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Transfer Pricing Challenges in the Digital Economy: A Case Study of the Internet of Things (Part II of II)

By Lorraine Eden, Niraja Srinivasan, and Srini Lalapet[*]

Are the current OECD and IRS transfer pricing methods and guidance adequate for taxing the global profits of multinational enterprises (MNEs) in the digital economy? If not, how might U.S. transfer pricing practitioners in business, consulting, and government work together to modify the approaches to reflect how value is created and measured in evolving digital business models?[1]

In the digital economy,[2] value is not created in isolation by a company for the benefit of the customer but, in fact, is created as a consequence of the constant flow of information between the company and the customer. Value creation, therefore, is no longer a static eventuality at the end of a value chain but rather a result of dynamic interaction within a digital ecosystem of shops and networks. From a transfer pricing perspective, these new business models challenge transfer pricing and international tax practitioners to consider whether their existing frameworks still apply. This issue is critical as we move into a digital world characterized by continuous and circular data flows, value shifts, and greater functional complexity of related and unrelated parties, both across space and time.

This article is the second in a two-part series designed to illustrate the complexity of digital business models and the challenge of applying transfer pricing analyses based on the value creation approach. In the first article, we discussed the old and new firms in the digital economy and reviewed the OECD's BEPS project focusing on Action Items 8–10 (value creation) and 1 (the digital economy).[3] We argued that, given the newness and complexity of these new digital business models, we need to better understand the challenges they create for applying a transfer pricing framework in the 2017 OECD *Transfer Pricing Guidelines*.[4]

In this second article, to better understand the challenges that digital business models pose for transfer pricing analysis, we examine a stylized case study drawn from the technology industry, specifically, from the emerging world of the Internet of Things (IoT).

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[2] Eden, Lorraine, *Multinationals and Foreign Investment Policies in a Digital World,* The E15 Initiative: Strengthening the Global Trade and Investment System for Sustainable Development, E15 Task Force on Investment Policy, World Economic Forum and the International Centre for Trade and Sustainable Development (ICTSD) (www.e15initiative.org); Eden, Lorraine, *The Fourth Industrial Revolution: Seven Lessons from the Past*, *International Business in the Information and Digital Age* (Alain Verbeke, Robert van Tulder & Lucia Piscitello eds.) (Progress in International Business Research, Vol. 13 (European Int'l Business Academy and Emerald Pub., 2019).

[3] Eden, Srinivasan, and Lalapet, *Transfer Pricing Challenges in the Digital Economy: Hic Sunt Dracones? (Part I of II)*, 48 Tax Mgmt. Int'l J. 251 (June 2019).

[4] 2017 OECD, *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* (Paris, July 2017).

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IoT has been defined as "sensors and actuators connected by networks to computing systems" where the connected sensors and systems are used to "monitor or manage the health and actions of connected objects and machines [and] the natural world, people, and animals."[5] IoT emerged from the convergence of multiple new technologies, including but not limited to, embedded systems, artificial intelligence, real-time data analytics, enhanced data virtualization, and increased storage capacity within cloud-based solutions.[6] As such, IoT provides an excellent case study for us to study the challenges of transfer pricing in the digital economy.

We provide an overview of the IoT system and outline two new business models: the Direct Business Model and the Partner Business Model. We then evaluate each model using a traditional transfer pricing analysis framework. We argue that IoT creates at least four challenges for transfer pricing: data as a new type of related-party transaction; circularity of and value shifts in the IoT data/insight exchange; the speed of technological change and functionality; and difficulty in characterizing control, decentralization and cooperation among the related parties. We explore each challenge and conclude that more work is needed to "lift the veil" on—let alone set up the rules for—transfer pricing in the digital economy.

THE INTERNET OF THINGS (IoT)

The Internet is a "global system of interconnected computer networks that use the standard Internet protocol suite based on TCP/IP."[7] IoT involves the application of the Internet to physical objects (e.g., sensors, vehicles, mobile phones, and home appliances) such that the physical objects gain the ability to autonomously sense and communicate with other objects on the same network.[8] Some commentators define the IoT as "an open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data and resources, reacting and acting in face of situations and changes in the environment."[9]

IoT relies on the connectivity of devices and sensors through wired or short-range wireless networks such as RFID tags, Bluetooth and Wi-Fi.[10] IoT devices are connected, intelligent devices that can be classified as resource rich (e.g., smart phones and watches, personal computers) or resource constrained (e.g., sensors, light bulbs, and switches), depending on whether they do or do not have the hardware and software capabilities on their own to support the TCP/IP Protocol and communicate across the Internet. Resource-rich IoT devices use a "device-to-cloud" architecture, which may or may not be mediated through an IPv4/IPv6 security gateway. IoT devices can also be set up in a multi-layered architecture. For example, in a three-layer architecture a "network" layer of sensors is used to collect data from a "perception" layer of physical objects; and the sensors transmit the data via a communications network (the cloud) to a "computation" layer to process and analyze the data.[11]

An IoT solution also requires various technologies to be fully integrated into a single operational whole. Perhaps the best way to think of an IoT solution is an ecosystem of connected hardware, software and services that work in tandem to solve a specific problem. This connectivity may be enabled by the Internet, but one can also conceive of closed, non-Internet-based communication systems where IoT can be operationalized. In broad terms, we can think of IoT as having four distinct areas within the overall ecosystem that enable an IoT solution to work, which we illustrate in Figure 1 and outline below:

- *Customer:* The customer both produces data for the IoT solution and consumes the end product of that data after it has been analyzed and transformed into valuable insights. In an IoT solution, the customer is no longer just a passive recipient of the value that is created (as in the traditional value chain model) but is, arguably, an integral participant in the value creation process generated by an open innovation platform.
- *Edge:* The Edge refers to the devices, sensors, and similar equipment at the customer location

[5] McKinsey Global Institute, *The Internet of Things: Mapping the Value Beyond the Hype,* at 17 (McKinsey & Company, June 2015).

[6] Frost & Sullivan, *Bridging the Gap Between Operations and Information Technology*: *Accelerate IoT Solution Development and Deployment with Telit* (whitepaper) (2018) (www.frost.com).

[7] Madakam, Somayya, Ramaswamy, R., and Tripathi Siddharth, *Internet of Things (IoT): A Literature Review*, *J. of Computer and Commnc'ns*, at 164 (2015).

[8] Ara, Tabassum, Shah, Pritam Gajkumar, and Prabhakar, M., *Internet of Things Architecture and Applications: A Survey*, *Indian J. of Sci. and Tech.*, at 9(45) (DOI: 10.17485/ijst/2016/v9i45/106507); 2015 OECD, *Addressing the Tax Challenges of the Digital Economy*, *Action 1: 2015 Final Report*, Ch. 6, OECD/G20 BEPS Project (Paris).

[9] Madakam, Somayya, Ramaswamy, R., and Tripathi Siddharth, *Internet of Things (IoT): A Literature Review*, *J. of Computer and Commnc'ns*, at 165 (2015).

[10] 2018 OECD, *IoT Measurement and Applications*, OECD Digital Economy Papers No. 271, at 247 (Paris, Oct. 2018).

[11] Ara, Tabassum, Shah, Pritam Gajkumar, and Prabhakar, M., Internet of Things Architecture and Applications: A Survey. *Indian J. of Sci. and Tech.*, at 9(45) (DOI: 10.17485/ijst/2016/v9i45/106507).

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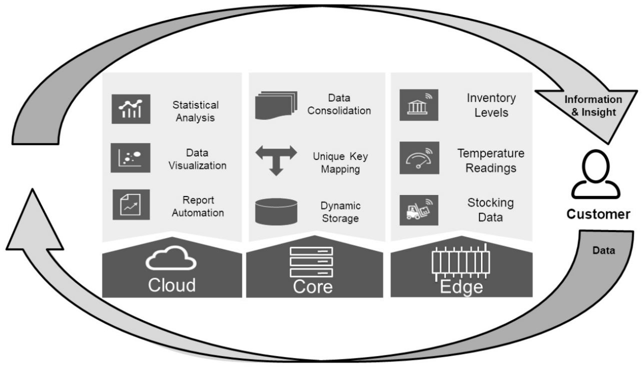
Figure 1: The IoT Ecosystem



that are used to collect the data. There are two generic types of devices in the Edge: embedded systems (i.e., the physical appliances and sensors used to collect individual data points) and gateways (i.e., specialized hardware used to collate data and pass it on to a data storage solution for further processing and analytics). While the Edge is usually seen as the entry-point of an IoT solution, it can also be the point where complex data analytics are performed and value is created.

- *Core:* The Core refers to both on-premise and off-premise storage solutions and servers (including data centers) that help to store and organize the collected data for further analytics. The Core may also include teams of highly skilled data scientists and data threat software that work on securing the integrity of the data transferred from the Edge to the on and off-premise datacenters and the Cloud. The Distributed Core can be the repository of raw data as well as the analyzed data and is at the heart of an IoT solution exchanging data with both the Edge and the Cloud in a dynamic and continuous value creation loop.
- *Cloud:* This refers to cloud-based applications and software used to analyze the stored data to provide valuable insights. The Cloud can be conceptualized as the brain of the IoT solution where specific applications and software analyze the data that is flowing from the Edge through to the Core and onto the Cloud. That said, IoT solutions can also be designed such that data analyses are performed at the Edge as well as the Core and the Cloud as needed.

IoT offerings are exemplars of business models that span both the physical and the digital world and sit at the nexus of the integration of operational technology and information technology.[12] Operational technology (OT) is "the hardware and software used in sensing and collecting data. This includes all the hardware at the edge of the network"; whereas the information technology (IT) in IoT includes "the network, cloud-based platforms, data analytics, and integration with other cloud-based platforms."[13] Most IoT solutions involve both IT and OT. An IoT solution would not exist without the constant interaction and exchange of data between the physical and digital worlds, and between operational technology and information technology. In fact, it is this interaction and data exchange that are critical to the success of any IoT solution.[14]

The complexity of an IoT solution is further exacerbated by interfirm collaboration—the opportunity for multiple companies to participate in providing an integrated solution to a customer. For instance, numerous technology companies participate in varying degrees in different parts of the IoT Ecosystem as noted below (this is not an exhaustive list):

- *Edge*: Field gateways, sensors and appliance providers (Dell, Emerson, Nest, GE, etc.);
- *Core*: Servers and storage solutions (Dell EMC, HP, etc.); and
- *Cloud*: Cloud software and services, security software, data analytics and applications (Microsoft Azure, AWS, VMware, etc.).

The principal challenge is to integrate the various parts of an IoT ecosystem into a coherent whole that provides value to the customer. To do this, an Industry 4.0 firm might adopt several business models, two of which we examine here, the Direct Business Model (hereinafter, referred to as Direct Model) and the Partner Business Model (hereinafter, referred to as Partner Model).

- *Direct Model*—In this relatively simple model, a single company sells sensors and Edge gateways directly to the end-customer and helps with the integration of core and cloud offerings that are also offered by the same company. In addition to the collection of millions of specific data points from the customer, a key characteristic of most IoT solutions is that other technologies such as modern imaging, big data and predictive analytics using machine learning may be used in tandem to process the data and make meaningful decisions.

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[12] 2016 OECD, *The Internet of Things: Seizing the Benefits and Addressing the Challenges, Ministerial Meeting on the Digital Economy Background Report,* OECD Digital Economy Papers No. 252 (Paris); 2018 OECD, *IoT Measurement and Applications*, OECD Digital Economy Papers No. 271 (Paris, Oct. 2018).

[13] Frost & Sullivan, *Bridging the Gap Between Operations and Information Technology*: *Accelerate IoT Solution Development and Deployment with Telit* (whitepaper), at 3 (2018) (www.frost-.com).

[14] Frost & Sullivan, *Bridging the Gap Between Operations and Information Technology*: *Accelerate IoT Solution Development and Deployment with Telit (whitepaper)* (2018) (www.frost.com).

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- *Partner Model*—In this model, which is commonly used by many IoT solutions providers, a company delivers an IoT solution by integrating the infrastructure and hardware/software offered by a partner or original equipment manufacturer (OEM) into their offerings to the end customer. Examples of this type of business model include many industrial IoT solutions and ‘‘infrastructure as a service’’ (IaaS) solutions where multiple companies can be involved in providing an IoT solution to a customer. In these business models, there is typically a convergence and collaboration of operational technology at the customer site with information technology within the IoT solution.

Given the complexity of IoT business models, whether a Direct or Partner Model, and the fact that IoT can be applied in a wide variety of consumer and enterprise applications, identifying how and where value is created within an IoT ecosystem, and performing a transfer pricing analysis poses numerous challenges. To illustrate these challenges, we examine a stylized industrial IoT case study (adapted to illustrate both models) and evaluate it from a traditional transfer pricing analysis framework.

TRANSFER PRICING IN AN IoT ECOSYSTEM

Transfer Pricing Analysis

A transfer pricing analysis typically follows a sequence of analytical steps. Performing these steps is not easy and many controversies and disagreements can arise between MNEs and tax authorities over the ‘‘right’’ price or margin as a result of the transfer pricing analysis.[15] for discussions of some of the difficulties.) The OECD *Transfer Pricing Guidelines*[16] outline the steps necessary to apply the value creation approach to the arm’s-length standard as the following:

- Identification of the intercompany transactions and the related parties involved in such transactions;
- An analysis of the functions performed, risks assumed, and assets employed (FAR analysis) in the context of the identified intercompany transactions that lead to a characterization of the related parties as distributors, manufacturers, intangible property (IP) owners, service providers, etc. This could be supplemented by a value chain analysis or a DEMPE[17] (development, enhancement, maintenance, protection and exploitation of intangibles) analysis which serves to identify where and how value is created and by whom; and
- Performing an economic analysis including reviewing and selecting an appropriate transfer pricing method(s), followed by their application to determine an arm’s-length price or profit.

We now apply this framework to the Direct and Partner IoT business models.

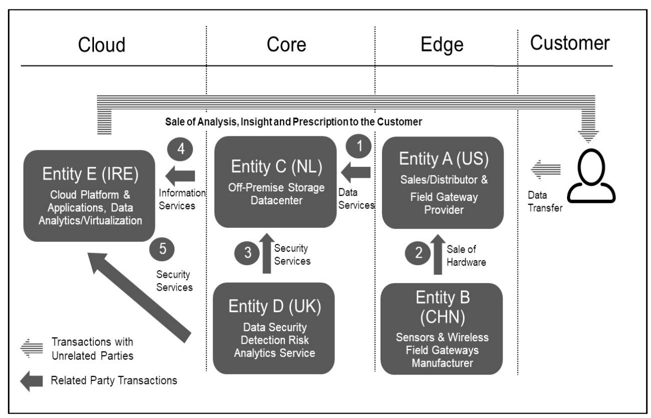
Transfer Pricing in the Direct Model

The Direct Model

In its simplest version, the Direct IoT Model can be a single company offering different facets of the IoT solution through multiple legal entities located in various jurisdictions. A stylized example of the Direct Model is illustrated in Diagram 2 below.

Figure 2

Direct Model IoT Case Study – Illustration of Intercompany Transactions



In the above example, our case study assumes that the end customer has a multi-year business contract with the IoT firm. Within the IoT firm are several wholly owned legal entities that engage in intercompany transactions that result in providing the end customer with the IoT solution. In this illustration, Enti-

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[15] Eden, Lorraine, *Taxing Multinationals: Transfer Pricing and Corporate Income Taxation in North America* (Univ. of Toronto Press, 1998); Eden, Lorraine, *The Economics of Transfer Pricing: The International Library of Critical Writings in Economics*, Edward Elgar Pub. (Cheltenham, U.K., 2019).

Eden, Lorraine, *The Arm’s Length Standard: Making It Work in a 21st Century World of Multinationals and Nation States* (Thomas Pogge and Krishen Mehta eds.), Global Tax Fairness (Oxford Univ. Press, 2016).

[16] 2017 OECD, *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* (Paris, July 2017).

[17] The acronym DEMPE (development, enhancement, maintenance, protection and exploitation of intangibles) was first used in 2015 OECD, *Aligning Transfer Pricing Outcomes with Value Creation. Actions 8–10: 2015 Final Reports*. OECD/G20 Base Erosion and Profit Shifting Project (Paris). *See also* 2017 OECD, *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations* (Paris, July 2017).

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ties A through E perform the following functions in their related-party transactions.

- **Entity A** is the customer-facing entity that houses the IoT business leaders as well as the sales force. Entity A negotiates and signs the contract with the customer and markets, sells, and maintains the Edge sensor software and the equipment installed on the customer's premises. It also provides the Edge gateway system through which the data, collected from the sensors and devices at the customer's site, is transferred to a data storage center.
- **Entity B** is a related-party located in, say, China, that manufactures and sells hardware to Entity A, for use in A's Edge gateway infrastructure.
- **Entity C** is the owner and operator of a data storage center that is located in, say, the Netherlands. It leases datacenter storage to multiple third-party customers. Entity C works in tandem with the IoT customer's own on-premise data storage sites, in a manner that shares the data processing load and optimizes time/cost efficiencies.
- **Entity D** is a data threat detection and rescue high-value "service shop" in the U.K. (for illustration purposes), which monitors the security and integrity of data transmittals between entities A, C, E and the customer.
- **Entity E**, located in, say, Ireland, provides the Cloud Platform, Cloud Applications, Data Analytics software and data or information analytical capabilities. The analytics that transform data and information into the patterns and insights that the IoT customer needs, is the "brain trust" of the business model. The insights generated are instantly communicated back to the IoT customer, which applies them in real time to its production or supply processes to improve its productivity.

In this simplified illustration of an IoT solution, there are five intercompany transactions.

- Conversion and transmittal of raw data collected by Entity A to Entity B for storage;
- Sale of hardware, primarily sensors and field gateways, by Entity C to Entity A for installation at the customer site;
- Provision of security services by Entity D to Entity C;
- Conversion and transmittal of stored data by Entity C to Entity D; and
- Provision of security services by Entity D to Entity E.

In addition to the five related-party transactions, there are two unrelated party transactions: one, where Entity A collects raw data from the customer through sensors located at the customer's site, and the second, where Entity E transfers data insight and prescriptive IoT solutions to the customer.

Transfer Pricing Analysis in the Direct Model

The second step of the transfer pricing analysis involves a characterization of the related parties after a detailed and lengthy review of its functions, assets, and risks (FAR). If the above transactions were simple and largely unchanged during the fiscal year or over the multiple years of the contract term, the characterization of the related parties and subsequent economic analyses might lend themselves to a relatively good fit with the methods prescribed by the U.S. Treasury Regulations §1.482 or the OECD transfer pricing framework.

Table 1 below presents the key factors considered in the characterization process in the typical tabular "FAR Matrix"; the related parties, their key business functions and headcount profiles, the risks they assume and assets they manage. This characterization of the related parties leads to the selection of the transfer pricing method and a profit level indicator, which we have also summarized in Table 1.

Table 1: Transfer Pricing Analysis in the Direct IoT Model

Related Party	Entity A	Entity B	Entity C	Entity D	Entity E
Location	**United States**	**People's Republic of China**	**The Netherlands**	**United Kingdom**	**Ireland**
Key Functions	Sales and contract execution. Headquarters & Business Strategy; Gateway infrastructure management	Manufactures gateway hardware	Owns and operates a large data center	Provides data security services and threat risk analytics	Cloud hosting and cloud based applications developer
Assets - Labor (Headcount)	150	1000	500	50	25

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Related Party	Entity A	Entity B	Entity C	Entity D	Entity E
Location	**United States**	**People's Republic of China**	**The Netherlands**	**United Kingdom**	**Ireland**
Assets - Tangible	Office leasehold and Gateway PP&E	Manufacturing PP&E	Data center PP&E	Limited PP&E for security hardware	Server farm and networking infrastructure PP&E
Assets - Intangible	Customer list (low value); Gateway technology (medium value)	None	None	Patented and unpatented data security algorithms, know-how	Patented and unpatented cloud application software, algorithms and know-how
Risks	Risks of contract cancellation, market competition, sales maker exits	Limited Capital Investment Risk	Medium Capital Investment risk	Skilled workforce retention risks; technology obsolescence risk	Skilled workforce retention risks; technology obsolescence risk
Entity Characterization	Limited Risk Distributor; Routine gateway services	Routine Manufacturer	Service Provider	Service Provider	IP developer and Service Provider

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Related Party	Entity A	Entity B	Entity C	Entity D	Entity E
Location	**United States**	**People's Republic of China**	**The Netherlands**	**United Kingdom**	**Ireland**
Taxpayer's Transfer Pricing Method	Residual Profit Split Method	CPM/TNMM	CPM/TNMM	CPM/TNMM	Residual Profit Split Method
Profit Level Indicator (PLI)	Market-Based Profit Split	Return on Manufacturing Assets	Return on Assets or Capital Employed	Markup on Total Cost	Market-Based Profit Split

The underlying assumption here, as is the case with all transfer pricing analyses, is that these entity characterizations and the underlying transactions will be static for the period of the analysis and all are going concerns. However, given that digital solutions like IoT are inherently dynamic and non-linear and can be quickly disrupted by newer and more efficient ways of operating, the required assumption of indefinite stasis may not be valid.

This inherent dynamism of the IoT ecosystems is worth examining separately by introducing a Partner Model and then using both cases to explore the distinguishing features of the IoT ecosystem and consequent challenges to traditional transfer pricing methods.

Transfer Pricing in the Partner Model

The Partner Model

As is very frequently the case, the customer may require a more complex IoT solution to manage its technology, output and productivity across a growing number of countries, markets, and vendors. As we noted above, one of the new ways of doing business in a digital economy is to distribute manufacturing across smaller, specialized units, both within the firm or between firms in a horizontal platform-based collaboration.

In turn, the IoT company may rapidly change the configuration of its solution provider footprint and the simple Direct Model may evolve into or be supplanted by a more complicated Partner Model. In a typical industrial IoT offering, there will be multiple suppliers and multiple entities belonging to the customer, all collaborating and providing different aspects of the IoT solution.

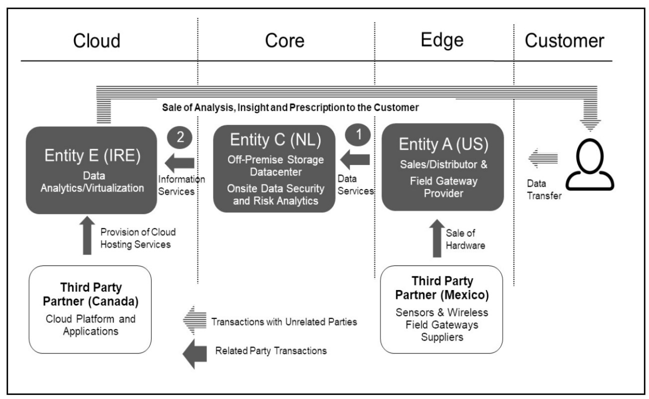
Let us assume that the customer in the Direct Model is now an upstream provider of oilfield evaluation services to another downstream and final customer, an oil refinery. The refinery's operations run on a just-in-time inventory basis with advanced, time-sensitive refining processes that minimize its risk and exposure to crude price volatility.

The oil refinery already works with several third parties in Canada and Mexico and wishes to include these vendors in the overall solution, rather than replacing them. Further, the new end customer has substantial datacenters on premises and rather than relying on and utilizing the IoT company's off-premises gateway, it desires to have all the data collection and analytics be performed on premises and within very short timeframes. In other words, the Direct Model, with the collection of data through the gateway, storage and parsing at the data center, transfer to the Cloud and then back to the customer creates too much latency for the refinery's operating model.

Our IoT company is asked to pivot its Direct Model to a reconfigured offering that best suits the customer which we refer to as the Partner Model. Both the intercompany and unrelated party transactions have changed from the illustration presented in Figure 2 and have been reconfigured as presented in Figure 3 below.

Figure 3

Partner Model IoT Case Study – Illustration of Intercompany Transactions



Transfer Pricing Analysis in the Partner Model

In the Partner Model, while there are still related-party transactions that we viewed in the Direct Model, there are more unrelated party transactions. As opposed to the Direct Model, the Irish entity, Entity E, no longer hosts the cloud platform or the applications. Instead, this activity is outsourced to a third-party partner in Canada. Consequently, the ''brain trust'' that was originally within the Entity E is now split between itself and a third-party partner. In addition, Entity B, the related-party manufacturer, could presumably be replaced by a third-party partner located in Mexico. Finally, Entity A may also be required to perform data analytics at the Edge to fulfill the customer demand for such analytics to be performed at its own premises.

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Table 2: Transfer Pricing Analysis in the Partner IoT Model

Related Party	Entity A	Entity B	Entity C	Entity D	Entity E
Location	**United States**		**The Netherlands**		**Ireland**
Key Functions	Sales and contract execution. Headquarters & Business Strategy; Gateway infrastructure management. **On-prem distributed analytics**		Owns and operates a large data center. **On-site Data security services and analytics.**		**Data Analytics**
Assets - People (Headcount)	250		550		15
Assets - Tangible	Office leasehold and Gateway PP&E		Data center PP&E		Server farm and networking infrastructure PP&E
Assets - Intangible	Customer list (low value); **Distributed analytics at the Edge (high value)**		**Data Security and Integrity Algorithms (high value)**		Algorithms, know-how
Risks	Risks of contract cancellation, market competition, **technology obsolescence**		Medium Capital Investment risk; **technology obsolescence**		Skilled workforce retention risks; technology obsolescence
Entity Characterization	Limited Risk Distributor; **Value-added Data Analytics**		**Service Provider + Value Added Data Analytics**		**IP developer and Service Provider + Value Added Data Analytics**
Taxpayer's Transfer Pricing Method	Residual Profit Split Method		Residual Profit Split Method		Residual Profit Split Method
Profit Level Indicator (PLI)	Market-Based Profit Split		Market-Based Profit Split		Market-Based Profit Split
Note: Bold notes are changes in the Partner model relative to the Direct FAR					

As can be seen from the FAR analysis for the Partner Model, the functional profile of Entities C and E have changed since each performs value added data analytics in addition to various other functions. This added complexity makes it difficult, if not impossible, to apply one-sided methods such as cost plus or a comparable profits method (CPM)/transactional net margin method (TNMM). Instead, more complex profit split methods may be needed for a reasonable allocation of the residual profit between the various entities contributing to value creation within the IoT ecosystem—although the profit split method comes with its own set of problems.[18]

While these are stylized examples, they serve to illustrate how the IoT solution, including its critical aspects, can be effectively peeled off and performed by third parties or other related parties as necessary. The introduction of third-party partners into the solution changes not only the nature of the intercompany transactions but also the characterization of the entities themselves and often, within the same fiscal year period. The example also illustrates a key aspect of IoT business models: the dynamism and ease with which value can be shifted between the entities in the IoT ecosystem, whether related or not, and in fact, to new entities which were not part of the original IoT ecosystem before. It also brings home the point that, in this new world of value shifts, one may have to ultimately resort to using profit split methods from a transfer pricing perspective, regardless of the difficulties inherent in the practical application of such methods.[19]

[18] Eden, Lorraine, *The Arm's Length Standard: Making It Work in a 21st Century World of Multinationals and Nation States* (Thomas Pogge and Krishen Mehta eds.), Global Tax Fairness (Oxford Univ. Press, 2016); Eden, Lorraine, *Comments on the OECD's BEPS Public Discussion Draft BEPS Actions 8–10, Revised Guidance on Profit Splits* (issued July 4, 2016), *Comments Received on Public Discussion Draft BEPS Action 8–10: Revised Guidance on Profit Splits, Part II*, at 266–269 (Paris, Sept. 8, 2016).

[19] Eden, Lorraine, *The Arm's Length Standard: Making It Work in a 21st Century World of Multinationals and Nation States* (Thomas Pogge and Krishen Mehta eds.), Global Tax Fairness (Oxford Univ. Press, 2016); Eden, Lorraine, *Comments on the OECD's BEPS Public Discussion Draft BEPS Actions 8–10, Revised Guidance on Profit Splits* (issued July 4, 2016), *Comments Received on Public Discussion Draft BEPS Action 8–10: Revised Guidance on Profit Splits, Part II*, , at 266–269 (Paris, Sept. 8,

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IoT CHALLENGES FOR TRANSFER PRICING

Are the current OECD *Transfer Pricing Guidelines* adequate for the digital economy? How well do the existing transfer pricing methods measure value creation for the new business models of Industry 4.0? Below, we explore four distinguishing features of the IoT Business Model that challenge the relevance of existing transfer pricing methods for value measurement.

Goods, Services . . . and Data

Distinguishing Features of the IoT Business Model

In a traditional brick and mortar value chain, the firm's intercompany transactions are concerned with goods, services, intangibles, financial support, and software. In the digital economy, data and information may often be the only products being exchanged between related parties. As shown in the IoT case studies, data are transformed into millions of formless (0,1) packets that are constantly digitally transferred between the firm's legal entities, its vendors, co-developers, and customers. The data or information can either be unique and proprietary (collected in a highly customized IoT solution) or simply obtained from the public domain. An additional complicating factor is that non-proprietary data can be uniquely transformed during the intercompany exchange to acquire a unique profile and a market price. Data is a non-tangible but may not be an intangible asset in every cross-border exchange.

Transfer Pricing Challenges

When the transaction involves the exchange of easily identifiable, separable goods and services across the value chain, the transfer pricing practitioner can look for identical or comparable products (goods, services, intangibles) that are traded in markets where prices and terms may be publicly reported. The separateness and identifiability of products and services makes possible, a matching of characteristics and identification of comparable uncontrolled prices (CUP) or comparable uncontrolled transactions (CUT). Data and information on the other hand, do not have market prices *per se*, making the CUP or CUT, the most reliable of the transfer pricing methods, impossible to apply.

Circularity and Value Shifts

Distinguishing Features of the IoT Business Model

One of the unique aspects of IoT value chains is that data, even if it were a commodity at the onset, becomes increasingly valuable as it accumulates. This is because a larger number of patterns and dissonances can be detected in larger volumes of data and that information can be used to derive value-added solutions for the customer. The larger the volume of "big data," the greater the scope of marketable insights that can be generated. Further, the transference of data cannot be captured as a flow along a single linear value chain from the producer to the customer. It is circular—data is first collected from the customer through sensors and edge devices and is then transferred through the device and software in the distributed core, to the cloud, and then back again to the customer as insights and solutions to the customer, who uses it as inputs and sends output data back to the Edge, Core, Cloud, etc. Where the customer and the MNE have operations around the world, this circular exchange of data can occur 24/7 in a manner somewhat similar to the 24-hour global trading models for financial institutions[20]

This circularity of the IoT data/insight exchange means that the "final" end-product is not the output of the transactions between entities in either the Direct or Partner Model. With every iteration of transactions through the value chain, the accumulation of data and speed of insight generation grows, generating more value with each iteration. As larger volumes are processed faster, deeper and more marketable insights are also generated as time goes on.

As data exchanges increase and as data transforms into information and insight, as the related-party and third-party entities perform multiple and interconnected functions in relation to the flow and processing of data, how does the practitioner and the tax authority, as a precursor to evaluating nexus and applying profit allocation, pin down which entity is transferring routine data and which entity is transforming the routine data into valuable insight? Clearly, the digital economy throws off challenges even at the outset of the standard transfer pricing analysis—identifying the "simpler of the tested parties" to apply one-sided transfer pricing methods.

Circularity also creates an interesting dilemma in terms of when the "sale" takes place. While accounting standards determine revenue recognized over the contract period per specified milestones, does circularity, from an economic perspective, imply that value is continuously generated for the customer? If this is the case, should we rethink how to structure these contracts and how customers pay for them?

2016).

[20] Eden, Lorraine, *Taxing Multinationals: Transfer Pricing and Corporate Income Taxation in North America*, at 574–578 (Univ. of Toronto Press, 1998).

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Transfer Pricing Challenges

There is no disagreement that digital business models in the 21st century have a much higher degree of functional complexity than hardware manufacturing or services provision in the 1980s and 1990s. That said, there is disagreement about whether the ''service provider'' or ''intangible property owner/developer'' characterizations still apply when the intercompany product being transferred is data or information, or whether the cloud-based applications developer is also a manufacturer or a principal innovator of analytical insight. A related question is whether the ''value'' is created and controlled by the headquarters or the entities in the transaction chain that are involved in the data flows and transformation. Unlike traditional business models, in an IoT solution where value creation is not a linear process, it is not clear if there is any single principal entity or brain trust which controls the creation of value. Even if there were two or more principal entities, the same dilemma exists.

Indeed, at what point in the IoT value chain does the data acquire value? How could that value be measured? Is it a routine or non-routine intangible? In most of the IoT solutions, data is transferred between legal entities at lightning speed. If the value is created when the data is transformed into a ''prescriptive solution'' for the customer, the entity taking on the activities and risks of this transformation should be the principal value-driver or the entrepreneur. To set the price of the data transferred to this principal entity, it is necessary to characterize the related-party trader as a routine manufacturer or service provider, which it may not be. It is hard to pin down the exact moment when the data acquires value, which in turn makes the legal entity that transfers or processes that data harder to characterize from a transfer pricing perspective.

Speed of Technological Change and Functionality

Distinguishing Features of the IoT Business Model

IoT is fundamentally designed to be smarter and more flexible over time. The digital economy is characterized by high technological obsolescence where firms compete fiercely to be first to market with a lower-cost solution that delivers higher customer satisfaction. This in turn means that functions, risks and the intangible property developed by entities can change as the several cycles of data collection-transformation-feedback occur and more efficient ways of delivering value to the customer emerge.

An example of this in the IoT space is the recent emergence of distributed analytics. Distributed analytics is the technology and capability to shift the machine learning and data analytics from the cloud to the edge so that sensors and devices that were previously deployed only to collect data are now also performing certain analytical tasks ''in the moment.'' The output that previously came from the Cloud entities are now being generated by entities that own devices on the Edge (viz., sensors, mobile phones, laptops, etc.). Distributed analytics is attractive for certain customers who need to minimize latency and increase response rates for time-critical IoT applications such an autonomous vehicles or robot-supplemented surgeries. In the Direct Model, this would mean that the insight generation functions can be shifted from Entity E to Entity A or from Entity C to A. Moreover, the shift may occur within a single fiscal year depending on how quickly the customer's requirements change. As functions shift across entities, so will the risks of managing the costs of technological or market failures.

Transfer Pricing Challenges

If the related-party's functions change from routine data collection/processing service to analytics and insight generation in a short period of time, even within the same fiscal year, what is a reliable characterization of the entity? A dynamic functions-assets-risks (FAR) profile presents the taxpayer with the very simple practical challenge of preparing *annual* transfer pricing documentation that describes the entity's functions for the first say, six months as significantly different from the next six months of the year. When all intercompany transactions must be priced at arm's-length, the functional shifts can mean switching from a cost plus method to a TNMM/CPM or even consideration of a profit split.

Functional shifts challenge the very idea of value attribution to specific legal entities based on their functional profile, a fundamental aspect of transfer pricing analyses. The key question for taxpayers is not whether to recharacterize entities constantly and reprice the flow of goods, services and data but whether these dynamic business models will be well understood and accepted by tax authorities.

If the key functions, assets, and risks change every two or three years, or even every year, taxpayers should weigh the costs of impending controversy against a more practical approach of pegging a target operating margin based on comparables that ''do it all''—from sales and marketing to data analytics to asset management and sale—rather than trying to associate the entity's returns with too narrow a set of more functionally comparable companies, that with functional shifts, may become redundant and stir up more rather than less controversy.

To be fair, the emergence of Industry 4.0 does not mean that every digital economy firm needs a brand-new set of transfer pricing rules. For the majority of the Going Digitals, the traditional cost plus method or TNMM/CPM can be applied to separable routine functions such as data transference services or hardware production and supply. These transactions within

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the digital value chain are fundamentally like those in a brick-and-mortar environment. They are at the low end of functional complexity even if there is no ''more complex'' counterparty that controls or manages their activities and risk taking.

Conversely, traditional transfer pricing methods become less and less useful as complexity increases and related parties cannot be easily characterized, either because their functions and risks are evolving and changing as the IoT solution matures, or because the value is in what they transact (big data) and not in their activities.

The profit split method, while more cognizant of distributing value among complex entities, is still tethered to some level of comparable benchmarking for routine functions. In addition, the actual implementation of a residual profit split method involves a variety of decisions and complications that may render it worse than a TNMM/CPM analysis added to an intangible asset valuation.[21]

Control, Decentralization and Cooperation Among Related Parties

Distinguishing Features of the IoT Business Model

An IoT offering is more akin to a loosely connected chain of value shops than a traditional value chain with linearly dependent set of related parties performing sequentially interconnected functions. The notion of which party controls another and with what economic substance is less amenable to a DEMPE-type characterization. IoT providers will typically have many groups of highly skilled data scientists and software engineers distributed across many different geographies (and legal entities) that simultaneously work at transformation and analyzing big data. In addition, the interaction between these groups and value creation is often too fluid to fit them within a traditional ''principal-agent'' framework.

Transfer Pricing Challenges

In fact, in most IoT solutions, there is no traditional ''principal-agent'' relationship or contractor-subcontractor arrangement between the parties, whether related or unrelated. Entity C is not providing data security on behalf of Entity E, nor is the redistribution of analytical capabilities from E to Entity A on the Edge some type of sale or license of Entity E's intangible property to A. Without a large capital investment and only a relatively small but scalable investment in human capital, functions based purely on workforce competency can quickly migrate from one jurisdiction to another.

For example, in the Partner Model typical of IoT offerings, without a traditional control and functional dependency and without a ''simpler'' party, it is difficult for the transfer pricing practitioner to embrace the application of TNMM/CPM. While the number of discreet intercompany transactions has certainly diminished, more third-party vendors and value shops are necessary to work a complex solution. Even if there are no intercompany transactions, related parties may still influence their siblings' financials or operations within the overall value chain. It could be argued that the interactions with third parties provide the best transactional comparables for gross profit or operating profit margin setting. This is true only if the uncontrolled parties and related parties transact on a relatively frequent and stable basis. When multiple centers of excellence for data analytics or cloud hosting exist across related and unrelated parties, using a limited duration gross margin comparison could be less accurate than an imperfect application of a CPM/TNMM.

CONCLUSION

Are the current OECD *Transfer Pricing Guidelines*, including the recently issued programme of work in 2019 OECD,[22] adequate for the digital economy taxation? How well do the existing transfer pricing methods measure value creation for the new business models of Industry 4.0? In the first article in this two-part series on this topic, we explored the old and new firms in the digital economy and reviewed the OECD's BEPS project focusing on BEPS Action Items 1 and 8–10.

In this second article we provided an overview of IoT and outlined the Direct and Partner Business Models. We evaluated each model using a traditional transfer pricing analysis, and explored four challenges that these new business models create for transfer pricing: data-based related-party transactions; circularity of and value shifts in the IoT data/insight exchanges; the speed of technological change and functionality; and difficulty in characterizing control, decentralization and cooperation among the related parties.

Our IoT case study has attempted to illustrate some of the key challenges of applying existing transfer

[21] Eden, Lorraine, *The Arm's Length Standard: Making It Work in a 21st Century World of Multinationals and Nation States* (Thomas Pogge and Krishen Mehta eds.), Global Tax Fairness (Oxford Univ. Press, 2016); Eden, Lorraine, *Comments on the OECD's BEPS Public Discussion Draft BEPS Actions 8–10, Revised Guidance on Profit Splits* (issued July 4, 2016), *Comments Received on Public Discussion Draft BEPS Action 8–10: Revised Guidance on Profit Splits, Part II*, at 266–269 (Paris, Sept. 8, 2016).

[22] 2019 OECD, *Programme of Work to Develop a Consensus Solution to the Tax Challenges Arising from the Digitalisation of theEconomy*, OECD/G20 Inclusive Framework on BEPS (Paris).

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pricing frameworks to an IoT ecosystem. However, IoT is just one among many digital business models that are emerging as we move into Industry 4.0. Transfer pricing analyses of other digital business models are also needed before we can start to develop a robust understanding of our current transfer pricing models and methods in Industry 4.0.

We conclude that more work is needed to ''lift the veil'' on transfer pricing in the digital economy. A better understanding of how the current transfer pricing rules apply to digital economy models is needed before governments should make additional changes to international tax and transfer pricing policies. As we move into Industry 4.0, we hope that our analysis will contribute to the ongoing debate about reforming the rules with a renewed focus on updating the arm's-length standard for measuring value and allocating profits in the digital economy.

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