the analysis of interdependent networks of companies. For instance, Microsoft, Wall Mart or eBay provide ecosystems where lots of companies of different size can thrive or fail. We argue that mould and die industries, plastics industry and automobile industry together they also are part of a large business ecosystem, and the ecosystem approach can be useful to analyse the actual situation and to plot the future directions.

A lot of the companies in such ecosystem are vulnerable to influences that they do not fully control. Their survival and growth is dependent on their ability to influence resources that they do not own, like product scheduling of manufacturing companies or the technical standards of products that they must incorporate.

Professor Marco Iansiti, from Harvard Business School, and Roy Levin discuss the business ecosystems issues in a book published last year (4). The interdependence between large and small companies and the ecosystem concept implications for small companies operating in such environments is discussed as “strategies for niche players”: how to achieve specialization by taking explicit advantages of the opportunities provided by the ecosystem while avoiding the kind of traps that challenge firms in such environments. Small companies face the dilemma of dominators clients that are the “keystones” of the ecosystem. Analysis of their drivers for an effective niche strategy can give useful insight for the challenges faced by all of us (mould and die makers, injection moulders, first and second tier automobile suppliers) (see box I).

Iansiti and Levin argue that niche players can keep keystones playing honest and to prevent them from staying into becoming dominants. It is in fact in this sense that ecosystems compete: they compete for mobile niche players. And it is precisely this competition that keeps ecosystems healthy. Without this kind of
leverage from niche players, the ecosystem will be less healthy and even it may fall into sickness if the keystone or dominant players loses sight of its role.

The strategy for small fish should be based on business interdependence and collaboration, a source of competitive advantage to create value (5).

This makes a full agenda for all of us in the automotive business ecosystem, especially for small players like mould and die makers. We will go into more detail in the next section, considering the future positioning of European mould and die makers.

**European mould and die industry: challenges**

Tools - moulds and dies - are involved in the manufacturing chain of almost all industrial products, from aeronautical and automotive to electronics and household products.

**COST, TIME-TO-MARKET, QUALITY, RELIABILITY** and sector’s embedded **KNOWLEDGE PLATFORMS** are **key competitive factors**, which impacts structurally and horizontally the sustainability of **European industrial competitiveness**. This implies that it is critical to maintain and develop **European competencies and capabilities** to keep providing innovative processes through unique solutions of mould and die making: a flow of innovation, engineering and technologies.

In the recent years, the long established European Tooling Industry has been facing a fierce competition from new emerging export oriented manufacturing countries (notably from Asia). Most important driven factor has been lower production costs. But shorter delivery and servicing times are also taking an important role for re-localization of suppliers for mould and dies, notwithstanding the increasing client’s awareness, for the time being, on the
current “implicit costs” of quality, performance and service inherent to most of this emerging competition.

The competitiveness battle of the European Tooling Industry cannot be sustained on price, so **a new strategic positioning in the value chain has to be met**.

As the strengths of the European Tooling Industry derives from a complex puzzle of competencies, knowledge based and long established engineering base, the competition pressure imposes a shift from the traditional resource-driven posture as mere tool providers, towards a critical, but fundamental role as **adding value engineering service providers**. focused on:

**client’s processes:**
- **responsiveness** to increased complexity and engineering requirements;
- the triad of **product – process - service** differentiation based on:
  - much broad participation in **value added generation**;
  - the delivery of **extended benefits** to client’s outsourcing needs;

This new positioning implies:

a) **Changing business focus**; from client’s **requirements to their processes needs**, by the development of new tool paradigms based on technology integration and process performance:

- Increased Flexibility and cost efficiency throughout the tool life cycle;
- Customized solutions and innovative applications, **embedded knowledge**, based on engineering competencies and new enabling technologies combined with extended services;
- Improved functionality, adapted to advanced processing methodologies of complex moulded parts, enabling innovative automation features for component **in-process assembling**.

b) **Extensive participation in the value generation** on client’s extended value chain, exploiting links:
Upstream, by an increased participation on co-engineering, design and development solutions for products and systems;

Through horizontal integration and networking, sustaining diversification and specialization, by the integration of complementary unique knowledge, competencies and capacities;

Downstream, placing the focus on complete system supply, for a more efficient development of the company’s value chain and its specialization.

The development of Tool, Mould and Die making sectors competitive edge needs to be oriented through:

- enhanced technological capability;
- extended capacity to present innovative, competitive and effective solutions compliant with the demanding market requirements (for instance: design change friendly moulds);
- an increased flexibility in production and cost & time proficiency,
  that means

The continuous development of the knowledge base, assisting the strengthening and leveraging of existent engineering resources;

The development of innovative applications, by the incorporation of existent, but not fully exploited, technology base and emergent technologies, in the delivery of adding value engineering solutions to new products;

The integration and adoption of broad approaches towards R&D and Business organizational development, exploiting:

- complementarities with technological centers, universities, suppliers and customers, towards the suppression of needs and requirements at both Tooling Industry sector and at customer level;
- integrative approaches throughout the entire value chain towards engineering and plastics processing, recognizing the importance of the knowledge base of tooling Industry and dealing with all tool life-cycle elements, from part & tool design, to extended services - like tool repair and recycling
The development of global alliances for engineering, production and servicing, enhancing responsiveness and enabling the exploitation of opportunities, focused on adding value and the integration of partnering complementarities.

A coordinated effort of the all innovation agents and through a comprehensive approach encompassing the entire value chain is therefore required in order to tackle the current challenges and reposition the European Tooling Industry as high added value solution providers.

**The automobile ecosystem challenges**

The automobile industry is very important for the tool, mould and die makers, both as a customer and as a competitor.

In the USA, the automobile and transportation industries represent around 70% of the shipments (sales) of the stamping and die casting sector and 40% of the industrial moulds sector. But the carmakers (the OEMs) are also competitors. They run their own tool and die operations, of substantial size. Around 80% of the stamping tools needed by General Motors, 66% by DaimlerChrysler and 58% by Ford are manufactured in-house. Overall, GM internally supplies around three quarters of the total tooling needs, Ford around half and DaimlerChrysler around one quarter (6).

Differences in size and power of tool and die companies and automobile OEM’s / first tier suppliers do not make things easier. Car makers also control some of their own important first tier suppliers, who do a lot of moulding and mould making. So relationships between OEM’s, large suppliers, smaller independent moulders and mould makers are complex with constant shifts between cooperation and competition.

The car industries have developed a very aggressive competition policy with their suppliers along the last two decades. But the industry suffers from a “paradox”, as The Economist puts it (Box II, (7)). Squeezing the manufacturing supply chain approached the limit and
deep changes are now needed also in the commercial side of the business. It may happen that relationships inside the automobile supply chain may be changing from the aggressive procurement model to a more cooperative model, based on “Chrysler extended model” and Honda Motor experiences. Fragmentation of model variety, shorter life cycles, smaller production runs and higher demand for flexible and modular design and manufacturing should be an incentive for a more cooperative and concurrent approach. That will require more information flow and competitive trust & cooperation. Mould makers should be ready for that, including more integrated answers for complete components, from design to delivery and logistics. The automobile sector may be in a phase of increased product innovations. This may well represent an opportunity for the European advanced engineering and tooling companies, as long as trust & cooperative relationships can be developed with companies in the automobile supply chain and joint cooperative networking for new product development can be shared. There are and there will be opportunities at both ends of the depth of supply chain integration.

A European knowledge base

European mould makers also need to improve their global marketing, stressing the offer of advanced engineering services for highly complex and demanding projects. High precision manufacturing, including mould making, is important for the future of Europe, due to its importance in the aerospace and military industries and the imbedded competences for advanced product design and production. Like the USA, Europe must be concerned with the long term effects of off-shoring complex and high precision mould making. It is not only a question of business and trade, but also a question of the related advanced knowledge base that supports it. Europe must reinforce that knowledge base and to make it a key cornerstone of the sectors strategy.
The European capacity to integrate universities, mould companies, OEM clients and research institutes in a pan European cooperation to create value, monitor the technology frontier and the global competition are key assets for the competitive repositioning of the mould making business. The technology centres devoted to the plastic processing and tool making activities, and supported by the industry companies, have here a special role to play.

(2) Of course, this trend is not specific to the automotive industry. The emergence of ODMs (original design manufacturers) in the computer and electronics industry is well known. These are full service makers that design and build products that other companies can brand as their own. See Gomes, L., “PCs aren’t just made in Asia now; many are designed there”, Wall Street Journal, 19 July 2004.

(3) The importance of technology in the actual China boom has been very much stressed, along with China potential has a future high tech based economic power. China is adopting and using advanced manufacturing technology, driven by the export market and foreign investment. But the evidence is still fragile: “whether its future is as a high-tech powerhouse in its own right or as the world’s biggest branch-plant economy remains an open question” (Junquieres, G., “The myth behind China as a high-tech colossus”, Financial Times, 25 January 2005).


(5) Cooperation is the form of “open source movement” is transplanting concealment as the new standard for the computer industry. Tim O’Reilly discusses the possible lessons for other industries in a recent article: “Sharing the advantage: a new paradigm for business”, Strategy and Innovation, July-August 2004. He emphasizes the importance of the “architecture of the participation”. Network effects based on customer added value, not proprietary interfaces, are
the key to the success. This compares well with Iansiti and Revlin observations (see driver 8).

(6) Data from “Tools, dies and industrial molds: competitive conditions in the United States and selected foreign countries”, United States International Trade Commission, Publication 3556, October 2002

(7) “Fighting back”, The Economist, 2 September 2004 issue (Car industry special survey)

(8) "Innovations of first order importance have taken place relatively recently and may still be emerging" (Fine, C. and D. Raff, “Automobiles”, in Steil, B., D. Victor and R. Nelson, “Technological innovation and economic performance”, Princeton University Press, 2002). A survey just published by The Economist (20 September 2004) defines car making has an industry that “now it has to reinvent itself".
Box I

Drivers for an effective niche strategy\(^{(4)}\)

1. **Value creation**: the very first driver.
2. **Specialize in unique capabilities**, sustainable over time and with enough market
3. **Leverage other capabilities from keystones** (dominant ecosystem agents or players): leverage the tools, technologies, services and products available through the ecosystem creating “coupling strengths” with locking proprieties.
4. **Sustain innovation**: permanent integration of technologies available in the ecosystem to sharpen the niche offering in a distributed business ecosystem.
5. **Value sharing and risk management**: to manage carefully the coupling strength of the implied interactions, increasing the cost of switching for the keystone partner).
6. **Tight coupling**: manage the balance between risks and dependencies. A common failure of niche players is to blind to lightly to a keystone, increasing the power of the keystone over the niche players and compromising the health of the entire ecosystem.
7. **Loose coupling**: embrace mobility and flexibility. Minimalist interfaces between organizations and technologies have the advantage to minimize technological risk to massive shifts in the technological environment.
8. **Niche leverage**: power over keystones. The emergence of loosely coupled technology interfaces give additional negotiating power and mobility with respect to keystones.
Box II

The automobile industry paradox

Manufacturers sweat blood, and squeeze their suppliers hard, to operate a just-in-time production system whereby the components for each car arrive at the right place on the assembly line at precise intervals several times a day. Given that the average car is made up of about 10,000 parts, some of them produced thousands of miles away, this is a miracle of logistics.

Yet once the car is finished, it usually sits around for 40-80 days, parked in fields, distribution centres and forecourts. So just when all those parts have been put together to make them more than the sum of their value, they are left lying around for months—a huge pile of profit-eating inventory. Moreover, most of these vehicles need to be discounted to get people to buy them, because customers rarely find the exact combination of colour, trim and options they are looking for.

This is the part of the car making system that lean techniques cannot reach. It mattered less in the days when dealers (particularly in America, where customers like to walk into a showroom and drive off in their purchase) could get the sticker price for their cars. But now some think the whole system is close to breaking point.