



**Deloitte.**  
University Press

# When tax meets technology

Tax implications of Industry 4.0

Deloitte's Center for Integrated Research focuses on critical business issues that cut across industry and function, from the rapid change of emerging technologies to the consistent factor of human behavior. We uncover deep, rigorously justified insights, delivered to a wide audience in a variety of formats, such as research articles, short videos, or in-person workshops.

Deloitte Consulting LLP's Supply Chain and Manufacturing Operations practice helps companies understand and address opportunities to apply Industry 4.0 technologies in pursuit of their business objectives. Our insights into additive manufacturing, the Internet of Things, and analytics enable us to help organizations reassess their people, processes, and technologies in light of advanced manufacturing practices that are evolving every day.

# Contents

**Introduction** | 2

**The Industry 4.0 tax challenge** | 4

Factory | 4

Support | 7

Customers | 10

**New business models** | 12

Industry 4.0 and manufacturing ecosystems

**Conclusion** | 13

**Endnotes** | 14

**About the authors** | 16

**Acknowledgements** | 17

**Contacts** | 17

# Introduction

**T**HERE is little doubt that Industry 4.0 increases the productivity and agility of supply chains and will likely continue to shape the evolution of manufacturing over the coming years.<sup>1</sup> The speed of change heralded by Industry 4.0 constitutes a key challenge for businesses. Klaus Schwab, executive chairman of the World Economic Forum, notes an underlying theme in his conversations with global CEOs, namely that “the acceleration of innovation and the velocity of disruption are hard to comprehend or anticipate, and that these drivers constitute a source of constant surprise, even for the best connected and most well informed.”<sup>2</sup>

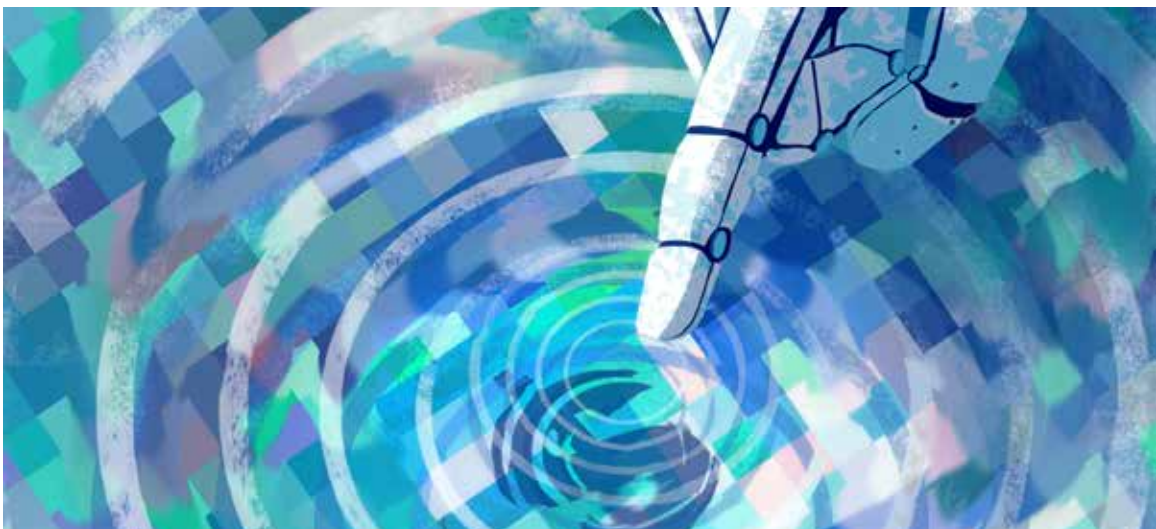
Planning is therefore key. In this environment, manufacturing business leaders typically face two main challenges: how best to realize the potential efficiency and operational gains offered by emergent technologies; and how to grow the business by accessing new markets, creating new products, and navigating additional ways to engage with customers. With this in mind, companies must decide how, where, and when to invest in new technologies, and identify which options can create increased value for its stakeholders. Consequently, the management of operational costs, specifically related to tax, is crucial.

---

The potential tax impacts should be examined whenever businesses are considering Industry 4.0-driven opportunities.

In many instances, business leaders simply do not consider tax when examining the cost of operations, yet tax issues are critical to the health and planning of any organization. Thus the potential tax impacts should be examined whenever businesses are considering Industry 4.0-driven opportunities. Beyond simply the cost benefits, a changed tax position can create additional compliance obligations as well as an increase or decrease in tax obligations, resulting in potential changes to cash flow.

In this article, we examine the tax implications of Industry 4.0 as organizations seek to use advanced technologies to improve operations or drive business growth.

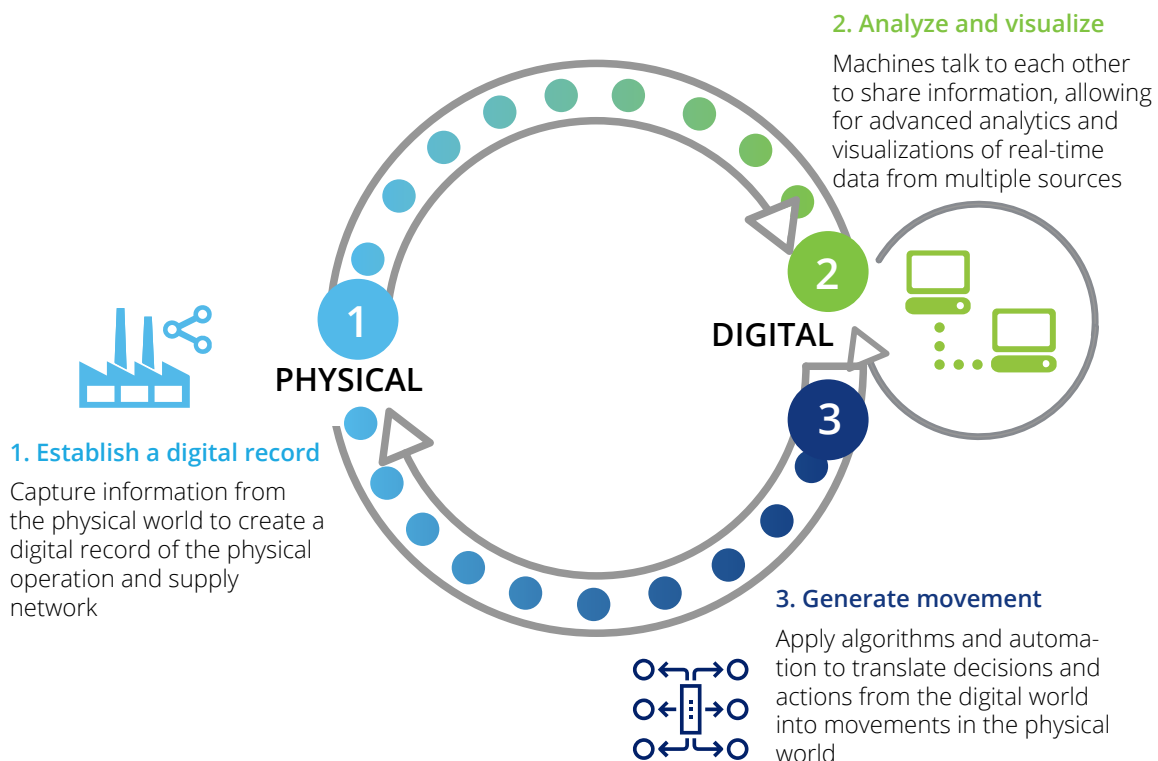


## DIGITAL MANUFACTURING ENTERPRISES AND INDUSTRY 4.0

The Industry 4.0 technologies that enable digital manufacturing enterprises and digital supply networks involve the integration of digital information from many different sources and locations to drive the physical act of manufacturing and distribution. This integration of information technology and operations technology is marked by a shift toward a physical-to-digital-to-physical connection. Industry 4.0 combines the Internet of Things (IoT) and relevant physical and digital technologies, including analytics, additive manufacturing, robotics, high-performance computing, artificial intelligence and cognitive technologies, advanced materials, and augmented reality, to complete that cycle and digitize business operations.

The concept of Industry 4.0 incorporates and extends the IoT within the context of the physical world—the physical-to-digital and digital-to-physical leaps that are somewhat unique to manufacturing and supply chain/supply network processes (figure 1). It is the leap from digital back to physical—from connected, digital technologies to the creation of a physical object—that constitutes the essence of Industry 4.0, which underpins the digital manufacturing enterprise and digital supply network.

**Figure 1. The physical-to-digital-to-physical leap of Industry 4.0**



Source: Center for Integrated Research.

Deloitte University Press | [dupress.deloitte.com](http://dupress.deloitte.com)

Even as we explore the ways in which information creates value, however, it is important to understand value creation from the perspective of the manufacturing value chain. Throughout the manufacturing and distribution value network, business outcomes may emerge from the integration of information and operations technologies via Industry 4.0 applications.

For further information, visit [\*Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises\*](#).<sup>3</sup>

# The Industry 4.0 tax challenge

**T**AX departments are required to negotiate change on a variety of fronts. Almost any shift in the way the business works—such as changes to supply chains, the introduction of new products or services, additional capital expenditure, or product customization—can have ramifications on the tax position. Through it all, tax personnel should always remain aware of the changing tax landscape.

This responsibility is challenging even in the most staid of times, but the pace and scale of change that manufacturers face today is unprecedented. In all decisions about where and how to play in this new environment, there is no master playbook nor a single path to success. Uncertainty exists around the extent to which individual businesses will use Industry 4.0 and how quickly, and the tax environment in which these changes will occur. By understanding the shifts, roles, and influence points created by Industry 4.0, businesses can create a tax strategy and framework to successfully navigate the new landscape.

Business can exploit the benefits afforded by Industry 4.0 in the short to midterm in many ways. For the purposes of this article, we illustrate the potential tax impacts of Industry 4.0 by examining the three

---

By understanding the shifts, roles, and influence points created by Industry 4.0, businesses can create a tax strategy and framework to successfully navigate the new landscape.

key transformational plays that underpin business growth and operations.<sup>4</sup> These transformational plays allow us to focus on some key tax considerations, and represent our current view on the key business disruptors through Industry 4.0:

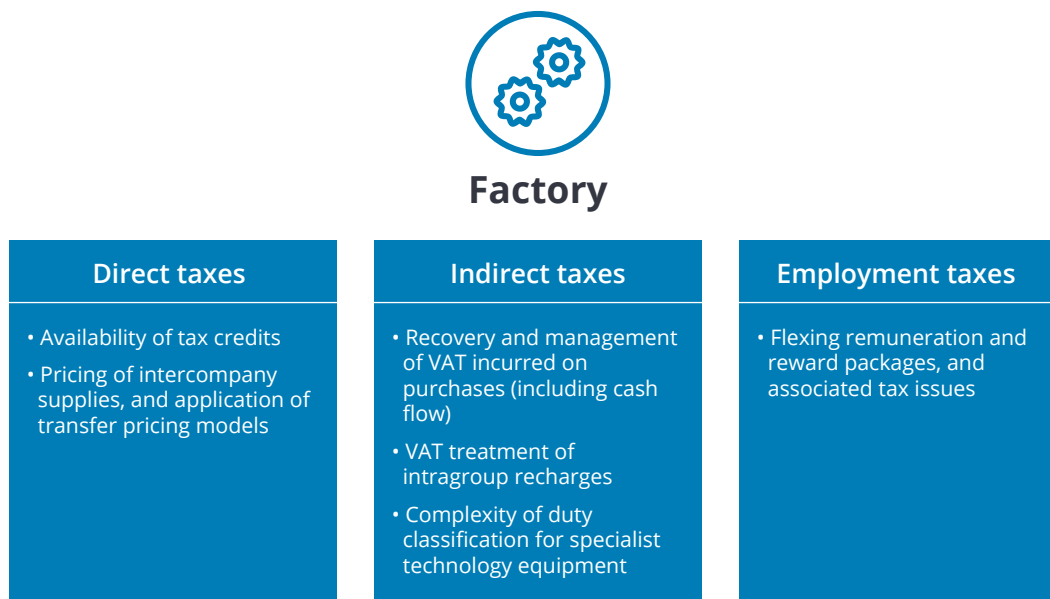
- **Factory:** Creating a digital link between operations and information technology
- **Support:** Automating and scaling aftermarket operations
- **Customers:** Connecting and integrating in new ways

We will also consider how businesses may need to work in new ways to harness the skills and resources required to fully exploit the benefits of Industry 4.0. These new approaches can help create new business models that allow freer sharing of knowledge and resources—and that will require thought from a tax perspective.

## Factory

The factory of the future may leave behind the manual processes and maintenance schedules of traditional factories as it leverages digital processes to link different operations. Indeed, smart factories are already improving operating efficiencies through numerous physical-to-digital technologies, such as augmented reality, sensors and controls, wearables, and the IoT.

These technologies are new for many manufacturers, and their implementation will likely require significant investment, both in terms of human resources and capital investment. The extent of investment in Industry 4.0 varies widely from business to business: Some have not yet made the leap to 4.0 technologies, while others are operating factories where almost all processes are automated.<sup>5</sup>

**Figure 2. Sample tax considerations for Industry 4.0 factory transformations**

Source: Deloitte analysis.

Deloitte University Press | [dupress.deloitte.com](http://dupress.deloitte.com)

As organizations begin to apply Industry 4.0 technologies, capital expenditure is expected to increase significantly, in many cases without clear return on investment projections. As with any significant expenditure, it is key to consider upfront how to plan for a tax-efficient investment. Several factors must be considered: direct taxes, indirect taxes, and employment taxes (figure 2).

## DIRECT TAXES

As many governments seek to incentivize businesses to invest in new technologies, tax credits can potentially be realized to offset income taxes payable. The availability of such relief should ideally be considered

---

As with any significant expenditure, it is key to consider upfront how to plan for a tax-efficient investment.

at the outset of any significant investment program and weighed as a consideration around where the investment should be made.

When a multinational business chooses to invest in a particular jurisdiction, consideration will also need to be given to the pricing of digital or physical services between entities. In some instances, this may be a relatively straightforward exercise where intellectual property (IP) is developed in one jurisdiction and licensed to another.

In other instances, however, it may be more challenging, for example, when a smart link is established between an information center in one territory and factory floor sensors in another. Whereas traditional transfer pricing models may be appropriate for scenarios such as the licensing of IP, they may not be so for other scenarios such as smart-linked factories. Companies thus need to analyze and evaluate their specific fact patterns and value drivers before setting intercompany pricing models.

## INDIRECT TAXES

Where significant capital expenditure is incurred, value added tax (VAT) and customs duties can

represent a significant percentage of the cost. For many organizations, VAT may be considered a tax that “washes through” the business, as they account for VAT on their sales and recover VAT charged on their purchases. However, where businesses make significant investments that fall outside their usual procurement patterns, they should plan in order to mitigate potential excess VAT outlays and effectively manage cash flows.

For example, if a business makes a purchase for which it incurs a significant VAT amount in January, but its VAT return covers the period to March 31, then it could be four to five months (or more) before the business is able to recover the VAT it has paid. This is because the VAT incurred would only be recovered when it is offset against VAT payable on sales when the return is submitted at the start of May. Additionally, high-value purchases can cause a business to be in a “repayment” position; in other words, the business is due a refund from the tax authority. This may bring additional scrutiny, further extending the time it takes for the business to receive the refund.

To ensure that any absolute VAT costs are planned for efficiently, businesses need to actively manage supply chains to ensure clarity around which entity is receiving the supply and incurring the cost, and if and how indirect taxes incurred can be recovered. Where the relevant cost is recharged to other group companies, it is also necessary to ensure that these are actioned appropriately to ensure that VAT incurred on purchases can be recovered.

---

From a customs duty perspective, the types of goods being transported internationally are likely to change as a result of the use of smart technologies.

Recharges can prove particularly challenging for complex multinational corporate structures, where there can be a lack of clarity on which entity is contracting with the supplier and why. For VAT recovery purposes, it is important that the contracts clearly set out which entity is the recipient of the relevant supplies, and that the VAT invoicing reflects that. Digital supply networks may prove especially complex, given the connected nature of suppliers and manufacturers.<sup>7</sup>

In terms of recovering any VAT incurred, businesses should remain aware that in some countries, even if a company is technically entitled to reclaim VAT, it can be difficult to actually obtain refunds unless VAT is paid over to the tax authorities on resultant sales. Therefore, in instances where expenditure is significant and cash flow is tight, it would be important to consider where and when expenditure is incurred before making procurement decisions.

From a customs duty perspective, the types of goods being transported internationally are likely to change as a result of the use of smart technologies. Initially, imports of specialist technology equipment may increase, creating additional classification complexity for duty purposes and requiring frequent reviews of World Trade Organization (WTO) classifications and, consequently, the European Union (EU) tariff. Where Industry 4.0 technologies such as additive manufacturing (AM) are used directly, fewer manufactured goods may need to be imported going forward. Shipments of chemicals and raw materials, on the other hand, may increase, resulting in changes to the current statistics for countries of origin.

On a practical level, technology goods may also be increasingly difficult to classify for customs purposes. The WTO information technology agreement was updated in 2015, eliminating duties on an additional 201 products.<sup>8</sup> However, technology evolves quickly. Any products not covered in the agreement can be subject to significantly high tariffs, impacting business costs.

### WORKFORCE CHANGES AND EMPLOYMENT TAXES

Availability of talent constitutes another factor driving selection of locations in which to invest. Put



simply, the workforce must be able to work with Industry 4.0 technologies. Workforce changes will be inevitable, and it is likely that competition for specialists highly skilled in advanced manufacturing will increase.<sup>9</sup> Consequently, companies may need to reconsider and possibly adapt their remuneration and rewards packages in order to attract talent.

---

## Engagement with self-employed or third-party specialists may further necessitate the evaluation of employment tax risks.

Furthermore, additional automation would require employees to undertake different roles. This progression is likely to continue to impact demand for skills in the manufacturing workforce.<sup>10</sup>

This reshaping of the workforce has potential implications from an employment tax perspective, particularly where staff members are employed in new territories or travel between different tax jurisdictions as part of their role. Additionally, automation within the industry may leave some roles redundant; companies may need to consider redeployment of staff or termination packages. Engagement with self-employed or third-party specialists may further necessitate the evaluation of employment tax risks.

It is clear from these tax considerations that companies cannot concern themselves merely with *what* to invest in but also *where* and *how* the relevant contractual relationships should be structured. These considerations could affect the absolute cost of implementation and create price variances that should be considered when implementing a procurement strategy.

## Support

Industry 4.0 can also transform aftermarket support for both customers and manufacturers. Early adopters of new technologies are seeing significant

benefits such as enhanced productivity and quality of field repair, early prediction of product failure, and the ability to respond quickly and accurately to that failure.<sup>11</sup>

For example, Industry 4.0 can enable companies to cut response times to aftermarket requests through the use of AM to print spare parts.<sup>12</sup> As AM technology becomes cheaper and more commonplace, this type of aftermarket delivery model may become more prevalent.

Siemens is exploring alternative aftermarket delivery strategies such as AM-produced burner tips for its gas turbines using laser beam welding, which allows the rapid procurement of replacement parts and cuts down inventory costs. Citing benefits such as reduced repair time by up to 90 percent, Siemens anticipates that AM will revolutionize the supply of spare parts.<sup>13</sup> In the future, it predicts that a network of small 3D printers could create the spare parts needed based on digital blueprints. These could make the parts precisely as and where they are needed: close to the customer.

The operational benefits to both the manufacturer and its customer are clear, but such a radical change to the aftermarket supply chain has consequences for a business's tax compliance position too, potentially changing both the direct and indirect tax footprints of the business. These consequences are explored below.

## MANAGING TAX IN A CHANGING AFTERMARKET SUPPLY CHAIN

The precise tax implications of using AM to provide aftermarket support will depend on the commercial structure implemented by the manufacturer. There are many factors that can influence the most beneficial supply chain model for a manufacturer; in time, common themes may emerge.

For example, as AM becomes increasingly common, local contract manufacturers may facilitate the provision of spare parts by intermediating between the IP owner and the customer. This type of arrangement could take numerous forms. In one scenario, the customer could engage with both the IP owner and the contract manufacturer. In another, the

**Figure 3. Sample tax considerations for Industry 4.0 support transformations**



Source: Deloitte analysis.

Deloitte University Press | [dupress.deloitte.com](http://dupress.deloitte.com)

contract manufacturer could act as an agent for the owner of the IP rights. The nature of the contractual relationship will create different tax consequences for each party in the supply chain and aftermarket support process (figure 3). We explore some of the tax ramifications of Industry 4.0–driven aftermarket support below.

### DIRECT TAXES

A business’s liability around corporate income tax is based on jurisdiction. If the supply chain changes as a result of using AM technology, the business would need to consider whether it has created additional permanent establishments, for example, if the IP owner is based in one jurisdiction and transfers and delivers goods to customers, with no physical presence in the customer’s jurisdiction. This can lead to tax compliance and reporting issues if the position is not considered.

In the example above, it is also important to consider which party owns the raw materials used in the AM printing process. For corporate tax purposes, stock holding for delivery may create a taxable presence for the owner, unless an income tax treaty applies. In other words, by creating a more responsive aftermarket delivery model that shifts the location of spare parts manufacture closer to the customer, manufacturers may create additional locations for which they have tax compliance or reporting obligations.

### INDIRECT TAXES

Similar issues arise for international indirect tax compliance obligations. Simply holding stock in a particular jurisdiction can, in some instances, be sufficient to create a registration entitlement for VAT purposes. Therefore, if a manufacturer holds printing materials in a jurisdiction to enable it to 3D-print parts close to the operations of its major customers, it

would need to consider local rules to determine what reporting (and indirect tax charges) are required.

Even in a scenario where a permanent or fixed establishment has not been created, a VAT registration requirement could still be triggered if the printing products are shipped into a country by a supplier, printed, and then sold to customers in that country. The title to the products would then pass from the supplier to the customer in the customer's jurisdiction. In this scenario, the supplier may incur import VAT and customs duty when the goods are imported, and may be required to register for and charge local VAT to its customer. Additionally, even though import VAT is often recoverable in the hands of the supplier, any duty payable, which is calculated on the VAT-inclusive amount, is not recoverable and would represent an absolute cost to the business.

## TAXING GOODS VS. SERVICES

Even where a business does not change its geographical footprint through the rollout of new aftermarket support models, companies should consider whether changes to reporting are necessary. For example, AM challenges the basic building blocks of indirect tax compliance, namely, whether the manufacturer supplies goods or services. Traditional spare parts sold to a customer would be considered either a supply of goods or, where fitted as part of a repair service, part of an overall service. However, the provision of a digital file to a third party so that it can create a product constitutes a service and may be taxed as such.

The regulations governing the provision of goods can be significantly more administratively burdensome than those around services. The European Union mandates additional evidential requirements where goods are exported and extra returns that must be made to the tax authorities.<sup>15</sup> Challenges remain, though, where services are provided: It can be difficult to determine exactly which outpost of an organization makes and receives supplies, and whether customers are receiving the supply for business purposes. All of these factors need researching as they will affect reporting requirements.

Understanding the applicable VAT, goods and services tax (GST), or sales tax rules is not only a

---

The regulations governing the provision of goods can be significantly more administratively burdensome than those around services.

question of managing the compliance requirements. For businesses operating in a business-to-consumer market where prices are often quoted as VAT inclusive, misunderstanding the applicable VAT rate can have a significant impact on the profit margin.

## VALUATION OF SUPPLIES FOR IMPORT DUTIES

Subject to adjustments, import duties need only be paid on the value of the goods. Software delivered via other channels (such as the Internet) may represent a nondutiable element of value. However, the impact on the valuation of any additional payments considered part of the economic value (known as "assists") will need to be taken into account. For example, software licenses, royalties, and license fees must be included in customs valuations. The vehicle for moving the software would also need to be considered. Transactional value constitutes the usual method for customs valuation; however, this may not be available in all cases. Bespoke valuation agreements may be needed on a case-by-case basis with the customs authority, particularly where a third-party supplier is involved.

Assists may include such areas as research and development, and product design. As with royalties, assists should be considered from a customs valuation perspective. Greater supply chain complexity may require more flexibility in policy to allow greater storage and processing of raw materials. Where raw materials are stored in a customs warehouse, it may be necessary to process "on-demand" supplies, which may take place within the facility. Alternatively, there may be an increase in demand for third-party

warehouse keepers to act on behalf of nonestablished entities to provide a supply of goods.

Export control implications may also apply, as it may be necessary to provide better traceability of data. It may become harder to monitor the flow of assets to their end use or end user, particularly as assets become less physical and increasingly virtual, such as digital files for use in a 3D printer.

## EMPLOYMENT TAXES

As businesses strive to meet the demands of an increasingly global and diverse customer base via aftersales services, they may encounter both short- and long-term mobility implications for employees. These may need to be considered from an employment taxes perspective. In some instances, using technologies such as virtual or augmented reality for “see what I see” training and communication may reduce the need for physical mobility.<sup>16</sup> But many businesses may see an increase in mobility, either to set up new operations or to address skills shortages in certain territories.

Considering the tax impacts highlighted above, tax and finance teams must consider several critical issues each time a supply chain is altered. For example,

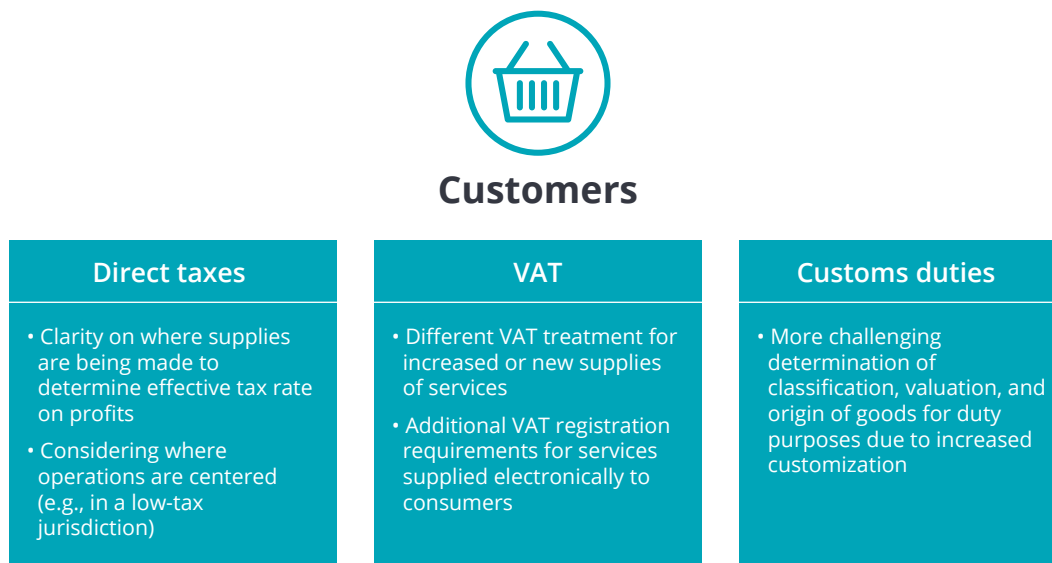
compliance obligations may be triggered in new jurisdictions. If they are not considered at the outset, missing these obligations may incur penalties as well as the additional ongoing costs associated with the compliance process. These recurring costs would also need to feed into the cost base of the altered supply chain to ensure that the financial forecasts are accurate and comprehensive.

## Customers

Beyond benefitting customers by improving aftermarket support capability and responsiveness, Industry 4.0 technologies also allow manufacturers to explore new areas outside of their core business. For example, smart products that connect to the IoT increase product life cycle data available to manufacturers. By utilizing these data, manufacturers can both enhance their own operations and offer new products and services to customers.

Manufacturers can use these data to create and offer new and complementary services to customers. Michelin, for example, has traditionally sold tires to its customers. However, as a result of sensors placed in tires as well as the ability to aggregate and analyze large volumes of data, it can now also offer certain

Figure 4. Sample tax considerations for Industry 4.0 customer transformations



Source: Deloitte analysis.

Deloitte University Press | [dupress.deloitte.com](http://dupress.deloitte.com)

customers a monitoring program.<sup>17</sup> Michelin uses sensors to monitor tires in real time, allowing reactive monitoring of alarms. By analyzing real-time information, operators can detect slow pressure losses, monitor temperature increases, and plan maintenance operations to reduce downtime.

For traditional manufacturers that have historically operated within a core business model of providing goods (rather than services), these additional revenue streams require special consideration to ensure that they are being taxed appropriately and in the correct jurisdictions (figure 4).

## DIRECT TAXES

From a direct tax perspective, the key challenge may be determining where the additional services originate; this location would impact the effective tax rate for the profits derived from the new business stream. In some instances, the specifics of the service on offer may mean that it is not straightforward to determine from where the service is provided. For example, the supply of services could potentially be separate from the location of the customer.

## INDIRECT TAXES

How big a challenge indirect tax teams face will likely depend on how big a change to traditional business operations the new services represent. With manufacturers historically supplying goods, tax teams may face a steep learning curve as they struggle to acclimate to regulations around services.

To highlight the differences that arise between the supply of goods and services, it is worth considering the basic “place of supply” rules in the European Union, which dictate where a supply is taxed. For services, the basic place of supply rule for services supplied to a business customer is determined by where the recipient is established. On the other hand, the basic place of supply rule for goods is determined by where the movement of goods takes place.<sup>18</sup>

Where businesses provide monitoring or other services electronically to private individuals or non-business customers, many countries have introduced or are planning to introduce legislation that may require the business to register and account for VAT at the applicable rate in the customer’s country.<sup>19</sup>

In some instances, new services may be merely ancillary to the goods that have been traditionally supplied by the manufacturer, and therefore their tax treatment remains unchanged. However, such technical considerations should be tackled early on to ensure that the business remains compliant and does not incur financial penalties.

From a duty perspective, where personalized or customized goods are imported and exported, it may be difficult to classify and value goods. It may also be difficult to identify the country of origin and thus apply taxes accordingly in situations where manufactured products have significant variation in parts or raw materials. This can affect the applicable duty rate.

## EMPLOYMENT TAXES

The impact of the additional services provided to consumers is unlikely to directly affect employment taxes. However, any such expansion may necessitate additional training for staff. This would create a cost to the business, and it is worth considering how these costs are structured to enable an efficient tax treatment in any particular circumstance.

Although the provision of additional complementary services may appear to be ancillary to a manufacturer’s core business, tax impacts are not necessarily insignificant. Any additional revenue streams require an analysis of some of the key building blocks of a business’s tax compliance. Fundamentals, such as place of establishment and place of supply, may be different for these new revenue streams than for the core business. Furthermore, tackling these considerations early may create opportunities for businesses to structure the provision of services in a tax-efficient manner.

# New business models

## Industry 4.0 and manufacturing ecosystems

**T**HIS paper would not be complete without acknowledging some of the means by which a business may seek to collaborate with other entities to exploit the benefits of Industry 4.0 technologies.

In many instances, the opportunities provided by Industry 4.0 are so significant, yet the expertise required so diverse, that entities often must partner with other businesses to fully capitalize on the available opportunities. Small, agile organizations are leveraging global digital platforms to pool skills and challenge the market leaders in their sector. For their part, global businesses are also turning to such global platforms to evolve at a similar rate.

For example, Samsung has used crowdsourcing to seek innovative solutions for existing electronic products and technologies from third parties. It has also sought collaboration with other firms and interested individuals. As long ago as 2013, Samsung partnered with product development platform Marblar to crowdsource ideas on utilizing new patents from NASA.<sup>20</sup> Samsung offered users the chance to help create the company's next product and earn a share of the revenue generated.

Despite the benefits of these types of partnerships, the tax barriers to implementing such arrangements are not insignificant. Many of the considerations we've set out in the preceding examples in this paper are relevant here, such as the place of supply and where a business has a taxable presence. However, the agile partnerships referenced above create additional layers of complexity. It is imperative to establish the legal status of these partnerships, as

both the direct tax and indirect tax position will vary depending on the form the arrangement takes. For instance, a formal joint venture may require separate tax registrations and returns, whereas a revenue share arrangement would require a detailed analysis of how the various proportions should be taxed.

These considerations apply to crowdsourcing arrangements too. Crowdsourcing can potentially enable an entity in any jurisdiction to access skills and expertise available elsewhere in the world without requiring any nexus to be established in that other state. This could enable a concentration of value in the business's home territory without margin leakage.

Many joint arrangements require a level of granular analysis to establish which party is responsible for various compliance activities. Where products are moved internationally between parties, for example, it is imperative to determine which entity should be clearing shipments and making the necessary declarations from an indirect tax perspective. Similarly, where IP is shared, it is key to determine how this is valued and supplied between the different entities.

Considering tax at the outset is likely to be the most effective way of preventing surprises within these arrangements. New business models should be carefully analyzed, and their impacts should be considered within the context of the affected supply chains. Such analysis can be a challenge even for seasoned tax practitioners, as much of the developed economies' tax legislation was drafted many years ago when today's collaborative business models were inconceivable.

# Conclusion

**I**N this paper, we have explored some of the potential tax implications of Industry 4.0 and highlighted areas of both risk and opportunity. There are a few key action points businesses could consider from a tax perspective as they navigate if, how, and when to implement Industry 4.0 technologies.

## Consider the tax position upfront

When and how the Industry 4.0 revolution will affect each business will likely depend on its own appetite and plans. However, for all businesses, it is crucial to consider the tax implications as part of the planning process—and certainly prior to implementation. This can help reduce the risk of surprise tax costs further into the project and help ensure that financial models are fit for purpose. As set out above, the tax consequences of certain supply chains may even prove to be a significant factor in determining the shape new products and business models take.

## Ensure the operating units within a business are communicating effectively

Many decisions regarding where and when to invest will be made by operational decision makers. Yet Industry 4.0 represents such a fundamental change that it will often impact all areas of the business, from supply chain to human resources to the finance and tax teams. It can therefore be crucial to ensure a feedback loop exists between the tax department and business leaders as to what proposals are being actively considered, and any potential tax implications and opportunities that result. It is only by establishing proactive communication in this manner that a business can achieve a holistic view of the true cost of any proposal.

---

The tax consequences of certain supply chains may even prove to be a significant factor in determining the shape new products and business models take.

## Consider whether the business wishes to take an active role in shaping tax policy

By considering the tax implications early, those businesses that stand to be most impacted may consider getting involved in the evolution of the policy governing taxation of Industry 4.0. The taxation of goods and services has traditionally been grounded in the physical movement of goods or the place of establishment of the business. Industry 4.0 may disrupt these building blocks, paving the way for new policies.

## Be aware of other disruptors impacting taxation

It is not just changes within the business that tax teams are required to factor in; there are a multitude of external influences that are affecting the tax landscape. The Organization for Economic Cooperation and Development's Base Erosion and Profit Shifting (BEPS) project, for instance, aims to address cases where multinational companies shifting profits to

lower tax jurisdictions has contributed to erosion of the tax base. This new tax framework, which will likely be adopted in one form or another by over 100 countries, is expected to impact many businesses engaged in cross-border trade and operating in multiple jurisdictions.

Apart from the BEPS project, a number of countries are also significantly changing their tax system by introducing a VAT or GST system. China, India, and many of the countries in the Middle East have either introduced a VAT or GST system recently or are poised to do so in the very near future. Others are moving toward a destination-based approach to indirect taxation and, with the rapid development of digitalization, are introducing rules to capture

e-commerce activities. In the United Kingdom, Brexit is likely to impact the indirect tax position of cross-border trade.

Significant challenges and opportunities exist that businesses should consider as they move to adopt Industry 4.0 technologies and practices. Tax will likely be a key factor that could affect the profitability and efficiency of the new smart factories, supply chains, and product offerings being considered. Despite the inherent complexities of the global tax system, through careful, early planning and effective communication between all stakeholders, tax need not be a barrier to the opportunities presented by the fourth industrial revolution.

---

## ENDNOTES

1. Brenna Sniderman, Monika Mahto, and Mark Cotteleer, *Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises*, Deloitte University Press, February 22, 2016, <https://dupress.deloitte.com/dup-us-en/focus/industry-4-0/manufacturing-ecosystems-exploring-world-connected-enterprises.html>; Adam Mussomeli, Stephen Laaper, and Doug Gish, *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016, <https://dupress.deloitte.com/dup-us-en/focus/industry-4-0/digital-transformation-in-supply-chain.html>.
2. Klaus Schwab, "The Fourth Industrial Revolution: What it means, how to respond," World Economic Forum, January 14, 2016, <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond>.
3. Sniderman, Mahto, and Cotteleer, *Industry 4.0 and manufacturing ecosystems*.
4. Ibid.
5. Conner Forrest, "Chinese factory replaces 90% of humans with robots, production soars," *Tech Republic*, July 30, 2015, <http://www.techrepublic.com/article/chinese-factory-replaces-90-of-humans-with-robots-production-soars/>.
6. Mark Humphlett, "Can the CFO predict ROI of digitalization in manufacturing?" *Industry Week*, October 12, 2016, <http://www.industryweek.com/technology/can-cfo-predict-roi-digitalization-manufacturing>.
7. Mussomeli, Laaper, and Gish, *The rise of the digital supply network*.
8. World Trade Organization, *Information Technology Agreement*, December 2015, [https://www.wto.org/english/tratop\\_e/inftec\\_e/inftec\\_e.htm](https://www.wto.org/english/tratop_e/inftec_e/inftec_e.htm).
9. Sniderman, Mahto, and Cotteleer, *Industry 4.0 and manufacturing ecosystems*.



10. "Automation and anxiety: Will smarter machines cause mass unemployment?" *Economist*, June 25, 2016, <http://www.economist.com/news/special-report/21700758-will-smarter-machines-cause-mass-unemployment-automation-and-anxiety>.
11. Sniderman, Mahto, and Cotteleer, *Industry 4.0 and manufacturing ecosystems*.
12. Craig A. Giffi, Bharath Gangula, and Pandarinath Illinda, *3D opportunity for the automotive industry: Additive manufacturing hits the road*, Deloitte University Press, May 19, 2014, <https://dupress.deloitte.com/dup-us-en/focus/3d-opportunity/additive-manufacturing-3d-opportunity-in-automotive.html>.
13. Siemens, "Additive manufacturing (3D-printing) of spare parts for industrial gas turbines," <http://www.energy.siemens.com/mx/en/services/industrial-applications/additive-manufacturing.htm>, accessed January 6, 2017.
14. Matt Widmer and Vikram Rajan, *3D opportunity for intellectual property risk: Additive manufacturing stakes its claim*, Deloitte University Press, January 22, 2016, <https://dupress.deloitte.com/content/dupress/dup-us-en/focus/3d-opportunity/3d-printing-intellectual-property-risks.html>.
15. Intrastat is an EU system through which the authorities collect statistics in relation to the trade of goods between the member states. Supply of services does not fall within the scope of the Intrastat system. Although Intrastat does not involve any additional tax cost, this is an additional administrative burden for businesses, and the information required, including the weight of the goods being traded, is detailed. For more information on the UK rules (the rules are similar across all member states), see UK government, "Notice 60: Intrastat general guide," <https://www.gov.uk/government/publications/notice-60-intrastat-general-guide/notice-60-intrastat-general-guide#introduction>, updated December 22, 2016.
16. Sniderman, Mahto, and Cotteleer, *Industry 4.0 and manufacturing ecosystems*.
17. Michelin, "Michelin earthmover: Michelin launches the MEMS Evolution3," June 15, 2015, <http://www.michelin.com/eng/media-room/press-and-news/press-releases/Products-Services/Michelin-earthmover-Michelin-launches-the-MEMS-Evolution3>.
18. European Commission Taxation and Customs Union, "Where to tax?," [http://ec.europa.eu/taxation\\_customs/business/vat/eu-vat-rules-topic/where-tax\\_en](http://ec.europa.eu/taxation_customs/business/vat/eu-vat-rules-topic/where-tax_en), accessed January 13, 2017.
19. A summary of the EU rules effective 2015 can be found at European Commission Taxation and Customs Union, "Telecommunications, broadcasting, and electronic services," [http://ec.europa.eu/taxation\\_customs/business/vat/telecommunications-broadcasting-electronic-services\\_en#new\\_rules](http://ec.europa.eu/taxation_customs/business/vat/telecommunications-broadcasting-electronic-services_en#new_rules), accessed January 13, 2017.
20. Jon M. Chang, "'Anti-troll' Marblar unites NASA patents, Samsung to crowdsource new products," *ABC News*, October 24, 2013, <http://abcnews.go.com/Technology/anti-troll-marblar-unites-nasa-patents-samsung-crowdsource/story?id=20661007>.

---

## ABOUT THE AUTHORS

### GARETH PRITCHARD

**Gareth Pritchard** is a partner with over 18 years of experience advising large global businesses on indirect tax matters. He leads the Deloitte UK Manufacturing Indirect Tax team and is also lead indirect tax partner for aerospace and defense businesses across EMEA. He has a special interest in disruptive technologies affecting the manufacturing sector.

### DEBBIE HATHERELL

**Debbie Hatherell** is an associate director in the Deloitte UK Tax service line. She primarily advises manufacturing businesses and has over 12 years of experience advising multinational clients on a wide variety of indirect tax issues, including complex international supply chains.

### LORRAINE YOUNG

**Lorraine Young** is an associate director in the Deloitte UK Indirect Tax team. She has seven years of experience working with the finance teams of many manufacturing businesses to assess tax risks and ensure compliance obligations are met.

### ALICE STOCKER

**Alice Stocker** is a consultant in Deloitte LLP's VAT practice in London and focuses on advisory work for clients in the consumer business sector. She has seven years of experience advising on indirect tax matters.

---

## ACKNOWLEDGEMENTS

The authors would like to thank **Ruth Kallio-Mielke, Paul Sallomi, Doug Hansen, Benno Tamminga, Ronnie Dassen,** and **Philip Walton** of Deloitte Tax LLP; **Francois Disch, Caroline Barraclough, Charlotte Prescott, Samantha Mannall, Tim Shaw, Andrew Clarke,** and **Sally Jones** of Deloitte LLP in the United Kingdom; and **Brenna Sniderman, Mark Cotteleer,** and **Elina Ianchulev** of Deloitte Services LP for their contributions to the preparation of this article.

---

## CONTACTS

**Gareth Pritchard**

Partner, Deloitte Tax LLP

+44 2920 26 4294

+44 7970 172813

[gpritchard@deloitte.co.uk](mailto:gpritchard@deloitte.co.uk)

# Deloitte. University Press



Follow @DU\_Press

Sign up for Deloitte University Press updates at [www.dupress.deloitte.com](http://www.dupress.deloitte.com).

## **About Deloitte University Press**

Deloitte University Press publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte University Press is an imprint of Deloitte Development LLC.

## **About this publication**

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

## **About Deloitte**

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee, and its network of member firms, each of which is a legally separate and independent entity. Please see [www.deloitte.com/about](http://www.deloitte.com/about) for a detailed description of the legal structure of Deloitte Touche Tohmatsu Limited and its member firms. Please see [www.deloitte.com/us/about](http://www.deloitte.com/us/about) for a detailed description of the legal structure of Deloitte LLP and its subsidiaries. Certain services may not be available to attest clients under the rules and regulations of public accounting.

Copyright © 2017 Deloitte Development LLC. All rights reserved.  
Member of Deloitte Touche Tohmatsu Limited