



RAPID PROTOTYPING,
ADDITIVE MANUFACTURING,
3D PRINTING,
DIRECT DIGITAL MANUFACTURE,
WHATEVER...

A JOURNEY THROUGH ASIA

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DDMC, Berlin 2014

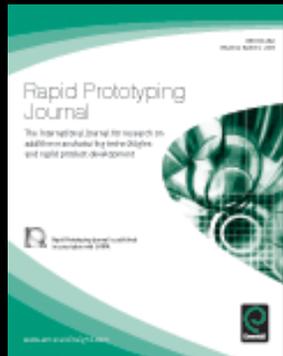
IN THE NEXT HALF HOUR, I WILL: -

- Take you from UK, to Hong Kong, Singapore and Australia
- Span approximately 20+ years
- Cover research, technology, application, education, geography, economics, culture
- Extend into other parts of Asia
 - Northern Asia
 - SE Asia
 - Australasia



THE JOURNEY – UK 1992

- The Nottingham Conference, industrial consortium, SLA, 3D Welding
- Phill Dickens, Richard Cobb, Mark Pridham, Ian Gibson
- The Rapid Prototyping Journal
- Exciting times, rapid rise in interest
- Exploration, evangelism, expansion



“In the country of the blind, the one-eyed man is king”



THE ONE-EYED MAN GOES TO HONG KONG 1994

- ICMA, fundamental research, SLS, FDM, Kira, ZCorp
- Software Solutions for RP, Adv. Man. Tech. for Medical Applications
- GARPA
- New technologies, industrial consolidation
- Research, dissemination

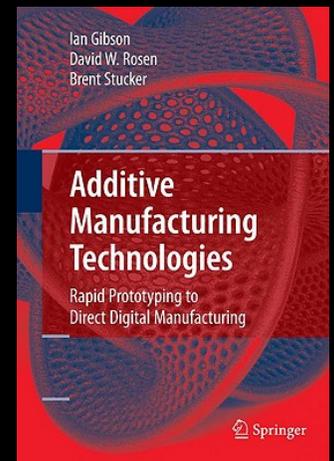
“Standing on the shoulders of giants”



THE WILDERNESS YEARS IN SINGAPORE 2005

- FDM, Objet, applications research (medicine, design, tissue engg)
- The calm (AM) before the storm (3DP)
- Additive Manufacturing: from Rapid Prototyping to Direct Digital Manufacturing
- Engineering Design & Innovation Centre
- Inside3DPrinting

“The future’s so bright I gotta wear shades”



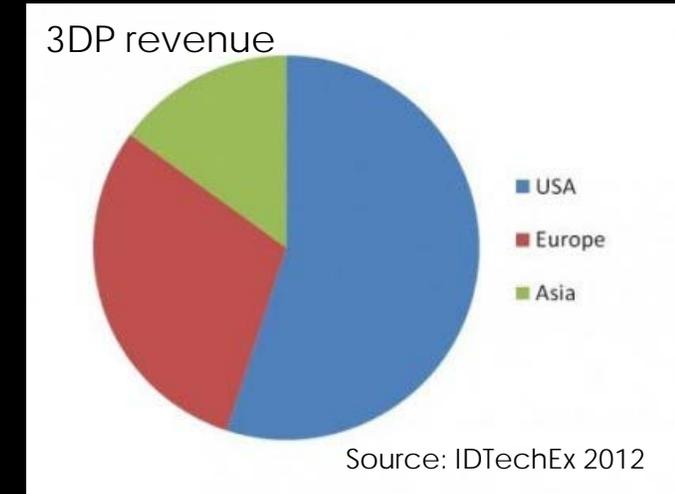
THE WAY FORWARD 2104

- University of Deakin
 - CADET
- Project Oriented Design-Based Learning
 - Significant changes in how we incorporate 3DP into education
- Objet, FDM, ZCorp, SLM, etc.
- Watch this space



GROWTH OF 3D PRINTING IN ASIA

- Beginnings in Japan
 - Competing with US
 - Didn't get the initial kick that happened in the US
- Lots of clone development in China
 - Always competing against cheap labour market
- Why not more innovation in Asia?
- Incorporated heavily into the education sector
- Wohlers' Report indicates 1/3 Asia, 1/3 Europe, 1/3 US
 - Others have Asia even less
 - Why not more in Asia?



GEOGRAPHY, CULTURE ECONOMICS

- High-volume, low cost
 - 3DP always competing against the labour market
 - Traditional solution – throw more men at the problem
- Product development done elsewhere (24-hour PD)
- Intellectual property
- Missing the big picture
- However - \$2bn in China, \$500m in Singapore
 - Where is this money going?



WHERE IS 3DP GOING?

- The Maker revolution
 - A bubble waiting to burst?
 - Dependent on system enhancement vs cost
- Bespoke technologies
 - Customisation
 - Design it yourself
 - Application specific technologies
 - Design tools
- Integrated technologies
 - Additive plus subtractive
 - Functional gradients
 - Multiple materials
 - Metals



AUSTRALIA?

- Transitional process
 - Commodities
 - BIG industry
 - Concern over the job market
- Move to a more agile industrial scene
- 3DP?
 - Metal systems
 - Support for the new design-based development



THE SHIFT IN OUR ROLE AS EDUCATORS

- 3DP machines in primary schools
- People buying their own
- Universities now playing catch-up with society
- Role reversal
 - No sage on the stage
 - Flipped classrooms
 - Problem based learning
- 3DP plays a huge role in this
 - Integrated with other technologies
 - 3D scanning, CAD/CAE, VR, subtractive processes



CADET

- Centre for Advanced Design and Engineering Training
- A\$50+ million investment – first of its kind in Australia
- Following the trends in other parts of the world
 - PBL, DBL, Experiential learning, Design-centric
 - Problem Oriented Design-Based Learning (PODBL)
- Not new technology, not a new engineering programme, not a new building

A new way of learning



CONCLUSIONS

- Asia has yet to come to grips with 3DP
 - How does 3DP fit into semiconductor industry?
 - How does it relate to the labour market?
 - How does DDM fit into all of this?
- Rapid Prototyping has evolved and will continue to do so
- Our role as educators has also changed

