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《产业生态学报》

2002 年冬，第 6 卷第 2 期，13-24 页

题目：能耗大户还是提高生产率的有效手段？信息技术与美国能源消费研究

作者： John A. Laitner

关键字： 复杂性，电子商务能源需求，预测，信息通信技术(ICT)，互联网

摘要： 目前有关互联网(Internet)能耗的争论十分激烈。大量文章均引用一项具有误导性的研究，即信息经济需要耗费大量的额外能源。即使一些研究试图纠正这种错误认识，讨论也还局限在对很多重大问题开展极其有限、初步的分析。虽然有研究表明信息经济的能耗仅占美国当前耗电量的 3%，但是因特网，或者更广泛的信息经济的复杂性和关联性，使得其能耗的长期影响存在很大的不确定性。虽然我们目前尚无法了解未来信息经济的长期能源需求，种种迹象表明技术进步和知识非物质化经济的发展，能耗强度及其环境影响将有望下降。本文对信息经济可能的能耗趋势进行了展望，并指明了未来的研究方向。

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Information Technology and U.S. Energy Consumption: Energy Hog, Productivity Tool, or Both?

John A. Laitner

KEYWORDS:
complexity, e-commerce energy requirements, forecasting, information and communications technology (ICT), Internet

SUMMARY:
A significant debate has emerged with respect to the energy requirements of the Internet. The popular literature has echoed a misleading study that incorrectly suggests the growth of the information economy will require huge amounts of new energy resources. Even correcting the misleading assumptions in that study, discussion on this topic tends to result in a highly limited and unsatisfactory review of many larger issues. Although the evidence suggests a relatively small amount of energy is required to power today's information needs—about 3% of total electricity consumption in the United States—the complexity and connectivity of the Internet, and, more generally, the information economy, yield a deep uncertainty about the eventual long-term impact on energy consumption. Although we may not yet be able to generalize about the future long-term energy needs associated with the information economy, the evidence points to continuing technical changes and the growing substitution of knowledge for material resources. These interrelated trends will likely generate small decreases in energy intensity and reduce subsequent environmental impacts relative to many baseline projections. Despite these trends, a number of questions need to be addressed before any solid long-term conclusions might be forthcoming. The article reviews some of the dimensions of these possible changes and suggests further directions for research that may help answer these important questions.

《产业生态学报》

2002 年冬，第 6 卷第 2 期，25–41 页

题目：电子商务的环境影响分析

作者：Klaus Fichter

关键字：经营战略，电子商务，环境管理，信息与通讯技术(ICT)，革新，回跃效应

摘要：有关电子商务和电子交易环境影响的研究还处于起步阶段。总的看来，电子商务的环境影响可分为三级，且其效果是积极的。但仍有两个重要的问题有待解决：(1) 如何加强对电子商务的环境影响的认识和管理。(2)什么是绿色的可持续的电子商务合适的实施途径？本文讨论了三种办法：在电子商务活动中充分考虑环境因素，采用新的协作型的环境管理方法，提供给客户一定的选择权。文中还对未来的研究作了展望，单纯的信息技术是不够的，必须把技术和产品设计、使用、管理等因素结合起来统筹规划，才能实现可持续发展。

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E-Commerce: Sorting Out the Environmental Consequences

Klaus Fichter

KEYWORDS:
business strategy, e-commerce, environmental management, information and communication technologies (ICT), innovation, rebound effect

SUMMARY:
The environmental effects of e-commerce may be described in terms of first-, second-, and third-order effects. Data for these effects are scarce, partly because research on environmental effects of e-commerce and e-business is still in its infancy, although it is evolving very rapidly. Until now, positive environmental consequences of e-commerce have generally been coincidental. Two crucial questions that must be addressed are (1) How do we improve our understanding and management of the environmental effects of e-commerce? and (2) Which approaches are best suited to the development of sustainable e-solutions? Three approaches to developing sustainable e-commerce solutions are discussed: the extension of environmental performance measurement and management to e-commerce activities, the use of new cooperative forms of innovation management, and the provision of customer choice. Finally, an outlook on future research demands is presented. The technology itself (information and communication technologies, Internet) does not determine sustainability, but rather its design, use, and regulation does.

《产业生态学报》

2002 年冬，第 6 卷第 2 期，43-57 页

题目：电信与旅行的互补性研究

作者：Patricia L. Mokhtarian

关键字：互补性，信息通信技术(ICT)，旅行，可替代性，电信，交通

摘要：本文分析了有关电信对旅行影响的概念、理论和实际证据。文章的重点在于客运，此外对货物运输也作了简要说明。以往的研究往往侧重于一种联系方式（如通讯联系）对另一种（如实地旅行）的短期替代效应，而忽视两者之间长期的间接的互补效应。总的来说，不同联络方式间的替代效应、互补效应和无关效应可能同时存在。多种效应的总作用后果表现为：社会的通信和交通运输活动都在增长，但前者增长的速度更快，所占的比重也不断加大。通信和交通之间间的实际作用方式十分复杂，仍有待深入研究。但据目前的一些实例来看，二者之间应该表现为一种互补而非替代的关系。

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Telecommunications and Travel: The Case for Complementarity

Patricia L. Mokhtarian

KEYWORDS:
complementarity, information and communication technologies (ICT), passenger travel, substitutability, telecommunication, transportation

SUMMARY:
This article examines the conceptual, theoretical, and empirical evidence with respect to the impact of telecommunications on travel. The primary focus is on passenger travel, but goods movement is addressed briefly. I argue that although direct, short-term studies focusing on a single application (such as telecommuting) have often found substitution effects, such studies are likely to miss the more subtle, indirect, and longer-term complementarity effects that are typically observed in more comprehensive analyses. Overall, substitution, complementarity, modification, and neutrality within and across communication modes are all happening simultaneously. The net outcome of these partially counteracting effects, if current trends continue, is likely to be faster growth in telecommunications than in travel, resulting in an increasing share of interactions falling to telecommunications, but with continued growth in travel in absolute terms. The empirical evidence to date is quite limited in its ability to assess the extent of true causality between telecommunications and travel, and more research is needed in that area. At this point, what we can say with confidence is that the empirical evidence for net complementarity is substantial, although not definitive, and the empirical evidence for net substitution appears to be virtually nonexistent.

《产业生态学报》
2002 年冬，第 6 卷第 2 期，59-69 页

题目：产品批发与零售的生命周期能耗分析

作者：Gregory A. Norris, Filippo Della Croce, Olivier Jolliet

关键字：销售，能耗，投入产出生命周期评价(IO-LCA)，电子商务，交通，计算机

摘要：电子商务被认为能够降低产品批发和零售过程的能耗，但实际上未必完全如此。批发与零售的贸易方式及其在产品运输途中的环境影响目前还没有一个系统化的研究，本文将填补这一空白，围绕电子计算机系列产品，利用投入产出生命周期评价法对计算机使用前的批发和零售阶段的能耗进行分析。

结果表明，产品销售阶段的运输过程仅占批发和零售过程总能耗的一小部分。另一方面，批发和零售过程的产品供给才是带来巨大能耗的主要根源。因此，电子商务密集的批发零售阶段是影响总能耗的主要阶段。文中对美国 400 种商品作了分析，结果显示，产品批发和零售阶段的能耗是很大的。由于产品批发和零售目前广泛基于电子商务，因此电子商务的能耗不容忽视。以计算机为例，产品在批发和零售过程中的能耗占产品使用前生命周期阶段总能好的 38%，而产品运输的相应能耗比例仅为 9%。因此应把批发和零售阶段列入产品生命周期过程，采用输入输出生命周期评价工具对其进行分析管理。

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Energy Burdens of Conventional Wholesale and Retail Portions of Product Life Cycles

Gregory A. Norris, Filippo Della Croce and Olivier Jolliet

KEYWORDS:
distribution, energy, input-output life-cycle assessment (IO-LCA), e-commerce, transportation, computers

SUMMARY:
E-commerce is often cited as offering the potential to reduce wholesale and retail burdens within product life cycles; however its potential impacts upon transport may be positive or negative. But the relative environmental importance of wholesale and retail trade and their intervening transportation links within product life cycles has not been generally characterized. The objective of this research was to assess the upstream (preusage) life-cycle energy burden shares associated with retail trade and wholesale trade using input-output life-cycle assessment (IO LCA) with a special focus on the electronic computers sector.

According to our results, the physical transfers of products within the distribution phase play a minor role in terms of energy consumption compared with wholesaling and retailing. On the other hand, the supply chains of the wholesale and retail trade sectors can lead to energy consumption that is a significant share of the total preconsumer energy consumption for many products. Thus, where e-commerce circumvents wholesale and/or retail trade, it can have a major impact on total preconsumer energy consumption. As an example, for the electronic computers sector, retailing and wholesaling as a portion of distribution are responsible for 38% of the total energy consumption from production until purchase (cradle to gate), whereas transportation within the distribution phase corresponds to only 9%. Our analysis of more than 400 commodities in the United States showed that for the large majority of them, retailing and wholesaling account for appreciable shares of the total preconsumer energy burdens. Wholesaling and retailing should be included in LCA, and IO LCA is an effective tool for doing so.

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题目：集中仓储的经济与环境影响

作者：H Scott Matthews, Chris T. Hendrickson

关键字：电子商务，投入产出生命周期评价(IO-LCA)，库存管理，物流，备件，仓储

摘要：库存管理出现的一些新变化对商务过程产生了很大的影响，为企业节省了很多运行成本，但这些变化的总体环境影响目前还不太清楚。集中仓储会降低库存总量，从而带来一些环境效益，但货运量的增加又可能抵消一部分正面环境效益。针对上述问题，作者研究了美国国防部备件库存的案例，结果显示仓储减少在提高经济效益的同时，也会改善环境效益。

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The Economic and Environmental Implications of Centralized Stock Keeping

H. Scott Matthews and Chris T. Hendrickson

KEYWORDS:
e-commerce, input-output life-cycle assessment (IO-LCA), inventory management, logistics, spare parts, warehousing

SUMMARY:
Recent changes to the management of inventory and warehousing methods have created significant changes in business processes. These changes have produced economic savings to firms from reduced handling of supplies. The system-wide impacts of this shift in methods on overall cost and the environment are still unclear, however. Reductions in inventories can provide significant environmental savings. In this article, we analyze the changes in inventory control methods and assess the environmental and cost tradeoffs between increased trucking and more efficient centralized warehouses. We consider the case of consolidating the spare-parts inventory at U.S. Department of Defense warehouses and discuss similarities to other existing businesses. The case suggests large economic and environmental benefits due to reductions in warehousing costs.

《产业生态学报》
2002 年冬，第 6 卷第 2 期，83-97 页

题目：电子商务对温室气体排放的影响：芬兰食品递送的案例研究

作者： Hanne Siikavirta, Mikko Punakivi, Mikko Kärkkäinen and Lassi Linnanen

关键字：分销，食品电子购物，食品消费，食品生产，温室气体(GHG)排放，后勤

摘要：在纵览了有关电子商务环境影响的文献的基础上，本文研究了食品生产与消费过程的温室气体排放情况，发现电子商务可提供很多温室气体减排的机会，并对随之而来的负面环境影响作了分析。考虑到电子购物可能直接或间接地减少食品生产和消费过程中的 GHG 排放量，文中实例分析了芬兰的食品电子购物和递送方式导致的温室气体环境影响。

与传统购物方式相比，理论上不同的电子购物方式可减排温室气体 18%到 87%，并可能使整个芬兰温室气体释放量减少 0.3%到 1.3%。然而电子购物的实际市场份额不大（2005 年可望达到 10%），这对改善环境是不利的。为了实现理论的预期，大量减少温室气体的释放，人们仍需对各种购物方式进行系统性的研究，并作出有效的改进。

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Effects of E-Commerce on Greenhouse Gas Emissions: A Case Study of Grocery Home Delivery in Finland

Hanne Siikavirta, Mikko Punakivi, Mikko Kärkkäinen and Lassi Linnanen

KEYWORDS:
distribution, e-grocery, food consumption, food production, greenhouse gas (GHG) emissions, logistics

SUMMARY:
In this article, we present a literature review of the general and environmental effects of e-commerce in various parts of the demand-supply chain. These are further translated into effects on greenhouse gas (GHG) emissions in the food production and consumption system. The literature study revealed many opportunities for e-commerce to reduce GHG emissions in the food production and consumption system. Some possibly negative effects were also identified. Electronic grocery shopping (e-grocery) home delivery service was chosen as the subject of a case study because of its direct and indirect potential for reducing the GHG emissions in the food production and consumption system.

GHG emission reduction potential through the implementation of various e-grocery home delivery strategies was quantified. Depending on the home delivery model used, it is possible to reduce the GHG emissions generated by grocery shopping by 18% to 87% compared with the situation in which household members go to the store themselves. We estimate that the maximum theoretical potential of e-grocery home delivery service for reducing the GHG emissions of Finland is roughly 0.3% to 1.3%; however, the current and estimated future market potential is much smaller, because the estimated market share of e-grocery services is only 10% by 2005. Narrowing the gap between the theoretical and the actual potential requires a model that would simultaneously provide additional value to the consumer and be profitable to companies. To be able to achieve significant reductions in GHG emissions, system-level innovations and changes are required. Further research is needed before conclusions can be reached as to whether e-commerce and e-grocery are useful tools in that respect.

《产业生态学报》
2002 年冬，第 6 卷第 2 期，99-114 页

题目：电子商务与传统商务的能耗分析：日本图书销售的案例研究

作者：Eric Williams, Takashi Tagami

关键字：企业对顾客(B2C)，快送服务，信息与通讯技术(ICT)，生命周期评价(LCA)，载荷，产品投送

摘要：本文分析了日本图书的两种不同销售方式——企业对顾客(B2C)电子商务方式和传统购销方式——的能耗情况。研究显示，在人口稠密的市区，电子商务方式需要额外的包装，能耗也较传统的方式大得多。对市郊和农村，两种方式的能耗差不多，因为传统销售需要长距离的人员往来，从而抵消其无需额外包装的优势。电子商务并不节能的另一个因素在于运输过程中汽车使用过于频繁。在全国（包括城市和乡村）的尺度上，二者能耗大体相近，电子商务为每本书 5.6 兆焦耳，传统销售为每本书 5.2 兆焦耳。尽管相差不大，但其结果不容忽视，在制定相关能源政策时要加以考虑。影响 B2C 电子商务能耗的主要因素包括：包装、货车载荷、单程递送次数等。

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Energy Use in Sales and Distribution via E-Commerce and Conventional Retail: A Case Study of the Japanese Book Sector

Eric Williams and Takashi Tagami

KEYWORDS:
business-to-consumer (B2C), courier services, information and communications technology (ICT), life-cycle assessment (LCA), loading factors, product delivery

SUMMARY:
Energy use associated with sales and distribution via business-to-consumer (B2C) e-commerce versus conventional retail is analyzed for the Japanese book sector. Results indicate that e-commerce uses considerably more energy per book than conventional retail in dense urban areas, because of additional packaging. In suburban and rural areas, the energy consumption of the two systems is nearly equal because the relative efficiency of courier services compared to personal automobile transport balances out the impact of additional packaging. The main reason e-commerce does not save energy, even in rural areas, is because of the multipurpose use of automobiles; e-commerce does consume less energy in the case of single-purpose shopping trips by automobile. Overall consumption at the national level is nearly the same: 5.6 megajoules (MJ) per book for e-commerce and 5.2 MJ per book for traditional retail. Although this difference is smaller than the uncertainty in the result, the structure of energy use for the two systems is quite distinct, which suggests reprioritization of energy-efficiency strategies. Important factors influencing the energy efficiency of B2C e-commerce include packaging, loading factors of courier trucks, number of trips per delivery, and residential energy consumption.

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2002 年冬，第 6 卷第 2 期，115-132 页

题目：电子版与印刷版学术期刊的能耗分析

作者：David L. Gard, Gregory A. Keoleian

关键字：数字图书馆，电子出版物，信息通信技术(ICT)，互联网，生命周期评价(LCA)，生命周期能量分析

摘要：数字与信息技术革命极大地改变了人类的生活。互联网的出现可否有效地保护环境？本文通过数字图书馆的生命周期能耗分析，对这一问题作了研究。

对于一篇典型的 12 页学术论文，屏幕阅读约需 0.97 小时。电子图书馆方式下需要使用服务器、路由器、激光打印机和工作站等支持设备。传统方式下也需要进行期刊生产、运输、储存、装订、出借以及影印等一系列操作。此外两种方式下的图书馆建筑设施、办公用纸以及读者往来情况也有待比较分析。作者建立了一个包括 30 个模型元素、90 个输入变量以及众多其它参数的生命周期模型，比较了图书馆期刊的电子与传统馆藏方式。考虑到问题的复杂程度，模型给出了 5 种可能的情景。情景 1 假设每篇论文只阅读一次，其它情景下论文可被阅读至 1000 次。数字图书馆的单位论文能耗低为 4.10 兆焦耳，最高可达 216 兆焦耳；而传统系统的能耗范围在 0.55 到 525 兆焦之间。研究发现：(1)单位能耗与每篇文章的被阅读次数紧密相关；(2)数字系统的网络基础设备能耗对系统的总能耗影响不大；(3)读者往返图书馆的交通过程所需的能耗很大；(4)不同复印方式的能耗不同，影印比屏幕阅读耗能，而激光打印则可能比屏幕阅读节能。

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Digital vs. Print: Energy Performance in the Selection and Use of Scholarly Journals

David L. Gard and Gregory A. Keoleian

KEYWORDS:
digital library, electronic publishing, information and communications technology (ICT), Internet, life-cycle assessment (LCA), life-cycle energy analysis

SUMMARY:
Advances in digital technology and the growth of information networks are revolutionizing human activity. The Internet has been championed as a new tool for environmental improvement. A life-cycle energy analysis of digital libraries, a growing application of information technology, was conducted to test this premise.

Life-cycle models were compared for journal collections in digital and traditional formats. The basis for analysis was the amount of information in a typical scientific journal article (12 pages), which is equivalent to 0.97 hr of on-screen reading time. Digital system elements such as servers, routers, laser printers, and computer workstations were modeled. Journal production, delivery, storage, binding, interlibrary loan, and photocopying were examined for the traditional system. Building-related infrastructure, office paper, and personal transportation of the library patron were analyzed for both cases. In all, the study incorporated nearly 30 model elements, 90 input variables, and numerous fixed parameters. Five primary scenarios were constructed to consider increasing levels of complexity. Scenario 1 assumes only one reading per article (unit of analysis). Additional scenarios assume 1,000 readings and vary the following: laser printing, photocopying, and personal transportation. Energy consumed by the digital collection ranged between 4.10 and 216 MJ. The traditional system realized burdens from 0.55 to 525 MJ. Four significant effects were uncovered: (1) Energy consumption per unit was highly influenced by the number of readings per article. (2) Networking infrastructure by itself had a relatively small effect on total energy consumed by the digital system. (3) When personal transportation was considered, its effects tended to dominate. (4) The impact of making personal copies varied. Photocopying always increased energy consumption, whereas laser printing actually saved energy when it substituted for on-screen reading.

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题目：产品的环境管理标签：基于废物处理的考虑

作者：Steven Saar, Valerie Thomas

关键字：条形码，电子标签，产品生命周期管理，无线电自动识别 (RFID)，回收

摘要：本文研究了条形码和无线电自动识别标签在产品生命周期过程中的使用情况，分析了这些标签用于产品环境管理的可能性。条形码比无线电自动识别(RFID)标签更便宜也更普遍，但 RFID 在人们视线所及之外工作。条形码和 RFID 都包含着各种有用的产品信息。如果在产品标签中注明产品能否回收，可有效地提高回收效率。使用条形码或 RFID 标签还可帮助垃圾收集和废物管理。为了促进产品环境标签的推广，需要进行的工作包括：增进废物管理的市场化、鼓励开发使用实验系统以及深入协调制造商和废物管理部门的关系等。

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Toward Trash That Thinks: Product Tags for Environmental Management

Steven Saar and Valerie Thomas

KEYWORDS:
bar codes, electronic tags, optical tags, product life-cycle management, radio-frequency identification (RFID), recycling

SUMMARY:
In this article, we explore several options for linking information technology to materials and products through the use of bar codes and radio-frequency identification (RFID) tags, and the implications for product life-cycle management. We also describe tests with existing and modified tags, both on and inside products, as would be needed for environmental management applications. Bar codes are cheap and have an existing infrastructure; RFID tags are more expensive and less widespread, but they can be read without a line of sight between the tag and the reader. Bar codes and RFID tags carrying basic product information could link to different databases for a range of applications. Product tags could increase recycling efficiency by automating the sorting of recyclables or by linking to product dismantling instructions during the recycling process. Product tags could provide incentives for good waste management, through Universal Product Code (UPC) bar-code recycling coupons or through RFID tag automatic recycling credits for curbside collection programs. Measures to encourage the development of these types of applications include moves toward competitive, market-based waste management systems, the encouragement of experimental systems, and coordination between manufacturers and waste management industries.