How will industry 4.0 reshape South African Manufacturing
Observations from a Design and Development perspective
Johann du Toit, CSIR Conference, October 2017
Industry 4.0

Overview

• Why is Product Development Important
• Industry 4.0, what is it all about
• Making it practical
• 10 Changes
• What Now
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But first, why is product development so important

First, it is important to recognise that product development plays an important part in building a sound economy. **By converting ideas to sellable products, you generate income.**

Somewhat clashing with my engineering training, and dreams of **beautiful flight** and **precision telescope systems**, products are far more than just tangible items. A new **biomedical datamining algorithm** will probably be more used (and likely more valuable) than a new piece of mining equipment.

My talk is about Manufacturing in general, **tangible and intangible** products.
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What is it all about

Whereas under the previous industrial cycles Steam, Electricity, Automation and computer was the enablers to change the way people live their daily lives, the current change is driven by **digital bi-directional integration at all levels.**
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An example – at a personal level

Technology in this digital domain is developing rapidly. Hardware with massive market penetration was almost non-existing only a decade ago.

![Bar chart showing smart phone sales]

*Source: [www.Statista.com](http://www.Statista.com)

**1 125% !**

Only 10 Years since first iPhone!
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An example continued...

Compare this to a more conventional manufactured system which general public probably see as the foundations of a sound economy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>52.2</td>
</tr>
<tr>
<td>2015</td>
<td>68.5</td>
</tr>
</tbody>
</table>

*Source: http://www.oica.net*
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An example continued...

1125% vs 31%

Impressive, but is it significant?
Add to this that Apple alone have **2.2 million Apps** on its App Store and in 2016 sales was **$28 billion**, and 70% of this went to App developers, opening a next layer of income – **far displaced from California**. And on a next layer, the **app itself generate data and earn revenue**, or supply data (advertisements) again with Billions in value.
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An example continued...

But my talk isn’t about Smart Phones or Cars or Games.

Just as a new iPhone shares some features with a Nokia 6210, on a rudimentary level, they are actually very different devices from a user perspective.

In the same manner, new technologies will enter production arenas and change manufacturing. Just as a new iPhone opens a wealth of opportunities – in both directions - SMART production systems will open a wealth of production opportunities, likely beyond our traditional scope of understanding and expectations.
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Business, not as usual

The last interesting and important aspect of Smart Phones. Most of us in the audience were caught in a cunning plan. Sign a two year contract and get a phone for free. This business model is part of the reason why mobile phone sales were so high....even if people can not really afford them.

This is my first “how will the I4 change manufacturing” point: New and creative Business Strategies understanding the various drivers and solutions around Industry 4, will need to be established. You also need to be creative in how you can leverage income from your products (over and over again).
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Requirements development...also not as usual

Continuing on the Business Development and strategy track, I would argue that the biggest challenge for smaller SME’s, and possibly for Larger Vertical Integrated Business as well, is going to be to understand and predict its client needs.

In a era of disruption, clients might not even now what they want.... or rather what they will want 3 years from now.

My second change Observation for I4: Creating development specifications will need visionary insight, and will likely need specialists from outside your current organisation and up-skilling your current development team on the new technologies out there.
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Time to market....what time?

To accommodate variable client needs, it is foreseeable that some items might be manufactured onsite. For instance, 3D printed shoes, helmets, or skull implants, tibia implants, even art.

3rd observation for I4: “Just-in-time” will be replaced by “Just-now”.
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Learn to handle data

In a era where DATA is becoming as precious as oil, you will need skills in your organisation which can handle data.

Sure, we all believe we can do anything in Excel.

But at the rate we are gathering data during the production, distribution and finally during operations, we will need better skills to visualise and extract sensible value from this data.

You will likely need data analysts, either as partners or upscale your team to at least understand the process, options and value that can be extracted.

This is observation 4 for I4: Employees will need to understand Data Integration and Analytics, and companies will need new partners to help them survive in this brave new world.
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The world is your oyster....and you can be the pearl

So in this light, we must start to think of the globe as clients and suppliers. This is my 5th change for I4: Digital data does not know about borders. The world is there for you and you are available to the world. Products will be exported less, the digital data pack is the item of value.
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However...

To help solve problems all over the world, or collect data all over the world, you will need the correct collaboration, data protection and creative tools and skills. You will likely need to invest in systems and your team training.

Change observation 6: Companies will have to invest in data sharing, data protection and creative tools sets and train their teams to operate in this environment.
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However...

We know **Change is Difficult**. But in the era we are living: **Change should be the Default**.

This is prediction 7: **Companies that embrace change, will prosper**.
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Work smarter, not harder

According to the World Economic Forum, South Africa is current in an Efficiency-driven state. **We should inspire to grow to an Innovation-driven state.**

Prediction 8: **Just working harder, will not make you successful, unfortunately.**
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Opportunities

Our financial systems rank very well. We should embrace this and think of clever ways to merge or fund manufacturing with financial systems.

Prediction 9: RSA will leverage its strong financial sector and develop financing solutions for industry 4 era.
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Need for Scientists and Engineers

What is however strange from the World Economic Data, is that we do not have enough engineers!

Prediction 10: RSA will (need to) increase quantity of people studying in STEAM fields
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Let’s recap

1) New and creative Business Strategies understanding the various drivers and solutions around I4, will need to be established. You also need to be creative in how you can leverage income from your products (over and over again).

2) Creating development specifications will need insight, and will likely need specialists from outside your current organisation and up-skilling your current development team.

3) Just-in-time will be replaced with Just-Now

4) Employees will need to understand Data measurement and Analytics, and companies will need new partners to help them survive in this brave new world.

5) Digital data does not know about borders. The world is there for you, and you are available to the world.
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Let’s recap

6) Companies will have to **invest** in the data sharing, data protection and creative tools sets, and train their teams to operate these new tools.

6) Companies that **embrace change**, will prosper.

8) Just working harder will not make you successful....unfortunately, **innovation is needed**.

9) RSA will leverage its **strong financial sector** and develop financing solutions for industry 4 era.

10) RSA will (need to) increase people studying in **STEAM** fields
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Help is needed!

For SME’s, with limited resources and access to partners who can transfer the know-how and optimised implementation, the scope, complexity and financial risk can easily be a prohibitive barrier to entry to learn to incorporation Industry 4.0

So, for SME’s, it might be that change is practically impossible.

SME’s will require guidance and help to implement Industry 4.0 systems and how to operate in this environment during establishment and early implementation phases.
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Help is needed!

To truly create a vibrant **Economy and create JOBS**, a **vision for production innovation** is required:

- Traditional Research and Development Departments
- Internal Strategic Focus Teams
- Incremental Development

- Creating Innovative Industrial Foundations cross cutting all industries
- Interlinked SME network
- Linked with Global Smart production systems and Industry 4.0 methods
- Focused innovation using general industry and technology foundation
- Development and training in modern production techniques.
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Product Development Centers

For these reasons, the establishment of sponsored I4 centers is essential that can assist SME’s with all the aspects of becoming integrated into the I4 environment. The centers should have specific industry focus, but importantly, the various Centers should interlink with each other and form the epicentres of the Industry 4 network in South Africa and ideally abroad. Once they lead the path, SME’s and Start-ups can adopt the principles and procedures in a low-risk manner.
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Changing the approach

Core capabilities
- Core manufacturing activities
- Training programs and experts
- Industry 4.0
- Consulting fees
- Technical expertise
- Equipment maintenance
- Equipment hire
- Software upgrades
- Service providers
- Administrative and business overheads
- Marketing, networking and events

Supply chain
- Training partners
- Technology partners
- Infrastructure
- Industry 4.0
- PLM
- Training

Value proposition
- The POCs provide Saudi Arabia with the capabilities to establish and develop the product development industry in Saudi Arabia.
- The POC does this using leading edge Industry 4.0 technology, equipment and specialized training, skills development and ultimately job creation.
- In Saudi Arabian Participants.
- The POC focus is advanced manufacturing product development up to prototyping and proof of concept small scale manufacturing phase.

Key activities
- Industry 4.0 product development
- Business support operations
- Training

Customer relationships
- Macro: long term project partners
- Micro: short term projects
- SMEs

Target customers
- Saudi Arabian cardinal projects
- SMEs

Channels
- Marketing
- Industry experts
- Commercial partners
- Training partners
- Innovation networks
- Academic institutions

1. problem / need
- What is the most accurate understanding of customer needs?
- The need to create a product development industry in Saudi Arabia, job creation, skills development for Saudi Arabia

2. Target customers
- Saudi Arabian cardinal projects
- SMEs

3. Value proposition
- The POCs provide Saudi Arabia with the capabilities to establish and develop the product development industry in Saudi Arabia.
- The POC does this using leading edge Industry 4.0 technology, equipment and specialized training, skills development and ultimately job creation.
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Differentiating advantage
- Supported financially by Saudi Arabian state institutions
- Supported in expertise and know how by global specialist networks

Costs after CAPEX
- Equipment maintenance
- Software upgrades
- Service providers
- Administrative and business overheads
- Marketing, networking and events

Revenue potential of the POC
- Equipment hire
- Consulting fees
- Partnership agreements
- Membership fees

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