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The Digitalization Productivity Bonus in Dairy Products Manufacturing

What value does digitalization offer the
Dairy Products industry?

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Management Summary

- Digital transformation – or Industry 4.0 - is a widely recognised imperative in manufacturing. Manufacturing CFOs, however, require measurable outcomes on which to base their investment in digital transformation
 - Research from Siemens Financial Services has shown that measurable improvements in manufacturing productivity are the most reliable starting point for the digital transformation business case
 - In this paper, productivity gains from digitalization and automation – known as the Digitalization Productivity Bonus – has been estimated for the Dairy Products industry in the UK
 - Creating an automated, digitized manufacturing environment requires major investment. Specialist financing tools – Finance 4.0 - are being developed by expert financiers to enable affordable and sustainable transition to the smart, digitalized factory
- Industry 4.0 Financing is now employing that new mindset to offer techniques which range across:
 - Pay to access/use equipment and technology finance so that precious capital is not tied up in depreciating equipment
 - Technology upgrade and update to take advantage of the latest innovations
 - Software finance to embrace all aspects of an Industry 4.0 solution
 - Pay for outcomes to align rate of benefit with rate of payment
 - Transition finance to minimise disruption in the move to automation and digitization
 - Working capital solutions to manage cash-flow in a digital world



Automation and digitalization: The new imperative

There is no longer debate about whether the Fourth Industrial Revolution – Industry 4.0 – is under way; the conversation has moved on to address where, how much and how quickly it is being implemented. Digitalization of the manufacturing environment and its processes forms the foundation of Industry 4.0, adoption of which varies from country to country and economy to economy. In some parts of the world and in certain industries, the emphasis is placed on automating previously manual processes. Automated systems are, by definition, programmed and controlled through digital systems; and where automation is already widespread, further digitalization is taking the form of the Internet of Things. This development involves the widespread installation of sensors in the physical environment and the ability to rapidly enhance production economics through real-time performance data analysis. Some digitalization pioneers are using digital controls and digital data analyses to improve a wide range of processes, including production capacity, job setup and turnaround, uptime maximisation, predictive maintenance, supply-chain logistics and just-in-time distribution. There are even instances of manufacturers – including those in the Food & Beverage sector - improving their competitive capabilities edge through mass customisation, a technique where tailored products are offered with much the same economies formerly associated with mass production¹.

For manufacturers that want to remain competitive in increasingly aggressive markets, the move to greater automation and Industry 4.0 is not an option – it is a necessity. But seizing the competitive advantages of automation and digitalization that lie at the heart of Industry 4.0 requires a substantial investment in new-generation automated and digital platforms. Responsible business leaders will therefore need a solid business case that justifies this kind of significant investment to stakeholders and shareholders, one that paints a credible picture of the revenue, margin and growth benefits an investment in automation and digitalization technology will bring.

Early movers in the manufacturing community (see figure 1) are already enjoying many Industry 4.0 benefits, yet the *precise* commercial gain from each of these benefits can sometimes be challenging to calculate. To help establish a more precise starting point for manufacturers embarking on the automation and digitalization journey, Siemens Financial Services commissioned research to understand which of these benefits could be most reliably estimated and used by most manufacturers to formulate a business case for investing in Industry 4.0 technology.

Figure 1



The starting point for a business case: *The Digitalization Productivity Bonus*

The vast majority of manufacturers and expert consultants interviewed for the research² confirmed that the ability to **increase manufacturing productivity** is a universal starting point for determining measurable value from digitalization. The ability to manufacture the same product volume at less cost, or manufacture more products for little or no increase in costs, resonates with manufacturers considering digital technology investment as a competitive enabler. This was felt to be the case for both manufacturers taking their first steps into automation and those looking to install the latest sensor-based technology to fully digitalize their production environment.

The research revealed that by automating and digitalizing their production systems, manufacturers were set to make production productivity gains equivalent to between 6.3% and 9.8% of their annual revenues. Termed the **Digitalization Productivity Bonus**, this gain was identified by respondents as the most reliable starting point to make a business case for investing in Industry 4.0 technology upgrades.

Global Digitalization Productivity Bonus: reduced production costs resulting from conversion to digitalized technology

Figure 2



Financing Industry 4.0

Manufacturers around the world, however, still face the challenge of having to make a major initial investment to acquire Industry 4.0 automation and/or digitalization technology in the first place. To overcome this obstacle, specialist financiers have developed a set of financing tools called “Finance 4.0” These tools enable the transition to new-generation digital technology in a way that is affordable, sustainable and designed to alleviate the manufacturer’s cash-flow and working-capital pressures.

These specialist Finance 4.0 tools can be summarized as follows::

Pay to access/use equipment & technology finance

This enables the acquisition of a system or piece of equipment. Technology, service and maintenance are all included in a single agreement. Periods can be adjusted to match payments to the financial benefits gained. Master agreements can be established that help speed up future technology acquisitions.

Technology upgrade & update

Manufacturers want to access technology innovations as they appear (and digital innovation cycles are shortening³). Finance can also offer options to upgrade during the financing period, whether to replace with a newer model or retrofit enhancements to the main technology platform.

Software finance

By definition, most Industry 4.0 technology solutions involve both hardware and software. Because specialist financiers understand how the software is implemented and likely benefits in practice, they can understand the associated risks and include the software as an element in the total financing package.

Pay for outcomes

These arrangements base payments on the expected business benefits, or “outcomes”, that automation or digitalization technology makes possible.⁴ Actual financial savings, such as reduced electricity consumption, are used to subsidise or even completely fund monthly payments, making the technology cost neutral for the manufacturer.

Transition finance

Manufacturers do not want to start paying for their Industry 4.0 technology platform until it is installed, tested and operational. Finance 4.0 recognises the challenges of transition and offers financing arrangements that defer payment for a new system until it is reliably up and running, eliminating any period of cost duplication for the manufacturer.

Working capital solutions

Finance can be optimised in more areas than technology acquisition. Improved competitiveness can lead to sudden growth, which exerts pressures on supplies, inventory and overall cash flow. Financing services such as ‘extended payment terms’ – usually based on some form of invoice finance – are available to help manage the broader financial challenges that success through digitalization brings.

Sector focus: Dairy Products Industry

The Dairy Products Industry is well known for its product innovation and brand promotion skills. However, the advent of Industry 4.0 is now opening the doors to a series of new ways of working that offer the potential for substantial competitive advantage – the imperative commercial payback needed from digital transformation.

Within the factory environment digital technology is enabling automated restocking of material, automated quality control, augmented reality remote support, and predictive maintenance⁵. Not only do stock usage sensors automatically process ingredient, consumables and packaging re-orders, the data coming off the production line can be integrated with historical demand trend information to predict demand and allow stocks to be ordered in advance of consumption. Really sophisticated big data analysis can also embrace weather and crop yield data to optimise when supplies are acquired to gain the optimum pricing. The result is less waste, improved customer service and the ability to flex for spikes in demand. Waste management and peak production capabilities are key productivity and cost-control factors in any food business.

Factory floor productivity is also dependent on production and packing line uptime. With dairy products manufacturers using increasingly complicated equipment in order to ensure consistent food safety and quality, machine performance can be remotely monitored and likely breakdown predicted. Such predictive analysis allows

engineers to be triggered to visit a site and maintain equipment in advance of breakdown, maximising uptime and minimising disruption. Often – using augmented/virtual reality, engineers can perform maintenance remotely during quiet periods, reducing cost and disruption further still. Moreover, VR is also being used in the smart factory to help train staff in key hands-on skills without have to interrupt the production environment or build parallel training ‘twin’ production lines⁶.

Most of the smart factory discussion has focused on the manufacturing shop floor. Yet, smart sensing technologies are also being applied to improvements in other areas of the industry, particularly for food safety and track and trace, improved packaging and new product opportunities.

Product recalls⁷ are one example. They may occur for several reasons: microbial contamination; errors in labelling; contamination from inorganic foreign matter (e.g. glass); chemical contamination; non-compliant allergens; packaging faults; etc.

Quite apart from the regulatory pressure to detect where in the supply chain or production process the problem lies, the quicker such incidents are dealt with, the quicker public confidence is restored and revenues returned to normal. Complete food traceability involves the tracking of a product history through data points along the entire processing (field-to-fork) path. Industry 4.0 smart sensing technology – such as RFID – is clearly a major factor in streamlining the entire supply chain to make accurate identification and traceability as rapid and reliable as possible.

Many food businesses have talked about the 'batch of 1' (or 'mass customisation'⁸), where the consumer specifies their product, but production still runs at near mass-production efficiencies. This may be a little fanciful. One manifestation of this approach which is really being implemented is where speciality yoghurt manufacturers are using real-time data and predictive analytics to deliver outlet-specific quantities, and to match daily production runs better to likely demand.

Another area of mass customisation that is bearing fruit is customisable packaging⁹. An example is equipment that can pack cheese combinations for special occasions – even those of different sizes – on a single system using smart sensor detection with automatic format adjustment. Product and packaging variations are implemented automatically and the system does not require line shutdowns to change batches.

Industry 4.0 is also helping to create safer workplaces¹⁰. The Food & Beverage industry, with its hazardous machinery, clean environments and complicated manufacturing processes, by definition creates a shop floor full of hazards. Data flows linking production systems, safety systems and buildings technology allows manufacturers to exert more rigorous safety controls on the factory floor. Real-time analytical systems can help floor supervisors identify danger times and zones and ensure that improved safety measures are in place. Machinery can be programmed to self-trigger when critical limits are reached. More manual tasks can be automated, improving safety, reducing errors and minimising legal liabilities.

All in all, with changing business models, new competitive challenges, developing consumer demands and proximity, and innovative manufacturing possibilities enabled through digitalization, further production efficiencies are an imperative for an industry undergoing such major disruption.

Even such a highly automated industry is looking to Industry 4.0 digitalization to improve production efficiency still further, as well as well as leveraging incremental competitive gains from digital connectivity between people, machines, systems and locations – within the factory, down the supply chain and connecting with distributors and customers. In order to give an idea, however, of the fundamental financial benefit to be gained from Industry 4.0 in Dairy Products Manufacturing, this paper has applied its Digitalization Productivity Bonus model to the Sector in the UK, highlighting a couple of subsectors. The average 'Bonus' percentage range was applied to the total annual revenue of the Dairy Products Manufacturers across the country (revenue data derived from official third party sources). The resulting financial sums in the table below estimate how much Dairy Products Manufacturers could gain from improvements in manufacturing productivity as a direct result of digital transformation. These efficiencies, although not estimated here, can also be realised throughout the supply chain.

Estimated Digitalization Productivity Bonus – reduced production costs resulting from conversion to digitalized technology for Dairy Products Manufacturers

| COUNTRY | Baseline Bonus (production cost reduction) |
|--|---|
|  Dairy Products | £399.6 m |
|  Yoghurt | £86.5 m |
|  Cheese | £81.4 m |

The **Digitalization Productivity Bonus**, is only one aspect of value that digitalization is delivering in the Dairy Products industry. However, it provides industry players with a reliable starting point from which to build a digital transformation business case. These gains from conversion to an Industry 4.0 environment might then be returned to shareholders, invested in R&D, or used to fund a sharper competitive position in a company's key marketplaces.



“Digitalized technology has allowed us to see what is happening in detail within our production environment in real-time throughout each day. We have full insight into downtime detail and production rates, which is helping us to continuously introduce improvement adjustments in each of our lines. Overall, we’re seeing average productivity improvements of around 13%.”

Operations management, major dairy products group

Key references

- ¹ See, for instance: IBM, A framework for Industry 4.0, 10 Feb 2017; PwC, Industry 4.0 – Building the Digital Enterprise, 2016; McKinsey, Industry 4.0 (2015); Strategy&, Industry 4.0 (2014); McKinsey, “Manufacturing’s next act” (2015); Control Engineering Asia, “The dawn of the new industrial era with the Smart Factory” (January 2017); ABB, “The new age of industrial production” (2016); Assembly Magazine, Industry 4.0 (2016); Accenture, “The Growth Game-Changer: How the Industrial Internet of Things can drive progress and prosperity” (2015); Roland Berger, Industry 4.0 (2016); VDMA and McKinsey, “The future of German mechanical engineering” (2014); Oliver Wyman, “Digital Industry” (2015); Manufacturing Technology Center, Industry 4.0 (2016).
- ² Methodology: Over 60 international manufacturers, international management consultants and specialist academics were interviewed in January and February 2017. Respondents gave their expert estimate of financial gain from increased manufacturing productivity resulting from implementation of the new generation of digitalized and/or automated manufacturing technology and equipment classified under the title of Industry 4.0 or The Fourth Industrial Revolution. Respondents expressed their estimates of this financial gain as a percentage of total revenues, using their knowledge of gains calculated as a proportion of total operating costs (total operating costs for manufacturing companies varies between 75% of revenues in Europe to 85%+ in China, according to official statistics). This model was then applied to total revenue data of the manufacturing sector in different countries and manufacturing subsegments around the world to estimate the financial gain from increased manufacturing productivity resulting from implementation of digitalization and automation in each of these geographies and segments.
- ³ Research from Siemens Financial Services published in “Investing in Success” (2016) indicated that 67% of manufacturing respondents observed that technology replacement/upgrade cycles are shortening.
- ⁴ This whole subject is discussed in the Siemens Financial Services research paper “Opportunities and Outcomes” (February 2017).
- ⁵ Food Engineering, Industry 4.0’s impact on the food & beverage industry, 27 Apr 2018
- ⁶ Techcrunch, How augmented and virtual reality will reshape the food industry, 25 Dec 2017
- ⁷ Strategy&, Industry 4.0 - Opportunities and challenges for consumer product and retail companies, 2017; Food Manufacture, Food manufacturers plan for Industry 4.0, 15 Jun 2016
- ⁸ J Simon, M Tojanova, J Zbihlej, J Sarosi, Advances in Mechanical Engineering, Mass customisation model in food industry, 27 Mar 2018
- ⁹ Tetra Pak Foodnavigator, Industry 4.0: Impact on food and beverage manufacturers, 17 Apr 2018
- ¹⁰ Specpage, Food Industry 4.0 – Revolution or Evolution, 27 Oct 2017

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