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Ecosystem-Driven Value Creation for Smarter, Digitalized Buildings | 构建商业生态系统，提升数字化智能建筑价值



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毕家乐先生在通力集团担任执行副总裁，负责技术和信息技术发展。他自2013年起加入董事会，当时负责通力集团的运营发展。在此之前，毕家乐先生已在通力工作了超过12年，曾在维保业务，通力中国以及芬兰最大的研发部门历任各类管理职务。



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Samu Salmelin先生自2016年1月起负责领导通力服务解决方案的研发工作。他于1998年加入通力，在研发部门历任多个职位，并曾任通力芬兰市场经理，以及通力中北欧区域新设备业务部长。Samu目前主要负责通力维保方案，以及智能客流解决方案的研发。



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Abstract | 摘要

Digitization is reshaping industries and driving the rise of new business models, with new ways of working and new entrants rewriting the rules in the media, leisure, and transportation industries. At the same time, urbanization is continuing at a remarkable pace, leading to more densely developed cities with taller buildings. Digitization makes these buildings smarter. Smooth people flow in buildings relies on numerous factors, systems, functions, and circumstances, all of which must meet the needs of end users. This complex challenge cannot be solved by a single operator using closed, proprietary systems. It requires a more open approach where solutions from various vendors work together efficiently and seamlessly. This paper describes how the ecosystem-driven business model will drive new innovation and value creation. It examines how modern operating models based on an API (application programming interface) Economy can be applied in smarter buildings to improve both convenience and building appeal.

Keywords: API-Economy, Business Ecosystem, People Flow, Smart Building, Value Creation

数字化正在重塑各个行业并催生出新的商业模式，带来全新的工作模式和概念，改写传媒、休闲及运输行业的经营规则。同时，城市化进程正以惊人的速度不断加深，城市变得愈加拥挤，促使城市建筑越来越高。而数字化让建筑变得更加智能。在建筑内部，顺畅的客流环境取决于多种因素，系统、功能和环境，而所有这些都必须满足终端用户的需求。这项复杂挑战是无法由一家公司通过一个专有封闭的系统解决的。攻克这样的难题，需要采取更开放的方法，将多家供应商的解决方案高效无缝地结合起来。本文介绍了如何运用商业生态系统模式推动创新并创造价值。并探讨了如何在智能建筑中运用基于API（应用程序接口）经济的现代化运营模式，以提高建筑的便利性和吸引力。

关键词：API经济、商业生态系统、客流、智能建筑、创造价值

Introduction

Digitization and urbanization are reshaping our world at a remarkable pace. Even though they are mainly seen as a positive phenomenon, they also create some challenges. For example, digitization changes the business landscape of companies requiring them to renew themselves or fade away. Rapid urbanization creates challenges to the society and infrastructure, especially how to achieve sustainable and functional urban environments for a growing number of urban dwellers.

Smooth people flow in buildings relies on numerous factors, systems, functions, and circumstances, all of which must meet the needs of end users. This complex challenge cannot be solved by a single operator using closed, proprietary systems. It requires a more open approach where solutions from various vendors work together efficiently and seamlessly.

This paper describes how the ecosystem-driven business model can be applied to

引言

数字化和城市化正以惊人的速度重塑我们的世界。虽然总体上这是好现象，但同时，也为我们带来了各种挑战。举例来说，数字化改变了企业的商业环境，企业需要不断自我更新，否则就会在市场竞争中被淘汰。快速的城市化进程给社会和基础设施带来的挑战在于，如何为持续增长的城市人口创造可持续发展的多功能城市环境。

在建筑内部，顺畅的客流环境取决于多种因素、系统、功能和环境，而所有这些都必须满足终端用户的需求。这项复杂的挑战是无法由一家公司通过一个专有封闭的系统解决的。攻克这样的难题，需要采取更开放的方法，将多家供应商的解决方案高效无缝地结合起来。

本文介绍如何有效运用数字化工具，通过商业生态系统模式解决城市化带来的部分挑战。并探讨如何在智能建筑中运用基于API（应用程序接口）经济的现代化运营模式，以提高建筑的便利性和吸引力。

solve some of these challenges by efficient utilization of digitization. It examines how modern operating models, based on an API (application programming interface) Economy, can be applied in smarter buildings to improve both convenience and building appeal.

The Megatrends Shaping Our World

Urbanization

Roughly 200,000 people move into cities across the globe every day. We are witnessing the rise of megacities at an unforeseen pace. For example, the city of Shenzhen in Southeast China had 3,148 inhabitants in 1950, but according to the UN, by 2025 that number will exceed 12 million (Burdett, 2016).

Megacities are cities with a population of 10 million or more (Figure 1). New York City and Tokyo were the first megacities, both reaching an urban conglomeration of over 10 million by the 1950s, but today they are far from alone. In 2014 there were 28 megacities across the planet – including Sao Paulo in Brazil, Lagos in Nigeria, London in England, and Shanghai in China. All major global regions except Oceania are dotted with megacities (<http://worldpopulationhistory.org/urbanization-and-the-megacity>, 2016).

According to the website Population Connection: “Most of the cities that have reached the 10 million marker in recent years are located in Asia and Africa. In fact, it’s where seven of the eight newest megacities can be found and where 10 of the 12 projected 2030 megacities will be located.” This rapid growth brings with it various challenges. For example, in some of the fastest-growing cities, problems such as food shortages, traffic congestion, and lack of educational facilities have become a stark reality. New innovations and the adaptation of new technologies can help in solving these challenges.

At the same time, the global middle class will continue to grow in size and is expected to reach five billion by 2030 (Al Jaber, 2016). This fast-growing group of consumers has higher expectations in terms of quality, convenience, and experiences, and they have the purchasing power to get what they want. If a service provider cannot fulfill their expectations, they will find another that can. Higher standards of living demand more of urban infrastructure and built environments, while at the same time there is growing pressure to improve the energy efficiency and environmental friendliness of buildings. Traditional ways of solving these challenges

改变世界的大趋势

城市化

每天，世界各地约有20万人涌入城市。一座座巨型城市正以超乎想象的速度崛起。举例来说，1950年，位于中国东南部的深圳市仅有3148名居民。而据联合国统计，到2025年，这一数字将超过1200万（Burdett，2016年）。

巨型城市（图1）是指人口达到1000万以上的城市。纽约和东京是最早出现的两座巨型城市，其人口早在20世纪50年代就已经超过了1000万。如今，它们已经不再是世界上仅有的巨型城市。2014年，全球共有28座巨型城市，包括巴西圣保罗、尼日利亚拉各斯、英国伦敦和中国上海。除大洋洲外，全球其他主要地区均有巨型城市分布（<http://worldpopulationhistory.org/urbanization-and-the-megacity>, 2016年）。

org/urbanization-and-the-megacity, 2016年）。

据Population Connection网站报告：“近年来人口达到1000万的城市大多位于亚洲和非洲。事实上，在最新出现的8座巨型城市中，就有7座位于这两大洲。预计在2030年将出现的12座巨型城市中，有10座也位于这两大洲。”这种快速增长给城市带来了各种挑战。举例来说，在一些人口增速最快的城市中，食品短缺、交通拥堵和教育设施匮乏等问题已成为严峻的事实。最新的创新成果和技术可以帮助我们应对这些挑战。

同时，全球中产阶级的数量将持续增长，预计到2030年这一群体将达到50亿人（Al Jaber，2016年）。这一快速增长的消费群体对质量、便利性和体验有更高的要

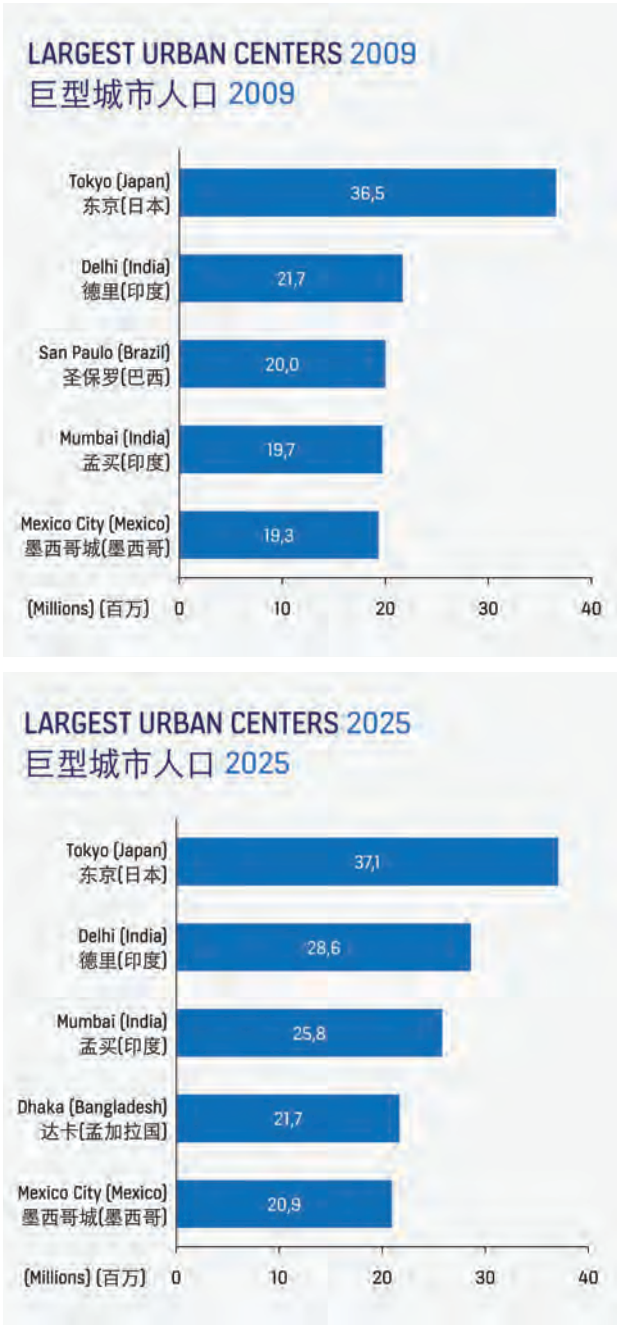


Figure 1. Urban shift has led to the emergence of megacities – cities with a population of 10 million or more. (Source: Population Connection)
图1：城市化演变导致巨型城市的崛起——人口达到1000万以上的城市。（来源：Population Connection）

are in many cases inefficient, meaning that new technologies and ways of thinking are required.

Digitization

Put simply, digitization is the process of converting information into a digital format. Today, digital technologies are commonplace in many different parts of our daily lives. Products, services, and processes are increasingly being digitized, enabling new innovations and improved efficiencies.

A good example of digitization is a smart watch, where technology has enabled phone, messaging functionalities, and even internet connectivity to be combined in what looks like an ordinary watch (Figure 2).

Modern-era customer solutions are increasingly complex and integrated rather than just standardized products and services delivered in homogenous volume. At the same time, digitization is breaking down industry barriers and creating new opportunities, while destroying established business models. This process is called digital disruption. From the point of view of traditional companies, digital disruption is in many cases seen as a threat. For example, the rise of Uber, Netflix, and Airbnb is threatening the very existence of established players in their respective industries.

However, increasing digitization also creates opportunities for these companies as they can leverage their strong customer relationships and increase cross-selling opportunities. In order to survive in the

digital era, companies must develop competences in two key areas:

- Learning more about their customers, for example by using digital capabilities to gather information and give customers a more prominent voice, while at the same time emphasizing evidence-based decision making in their organization.
- Becoming more of an ecosystem, i.e., becoming the first choice in their sector for a significant number of customers by having a great brand promise and delivering on it, receiving excellent customer recommendations, and being world-class at meeting customer needs (Weill & Woerner, 2015).

The first wave of digitization began with smartphones, which connected people with their surroundings and other people in a way that was impossible just a few decades ago. The second wave of digitization began with the Internet of Things (IoT). According to Wikipedia, the Internet of Things is defined as a network of physical objects – devices, vehicles, buildings, and other items – embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data.

Estimates of the number of connected devices vary, but it is generally agreed that the number is huge, from tens to hundreds of billions. Through IoT and digitization, products become connected, and these connected products form larger connected systems, which eventually merge into the system of

求, 同时他们拥有强大的购买力来支付高标准的生活。当一家服务供应商无法满足他们的需求时, 他们会寻找另一家有能力强满足需求的供应商。更高的生活标准对城市的基础设施和建筑环境提出了更高的要求, 与此同时, 城市在提高建筑能源效率 and 环境保护方面也将面临越来越大的压力。在许多情况下, 传统方法已无法解决这些挑战, 对创新技术和思维方式的需求迫在眉睫。

数字化

简而言之, 数字化是将信息转换成数字格式的过程。如今, 数字技术已经被普遍应用在我们日常生活的许多领域。越来越多的产品、服务和流程被数字化, 促进各类创新的应用, 并提高效率。

智能手表就是一个很好的数字化例证。数字技术已经能够成功地将电话和短信功能, 甚至互联网连接功能全部整合在一块看上去很普通的手表中(图2)。

现代客户解决方案正日趋复杂化和集成化, 而不再是批量交付的同质化标准产品和服务。同时, 数字化也正在摧毁已有的商业模式, 打破行业壁垒以创造新的机遇。这个过程被称为数字革命。从传统公司的角度来看, 数字革命在许多情况下都被视为威胁。举例来说, Uber、Netflix和Airbnb的崛起正威胁着各自行业中老牌知名企业的生存。

然而, 迅速发展的数字化也能为企业创造机遇, 帮助企业巩固并加强客户关系, 同时增加交叉销售的机会。要在数字化时代生存, 企业必须重点发展以下两个关键领域的竞争力:

- 增进对客户了解, 例如利用数字化手段收集信息, 给客户更大的发言权, 同时在企业内部强调基于证据作出决策的理念。
- 成为一个商业生态系统, 即成为所在行业中绝大多数客户的第一选择, 能够作出并兑现强有力的品牌承诺, 得到客户的大力推荐, 在满足客户需求方面达到世界一流水平 (Weill和Woerner, 2015年)。

第一波数字化浪潮始于智能手机, 其将人们与周围的环境和其他人紧密地连接起来, 这是几十年前完全无法想象的。第二波数字化浪潮始于物联网 (IoT)。根据维基百科的定义, 物联网是指设备、车辆、建筑和其他物品等实物所组成的网络。该网络内置有电子、软件、传感器和网络连接功能, 能够实现网络内实物间的数据收集和交换。

对联网设备数量的估计众说纷纭, 但数字都异常庞大, 从数百亿到数千亿不等。产品通过物联网和数字化的方式连接起来,

Bluetooth 蓝牙	Notify View Content 查看内容提示	Notify Vibration 震动提示
NFC 近场通讯	Call Conversation 通话	Ambient Light Sensor 光线感应器
Developer Options 开发商选项	Find My Phone 寻找手机	Gyroscope 陀螺仪
GPS 全球定位系统	Voice Control 语音控制	Magnetometer 磁力计
Notify Link Loss Alert 连接中断提示	Respond to Notifications 回应通知	Multi-touch 多点触控
Notify Missed Call 未接来电提示	Notify Sound 提示音	Accelerometer 加速计
Notify Timer 计时提示	Notify Backlit Screen 屏幕背光提示	LED Flashlight 手电筒

Figure 2. Some common smart watch features and functionalities. (Source: Jukka Salmikuukka)
图2. 智能手表的部分常见功能。(来源: Jukka Salmikuukka)



Figure 3. Evolution from a product to the system of systems (Source: Porter M. E. & Heppelman J. E.)
图3. 由单一产品到多重系统的演变 (来源: Porter M. E. & Heppelman J. E.)

systems. Porter and Heppelman (2014) used farming as an example of this development (Figure 3), but the same logic is applicable to other industries, including construction. Building systems have traditionally evolved independently in separate silos, but digitization will break these silos and open up new innovation opportunities.

As discussed in the previous section, rapid urbanization has created challenges that require new kinds of solutions. At the same time, the growth of the global middle class is creating demand for higher living standards that are impossible to achieve with traditional means. Digitization enables the efficiencies and innovations required for sustainable urbanization. The introduction of digital innovations can increase the quality of life in cities.

The Business Ecosystem

A business ecosystem can be defined as a network of organizations and individuals that co-evolve their capabilities and roles and align their investments so as to create and/or improve efficiency (Williamson and Meyer, 2012).

The business ecosystem is not a new invention; companies have applied the logic of business ecosystems for centuries in

order to become more successful. In the era of digitization and the systems of systems, products cannot be developed in isolation – they exist in the context of other products and are closely interlinked (Figure 4).

This means external knowledge and capabilities are increasingly required for the creation of a successful new product or solution. In the digitized world, designers must also think of products not just as things that someone will use, but also as platforms that other products or services might be able to exploit.

All in all, this means that the complexity of products has increased, and mass-produced, homogenous products no longer fulfill customer needs (Iansiti & Levien, 2004). Therefore, the imperative of the business ecosystem is to achieve not only economies of scale, but also economies of scope (Williamsson, & De Meyer, 2012).

In successful business ecosystems, individual companies can focus on their core activities, but when they work together with other members the outcome fulfills even the most complex needs of individual customers. The lead companies of the business ecosystem have an important role to play, as they typically develop various platform services,

形成大规模的联网系统，而这些系统又将最终合并成为更大的系统，即多重系统。Porter和Heppelman（2014年）曾以农耕为例解释这一发展趋势（图3），同样的逻辑也适用于其他行业，包括建筑行业。传统上，建筑系统一直封闭地独立发展，但数字化将打破这一壁垒，开辟新的创新机会。

正如前一节所讨论的，快速的城市化进程已经带来了挑战，需要以新型解决方案来应对。同时，全球中产阶级的大规模增长也促进了人们对更高标准生活的需求，这些都是传统方法所无法满足的发展需求。数字化能够满足可持续性城市化进程对效率和创新要求。应用数字创新成果能够提高城市生活的质量。

商业生态系统

商业生态系统可以定义为由组织和个人组成的网络，网络内的成员共同发展他们的能力和职责，并就投资达成共识，以创造和/或提高效率（Williamson和Meyer, 2012年）。

商业生态系统并不是新发明；数百年来，企业一直在运用商业生态系统的逻辑以获取更大的成功。在数字化和多重系统时代，产品开发不再是一项封闭的独立工作，所有的产品都存在于其他产品所形成的背景之下，彼此紧密关联（图4）。

这意味着，要成功开发一款新的产品或解决方案，企业需要越来越多的外部知识和能力。在数字化世界中，对设计人员而言，产品不仅是消费者使用的物品，还是其他产品或服务能够利用的平台。

总而言之，这意味着产品变得愈加复杂，大规模生产的同质化产品不再能够满足客户的需求（Iansiti和Levien, 2004年）。因此，商业生态系统的使命是，不仅要实现规模经济，还要实现范围经济（Williamsson和De Meyer, 2012年）。

在成功的商业生态系统中，各个企业可以专注于自己的核心业务，但与其他成员合作，能够满足更加复杂的客户需求。商业生态系统中的领导企业担任着重要职责。他们通常负责开发各种不同的平台服务、工具或技术，以便该商业生态系统中的其他成员用以提升自己的业绩。这意味着，能够成功开发大型多样化生态系统的企业

Markets comprise entities that operate out of individual self-interest
市场由以个体盈利为运营目标的商业实体组成

A set of individuals or organizations who exchange products or services within an environment governed by the laws of supply and demand
个人或企业按照供求关系交换产品或服务



Ecosystems comprise entities that operate out of orchestrated, mutual shared-interest
商业生态系统由以共同利益最大化为目标的商业实体组成

A set of individuals or organizations who formally or informally operate together to produce something of greater value for the mutual benefit of the ecosystem as a whole
个人或企业正式或非正式地合作，共同为整个商业生态系统创造更大的价值



Figure 4. “Traditional” versus ecosystem logic (Source: Davidson, S., Harmer, M., Marshall, A.)
图4. “传统”逻辑与生态系统逻辑的对比 (来源: Davidson, S., Harmer, M., Marshall, A.)

An ecosystem of ecosystems

Organizations will inevitably participate within and across multiple ecosystems – an ecosystem of ecosystems. Ecosystem of ecosystems and ecosystems within ecosystems already exist in the natural world.

An ecosystem of ecosystems underscores the natural world...

Universe
Interconnected ecosystem of galaxies, solar systems and planets
Galaxy
Complex ecosystems of solar systems distinct from other galaxies
Solar system
Complex ecosystems of planets distinct from other solar systems
Planet
Enclosed ecosystems distinct from one another
Coral reef
Individual ecosystem



...but it also has ever-increasing relevance for business

Organizations may:

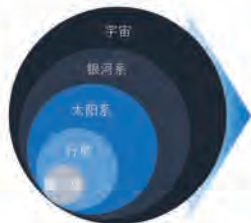
- Be a part of one or many ecosystems
- Play different roles in different ecosystems
- Evolve their roles in the ecosystem, as ecosystems evolve

多重生态系统

所有个体都将不可避免地参与多个生态系统——即多重生态系统。多重生态系统在自然界早已存在。

多重生态系统体现了自然规律^{[1][2]}

宇宙
由相互联系的星系、太阳系和行星组成的生态系统
银河系
由多个类似太阳系构成的复杂且独特的星系生态系统
太阳系
由多个行星组成的复杂且独特的星系生态系统
行星
各自拥有独特的生态系统
珊瑚礁
单个生态系统



同时与商业运营的联系越来越紧密

企业可以:

- 参与一个或多个商业生态系统
- 在不同的商业生态系统中担任不同的职责
- 伴随生态系统的演变和发展, 调整自身职责

Figure 5. Similar to the systems of systems, there can be several inbound and interrelated ecosystems (Source: Davidson, S., Harmer, M., Marshall, A.)

图5. 与多重系统同理, 商业生态系统也在各个层级相互关联 (来源: Davidson, S., Harmer, M., Marshall, A.)

tools, or technologies that the other members of the ecosystem can then use to enhance their own performance. This means that a company that can enable the development of a large and diverse ecosystem has also an access to a greater pool of knowledge. Therefore the ecosystem may benefit from learning faster than any single company.

According to several studies, business ecosystems create benefits for all parties involved.

- The business ecosystem built around Wal-Mart enabled a 22% margin advantage for Wal-Mart in retail groceries (Iansiti and Levien, 2004).
- ARM built a highly profitable USD\$10 billion chip business by successfully adopting the ecosystem business model (Williamson and Meyer, 2012).
- Companies that draw more than 50% of their revenue from the digital ecosystem and understand their customers better than their "average" competitors had 32% higher revenue growth and 27% higher profit margins than their industry averages (Weil and Woerner, 2015).

It is clear that being part of a successful ecosystem has a multitude of benefits. Compared to a single company, both the pace of innovation and the time to market of new solutions can be faster, leading to better and more innovative solutions and better business performance for all participants.

However, in reality the business environment is as complex as the natural world, meaning that each individual company is part of several inbound and interlinked ecosystems simultaneously (Figure 5).

Digitization it is not just about connecting devices to the internet, but also about enabling them to interact with one another. Application programming interfaces (APIs) are one of the most efficient ways of enabling this interaction. APIs specify exactly how software components should interact – essentially they provide interaction services between the software elements. For example, a weather API can provide one system with a fixed set of weather data from another.

APIs are becoming increasingly important from a commercial perspective as they enable digital business ecosystems and the utilization of new business logic. API Economy is a general term that describes the way in which APIs can positively affect an organization's profitability (Figure 6).

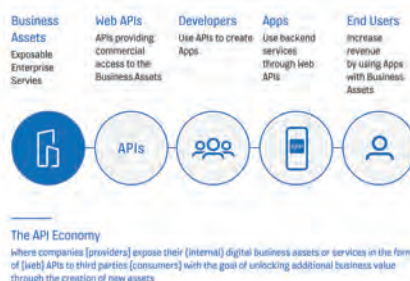


Figure 6. API Economy drivers (Source: Glickenhause A.)
图6. API经济的驱动因素 (来源: Glickenhause A.)

亦能获取更庞大的知识库。因此, 相比任何单一的企业, 商业生态系统的学习速度更快, 发展也更迅速。

多项研究表明, 商业生态系统能够为所有参与者带来好处。

- 围绕沃尔玛建立的商业生态系统让沃尔玛在零售杂货行业实现了22%的利润率优势 (Iansiti和 Levien, 2004年)。
- ARM成功采用商业生态系统, 使其芯片业务实现了高达100亿美元的利润 (Williamson和Meyer, 2012年)。
- 50%以上的收入均来自数字生态系统并比“平均”竞争对手更了解客户的企业所实现的收入增长和利润比所在行业中的普通企业分别高出了32%和27% (Weil和Woerner, 2015年)。

显然, 加入成功的商业生态系统能为企业带来诸多好处。相比单一企业, 新解决方案的开发和上市速度更快, 进而促进更多、更好的创新解决方案的开发, 并提高所有参与者的业绩。然而, 在现实中, 商业环境和自然界一样复杂, 每个企业都同时是多个互联生态系统的一部分 (图5)。

数字化不仅将设备连接到互联网, 而且还能实现设备间的信息交互。应用程序接口 (API) 是实现这种交互最高效的方式之一。API明确了软件组件之间的交互规则, 本质上, 它们在不同的软件要素之间提供交互服务。举例来说, 气象API可以向一个系统提供来自其他系统的一组固定气象数据。

从商业角度来看, API正变得越来越重要, 因为它们能够促进数字商业生态系统的建立和新商业逻辑的应用。API经济是一个通用术语, 描述API提高组织盈利能力的具体方式 (图6)。

API在许多成功的企业中都发挥了重要的作用。举例来说, API为Salesforce.com和eBay分别带来了50%和超过60%的收入 (Iyer和Subramaniam, 2015年)。





Figure 7. People flow from a user's perspective. (Source: Jukka Salmikuukka)
图7. 从用户角度出发的客流 (来源: Jukka Salmikuukka)

APIs play an important role in many successful companies. For example, Salesforce.com generates 50% and eBay over 60% of its revenues through APIs (Iyer and Subramaniam, 2015).

It can be concluded that APIs and business ecosystems enable companies to create new value for their customers and end users in an increasingly digitized business environment. The next section describes how KONE is applying APIs and a digital business ecosystem approach to its operations.

Example Case: Ecosystem Approach for An Elevator Manufacturer

Having discussed the business ecosystem concept in previous sections, it is now time to look at how this theoretical approach can be applied by an elevator and escalator manufacturer in practice, in a smart-building context.

Elevators and escalators are a fundamental part of the flow of urban life. Smooth people flow makes cities better places to live by providing safe, comfortable, and efficient transport, as well as accessibility for all. However, from the user's perspective, an elevator and escalator manufacturer can only provide a limited set of solutions required for smooth people flow (Figure 7).

Naturally, an elevator and escalator manufacturer can expand its offering to encompass a wider set of solutions for enabling smooth people flow. However, even with expanded offerings (including, for example, access control systems and access gates), the whole people flow journey is not fully covered by a single vendor, as there are several other building systems that also affect people flow. For example, if a building's lighting system shuts down suddenly

there is an immediate negative impact on people flow.

As there are several strong players operating in the building-systems industry within their established domains, it does not make sense for an elevator and escalator manufacturer to attempt to enter these new business areas with its own solutions. Instead, the optimal outcome for the company, its customers, and end users can be achieved through collaboration. IoT and APIs open up new ways to build meaningful interactions between the different building systems.

This is a good example of how an individual product cannot be developed or managed in isolation, since products exist in the context of other products; it also demonstrates how systems of systems are born.

The construction industry, like other mature industries, is facing the arrival of new digital entrants. Innovative start-ups that are "born digital" are eager to enter the market with new business models, value propositions, and digital solutions. Traditional business approaches based on proprietary technologies are being strongly challenged as customers and end users demand increased flexibility, more advanced and future-proof solutions, and innovative new approaches. Representatives of mature industries can take the strategic decision to view the new entrants either as a threat or as potential partners.

To be successful in this changing business environment, the elevator and escalator manufacturer should build collaborations and partnerships with both established building-system providers and innovative start-ups. By collaborating in this way to create a business ecosystem, the manufacturer has the opportunity to speed up the innovation timeline for new solutions and realize economies of scope through the

由此可以得出结论, 在日益数字化的商业环境中, API和商业生态系统能够让企业为他们的客户和终端用户创造新的价值。在下一节, 我们将介绍通力如何在公司运营中运用API和数字商业生态系统方法。

示范案例: 电梯生产商的生态系统应用

在前几节中, 我们已经讨论了商业生态系统概念。下面, 我们将介绍一家电梯和自动扶梯生产商如何在智能建筑环境中实践这一理论方法。

电梯和自动扶梯是城市生活客流的基本组成部分。顺畅的客流环境能够提供安全、舒适、高效和顺畅的体验, 让城市成为人类更好的居所。然而, 从用户的角度来讲, 要实现顺畅的客流环境, 电梯和自动扶梯生产商能够提供的解决方案是有限的 (图7)。

当然, 电梯和自动扶梯生产商可以扩展产品和服务组合, 提供更广泛的解决方案, 以实现顺畅的客流环境。然而, 由于其他一些建筑系统也会影响客流环境, 因此, 即使扩展了产品和服务组合 (包括大门和出入口门禁系统), 单一的设备供应商仍然无法全面覆盖整个客流过程。举例来说, 一旦建筑照明系统突然关闭, 将会立刻对客流环境产生直接的负面影响。

在建筑系统行业, 已经有多家在各自领域内实力强大的公司, 一家电梯和自动扶梯生产商没有必要进入这些新的业务领域重新开发已有的解决方案。相反, 与其他公司合作可以为该企业及其客户和终端用户带来最理想的结果。物联网和API为企业开辟了新的方法, 让他们能够在不同的建筑系统间创造有价值的交互。

这个例子充分表明, 产品开发不再是一项与封闭的独立工作, 所有的产品都存在于其他产品所形成的背景之下; 这同时也说明了多重系统是如何产生的。

complementary solutions provided by the application ecosystem (Figure 8).

In the digital business environment, connectivity is the cornerstone of any business ecosystem. For an elevator and escalator manufacturer it is crucial that devices are connected to some sort of IoT platform, which allows them to provide smarter and more efficient maintenance services that support and enhance their existing service business.

If an elevator and escalator manufacturer is truly committed to solving challenges across the whole people flow journey, they must seek out appropriate partners and focus on a business ecosystem approach, which is open by nature. The ecosystem partners can interact with elevators and escalators through smart APIs, on the cloud level and via on-site interactions. These kinds of interactions open up wider opportunities to develop the innovations required in a rapidly urbanizing environment.

As discussed earlier, business ecosystems can adapt and learn faster than a single company

operating in isolation. Therefore, they are also likely to be faster at bringing solutions to market. This is important when considering the rapid growth of the global middle class. Fulfilling the demands of this growing group in an efficient and ecologically scalable manner requires new innovations.

A large number of applications interacting with each other lead to the formation of the system of systems, which provides greater value for customers and end users. As different applications can be mixed and matched quite freely, the ecosystem also provides economies of scope – and the customer has greater flexibility to select the set of options that best meet their needs. The ecosystem approach also allows the people-flow-focused application ecosystem to connect with larger ecosystems, such as the smart-building ecosystem and eventually with much wider smart-city ecosystems similar to the ecosystem of ecosystems logic described earlier in Figure 5. By following this approach, the elevator and escalator manufacturer has a great opportunity to play an essential role in enabling successful urbanization for its customers and end users.

与其他成熟行业一样，建筑行业也正面临着数字化的入侵。一些“生来数字化”的创新型初创企业正迫切地以新的商业模式、价值定位和数字化的解决方案进入市场。基于专业技术的传统商业模式正面临巨大的挑战——客户和终端用户需要更加灵活，先进和创新的解决方案。成熟行业的代表企业需要就这些新兴的“入侵者”作出战略性的决策，决定将他们视为威胁还是潜在的合作伙伴。

要在这种不断变化的商业环境中取得成功，电梯和自动扶梯生产商应当与知名的建筑系统提供商和创新型初创企业建立合作关系。通过协作建立一个商业生态系统，电扶梯生产商将有机会加快创新进程和发布新方案的速度，同时，通过应用程序生态系统提供的互补方案实现范围经济（图8）。

在数字商业环境中，连接性是一切商业生态系统的基石。对电扶梯生产商而言，将设备连入物联网平台这一步至关重要。借助平台的支持，他们能够提供更智能和高效的维保服务，进一步支持和提升现有的服务。

如果电扶梯生产商真正致力于解决整个客流过程中的各种挑战，他们必须寻找合适的合作伙伴，重点开发开放性的商业生态系统。商业生态系统的合作伙伴可以通过智能API与电梯和自动扶梯产生交互，交互可以通过云技术或实地接口实现。这些信息交互创造了更多的机会，让电扶梯生产商能够及时为快速的城市化进程开发出各类创新的解决方案。

正如前面所讨论的，相比封闭运营的单一企业，商业生态系统的适应性更强，学习速度更快。因此，它们也能更快速地将新的解决方案推向市场。考虑到全球中产阶级规模的快速增长，这一点显得尤为重要。要以高效且可持续发展的方式满足这个正在日益扩大的消费群体的需求，创新是必不可少的。

大量相互连接的应用程序促进了多重系统的形成，从而为客户和终端用户创造更大的价值。由于不同的应用程序能够自由地混合和搭配使用，商业生态系统还能够提供范围经济——客户可以更加灵活地选择最符合自己需求的选项组合。根据前面图5中所描述的多重生态系统的逻辑，商业生态系统方法也可以让以客流为中心的应用程序生态系统与智能建筑生态系统等更大的生态系统连接起来，并最终与更广泛的智能城市生态系统连接起来。遵循这种方法，电扶梯生产商将有机会在城市化进程中，为提升客户和终端用户的体验发挥至关重要的作用。

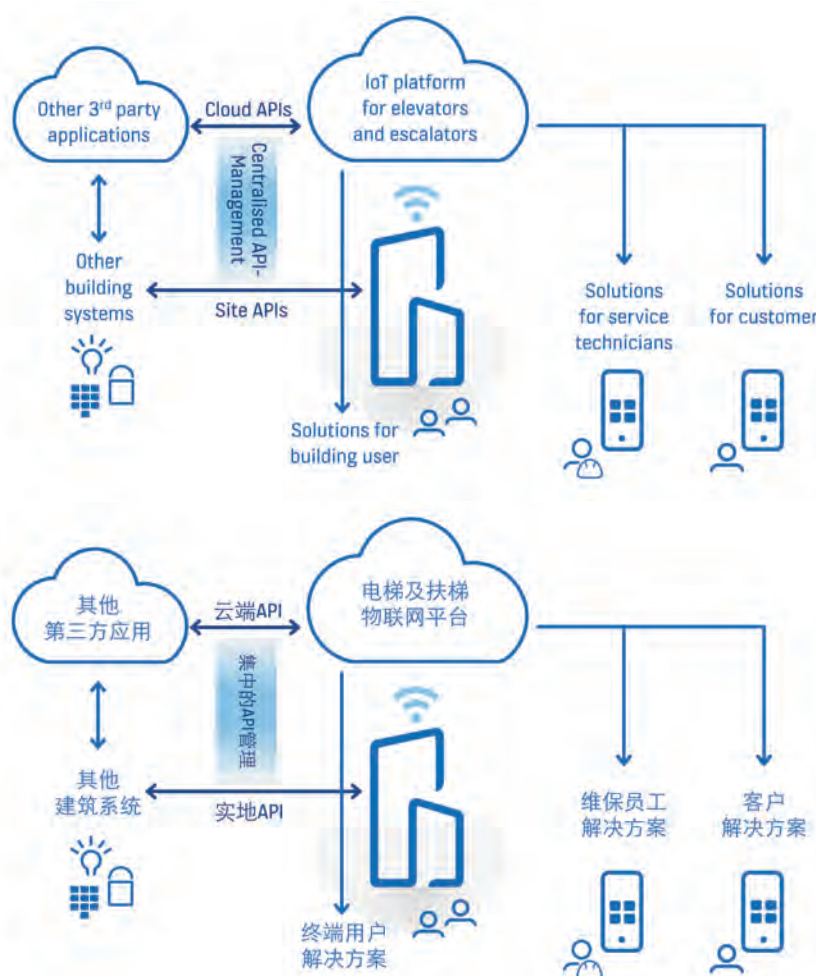


Figure 8. The business ecosystem model is enabled by the Internet of Things and application programming interfaces. (Source: Jukka Salmikuukka)

图8. 物联网和应用程序接口是建立商业生态系统的基本要素。(来源: Jukka Salmikuukka)

Summary

Digitization simultaneously presents new kinds of challenges and new opportunities for businesses. It seems that anything that can be connected will be connected. As part of this development, individual products are no longer independent; rather, they are increasingly interactive and eventually form larger systems of systems. In this changing environment, companies need to find smarter ways to operate. Business ecosystems have proven to be efficient at fostering rapid learning and faster innovation cycles, and delivering higher-value solutions for customers and end users.

At the same time, the increasing pace of urbanization and the growth of the global middle class are transforming societies by generating new needs. Urbanization is forcing cities and the individual buildings in them to become larger, while digitization is making them smarter. In an increasingly urbanized world, achieving smooth people flow is a challenge that requires an open approach, where solutions from various vendors are combined in such a way that they work together efficiently and seamlessly.

The business ecosystem model can provide practical solutions that fulfill these emerging needs and help to solve the challenges of urbanization. This approach requires openness and collaboration between parties that have traditionally operated in relatively isolated silos. The Internet of Things and the API Economy enable digital business ecosystems that open up interesting opportunities for all members to play an active role in making our cities better places to live.

总结

数字化给企业带来新挑战的同时，也带来了新的机遇。所有能够被连接起来的事物在未来都将被连接在一起。作为这种发展趋势的一部分，任何产品都将不再独立存在；相反，产品之间的连接和交互越来越紧密，并最终形成更大型的多重系统。要适应不断变化的商业环境，企业必须找到更明智的运营方式。实践证明，商业生态系统能够帮助企业加快学习速度，缩短创新周期，从而向客户和终端用户提供更具价值的解决方案。

同时，日益加快的全球城市化步伐和日渐增大的中产阶级规模正带来一场社会变革，同时也创造了新的需求。城市化推动着城市与城市建筑的规模不断扩大，而数字化则促使它们变得更加智能。随着城市化进程的不断加深，实现顺畅的客流成为一项巨大的挑战。要解决这一难题，需要采用开放的方法，将不同供应商的解决方案高效无缝地整合在一起。

商业生态系统模式能够提供切实可行的解决方案，满足这些新的需求，帮助应对城市化进程中产生的各项挑战。这一模式要求传统上独立封闭运营的企业保持开放性和协作性。物联网和API经济推动了数字商业生态系统的建立，让所有参与者都有机会为城市化建设做出贡献，让城市成为人类更好的居所。

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