

# Legal Statement

The purpose of the information in this presentation is to guide ICA programs and provide members information to make independent business decisions.

# Antitrust Guidelines

## ANTITRUST GUIDELINES FOR COPPER INDUSTRY TRADE ASSOCIATION MEETINGS

The following guidelines with respect to compliance with antitrust laws of the United States, Japan and European Community<sup>1</sup> are intended to govern the conduct of participants in copper industry trade association meetings, both at the meeting itself and in informal discussions before or after the formal meeting.

**Price.** Competitors should not discuss future prices (including terms of sale) of their products. There is no blanket prohibition against the mention of or reference to current or past prices but limits must be observed. Such references or mentions should occur only when necessary in connection with the development of association programs. For example, reference to a particular price level in comparing the cost of a copper product to a competing product is permitted. Whenever possible, such references should be discussed in advance with legal counsel.

**Competitive Information.** Competitors should not discuss the market share of a particular copper producer or copper fabricator's products. Furthermore, nothing should be said at a meeting which could be interpreted as suggesting prearranged market shares for such products or producer production levels. The overall market share of copper products may be discussed with regard to competition with non-copper products and general market acceptance.

**New Products.** Competitors should not encourage or discourage the introduction of a new product by another competitor or reveal a particular copper company's plans to change the production rate of an existing product or to introduce a new product. No company should disclose to another company whether it is in a position to make or market a new product. New products may be discussed in a technical manner or from the standpoints of competition with non-copper products and general market acceptance. In addition, proposed methods for and results of field and laboratory testing can be considered.

**The Role of Legal Counsel.** Legal counsel attends association meetings to advise association staff and other meeting attendees regarding the antitrust laws and to see that none of the matters discussed or materials distributed raise even the appearance of antitrust improprieties. During the course of a meeting, if counsel believes that the discussion is turning to a sensitive or inappropriate subject, counsel will express that belief and request that the attendees return the discussion to a less sensitive area.

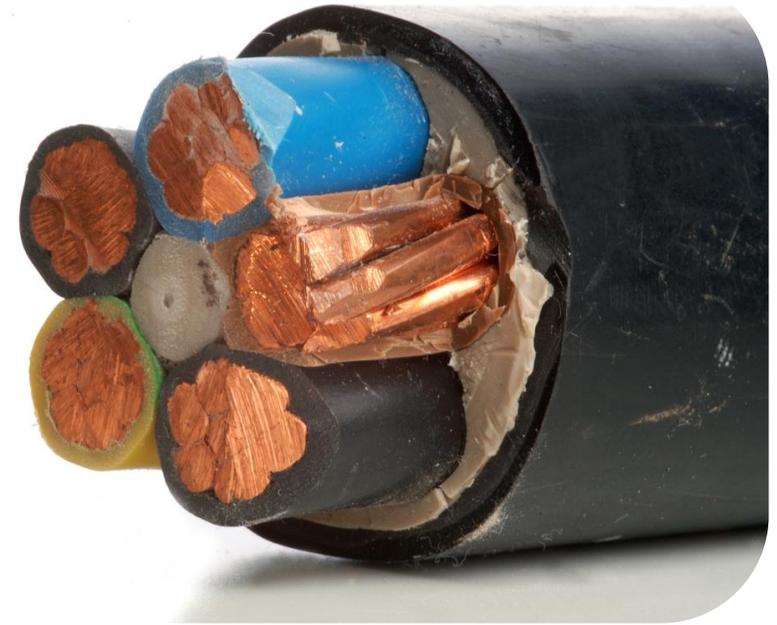
A paper entitled  
"Copper Industry Trade Associations and the Antitrust Laws"  
is available upon request.

10/92, 5/93, 10/10

<sup>1</sup> Other foreign competition laws apply to International Copper Association, Ltd. (ICA)'s activities worldwide.

# What is miniaturisation and minimisation and how does it affect copper demand?

Ian Hiscock of CRU Consulting



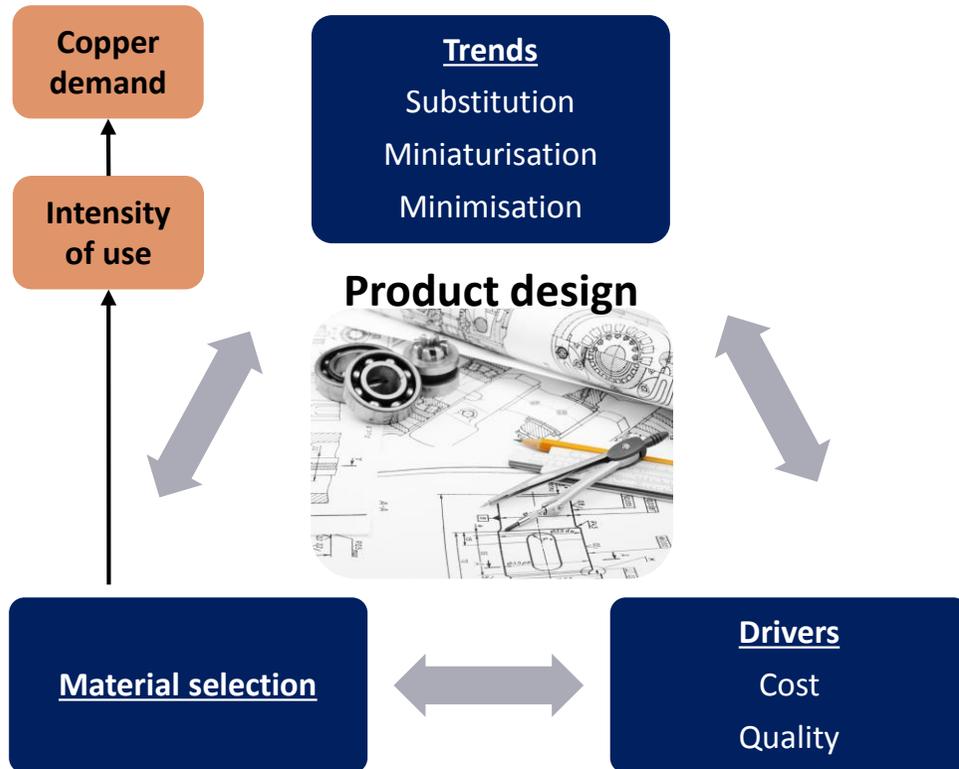
# This presentation discusses M&M in four end-use application groups and provides some conclusions

## Presentation outline

- What is M&M? How is it connected to copper demand?
- Methodology M&M impact on copper use
- Wire and cable
- Consumer electronics
- Heat exchange
- Transport and other
- Scoring by end-use sector and conclusions

# Cost reduction and a desire to reduce product size drive miniaturisation

What is M&M? How is it connected to copper demand?



## Miniaturisation

Performing the same function with a smaller product



## Minimisation

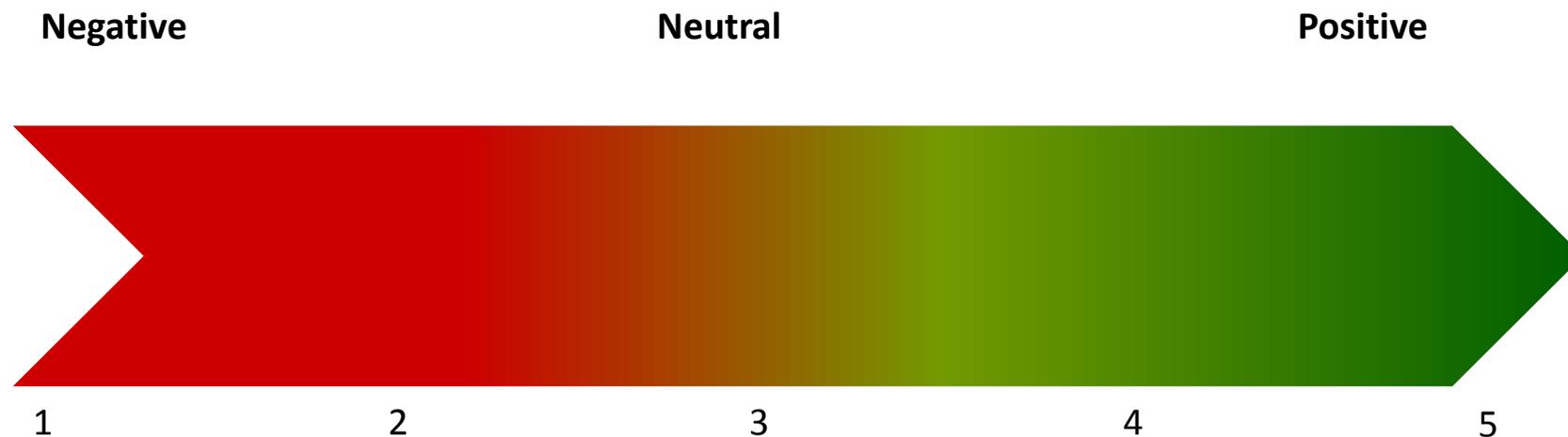
Performing the same function with less material



# M&M can have negative effects on copper use. They can also offset substitution or stimulate new demand

LHS: Methodology M&M impact on copper use

## Subjective scoring system



### Gross impact

Initial or short-term impact of M&M, when feedback loops are not considered. For example, changes in product design resulting in a 5% reduction in copper contained in the product.

### Net impact

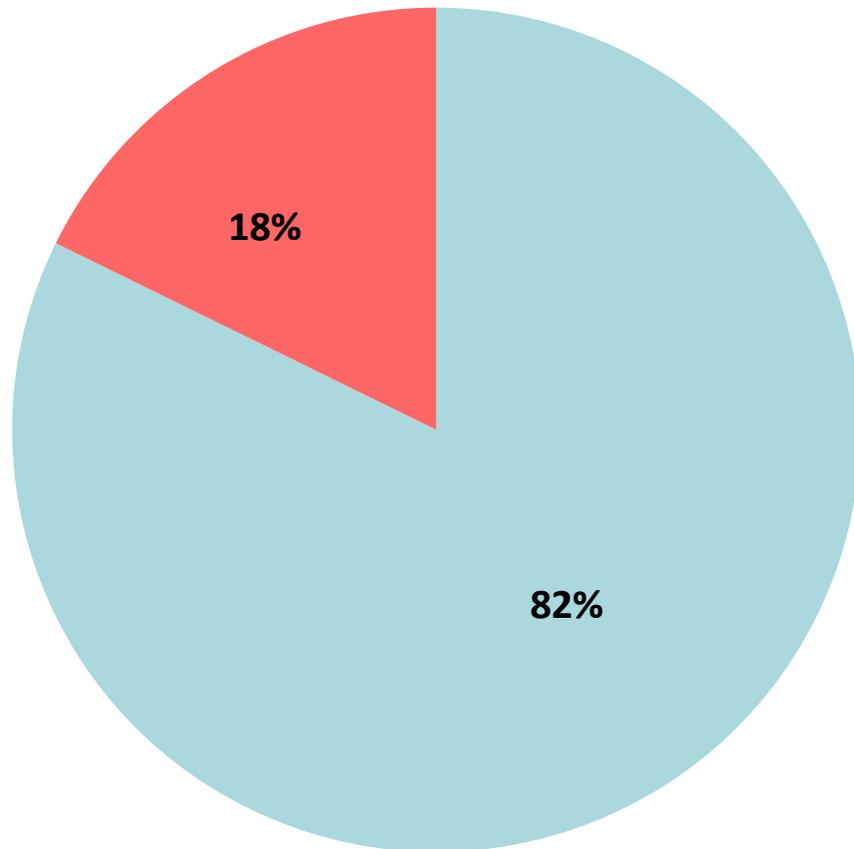
In many cases, it may be reasonable to conclude that the long-term impact of M&M is different to the initial effect. This “net” concept accounts for positive feedback loops such as innovation, higher product volumes and impacts on substitution.

# Little evidence to suggest that M&M is a significant trend affecting wire and cable applications

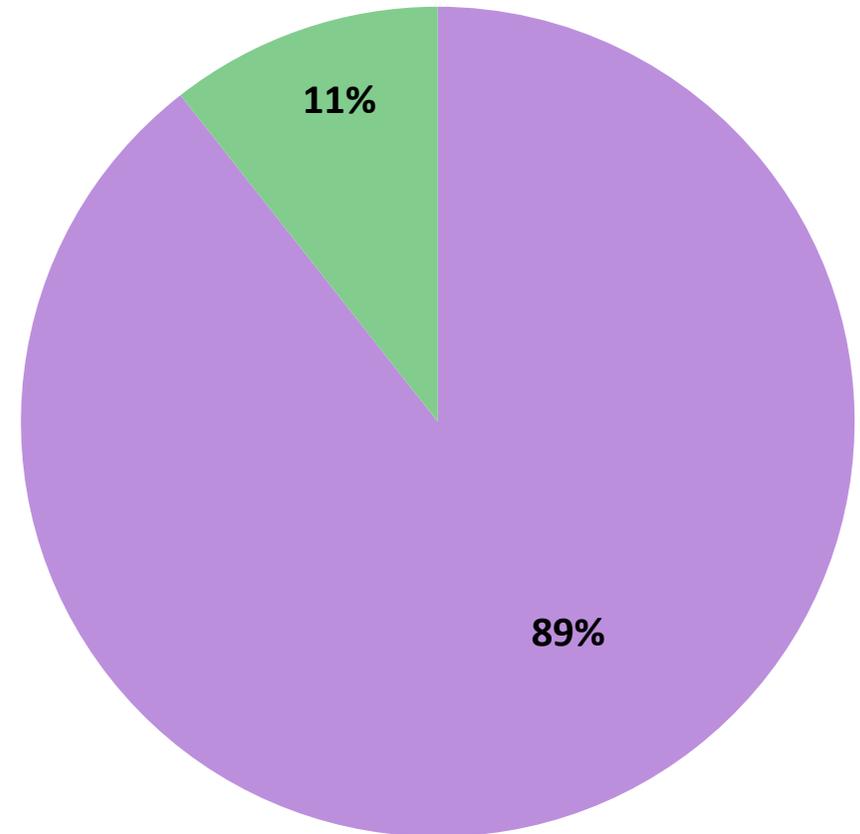
LHS: Global conductor content of electrical wire and cable, 2015

RHS: Global copper conductor tonnes used in wire and cable, 2015

■ Copper ■ Aluminium



■ Electrical ■ Communication

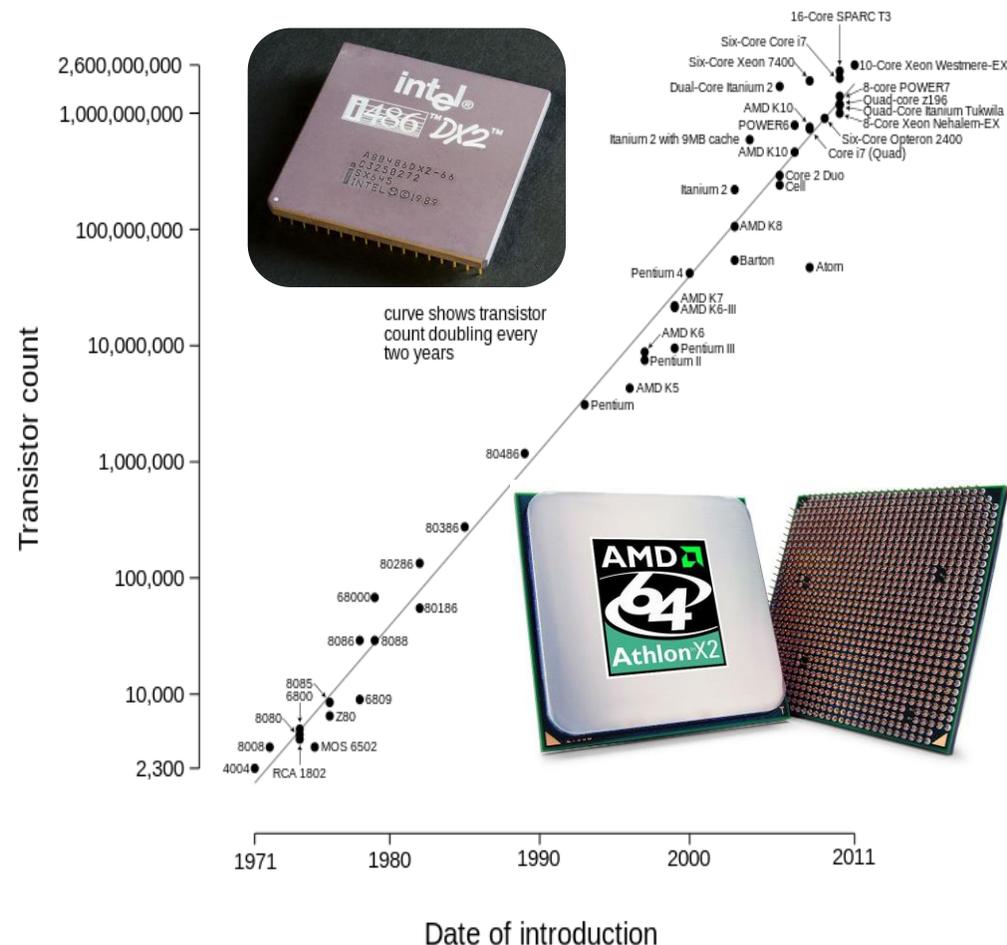


# Miniaturisation a key driver of innovation in consumer electronics, leading to new sources of demand

## Consumer electronics

- Moore's law perhaps longest and most well-documented example of miniaturisation. Number of transistors in integrated circuit doubles each year. Popularised as "Moore's law" by Caltech professor.
- Miniaturisation key to increasing computing power resulting in new electronic devices: desktops, laptops, smartphones and tablets - all of which contain copper.
- Pre-1997, interconnections in integrated circuits were made of aluminium. As transistors got smaller wires needed to get thinner making aluminium use problematic. Aluminium substituted for copper.
- Transistor size beginning to approach the atomic level. Technical limit? What next?

## Transistor Counts, by microprocessor 1971-2011



# Less upside potential from M&M in heat exchange - more about mitigating downside from substitution

Heat exchange and equipment summary

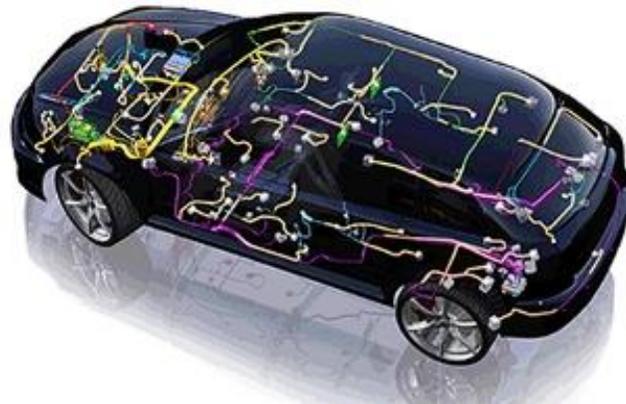


	Demand share	Gross Impact	Net Impact
Consumer electronics	4%	Negative	Neutral-positive
A/C and refrigeration	8%	Negative	Neutral-negative
Other	8%	Neutral	Neutral
<b>Total Equipment</b>	<b>19%</b>	<b>Negative-neutral</b>	<b>Neutral</b>

# M&M contributed to development of electric vehicles, which use more copper than conventional autos

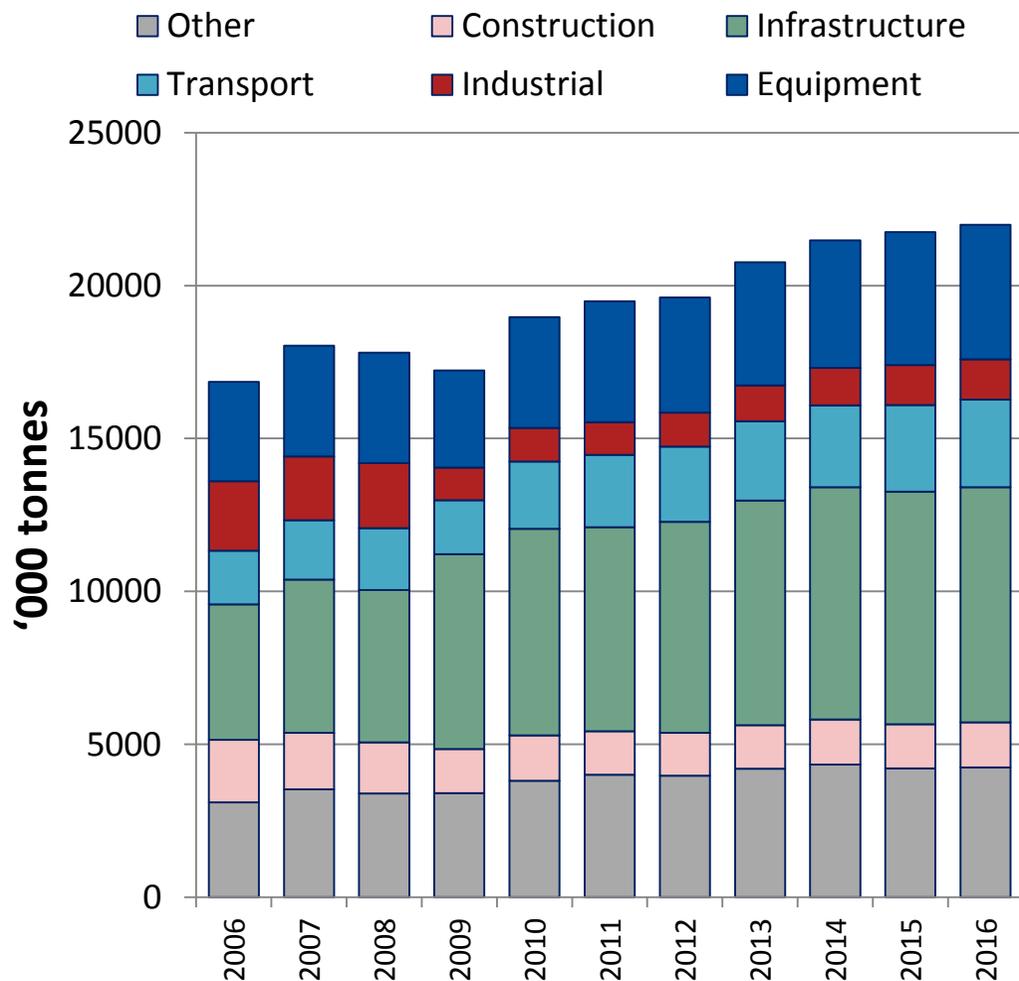
## Transport and other

- Key issue in autos is substitution driven by desire to reduce weight and increase fuel efficiency. Mechanical strength constraint on M&M in wiring.
- Electric vehicles contain roughly double the amount of copper as conventional ICE vehicles.
- Some developments in technology that have facilitated the commercialisation of EVs can be linked to M&M. Net impact of M&M on transport is neutral-positive.



# M&M impact complex and varies by end-use. At the industry-level, scoring suggests net effect is neutral.

LHS: Refined copper demand by end-use sector. RHS: M&M impact score summary \*Weighted average



	Global copper demand 2015	Gross Impact	Net Impact
Infrastructure	35%	3.0	3.0
Equipment	19%	2.0	3.0
Transport	13%	3.0	4.0
Construction	8%	2.0	2.5
Industrial	6%	3.0	3.0
<b>Total*</b>	<b>100%</b>	<b>2.7</b>	<b>3.1</b>

- Impact of M&M trends on copper demand is difficult to measure and forecast. Our scoring suggests gross effect is small, but not negligible over the long-term.
- M&M trends apply to all materials. They can influence substitution and cause unexpected externalities. Net effect relatively neutral.