

Annotated Bibliography; CS325

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Cloud computing benefits for startups and software engineering:

Cloud computing has transformed how startups operate by providing a flexible, scalable, and cost-efficient solution to IT infrastructure needs. Historically, startups faced significant barriers, such as the high costs of physical servers and complex infrastructure management, which limited their ability to compete with larger companies. By offering a "pay-as-you-go" model, cloud computing eliminates the need for substantial upfront investments, allowing startups to save money and allocate resources more effectively. Its scalability enables businesses to adjust resource usage as they grow, ensuring efficiency and reducing financial risks. Additionally, cloud platforms offer built-in tools for collaboration, analytics, and data security, empowering startups to focus on innovation and accelerate their time-to-market. As a result, cloud computing has become an essential driver of growth and success for small businesses in today's competitive landscape.

Hsu, P.-F., Ray, S., & Li-Hsieh, Y.-Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. *International Journal of Information Management*, 34, 474–488. <https://doi.org/10.1016/j.ijinfomgt.2014.04.006>

Cloud computing represents a transformative IT paradigm, offering reduced costs, enhanced elasticity, and widespread accessibility, poised to reshape traditional IT delivery. While adopting cloud computing requires firms to address challenges similar to those encountered with other enterprise IT systems, it also introduces unique pricing and deployment strategies not found in conventional solutions. The relationship between traditional enterprise IT adoption frameworks and these novel strategies remains unclear. To address this gap, this study employs the Technology–Organization–Environment (TOE) framework from innovation diffusion theory to propose a cloud service adoption model. This model incorporates adoption intention while also accounting for pricing mechanisms and deployment models. One of the listed author,

Pei-Fang Hsu is an assistant professor in the Institute of Service Science, College of Technology Management, National Tsing Hua University, Taiwan. She received her Ph.D. in Information Systems from the Paul Merage School of Business at University of California, Irvine.

Konstantinos, K., Persefoni, M., Evangelia, F., Christos, M., & Mara, N. (2015). Cloud computing and economic growth. *Proceedings of the 19th Panhellenic Conference on Informatics*, (pp. 209–214). <https://dl.acm.org/doi/10.1145/2801948.2802000>

Sharing resources is economically advantageous for companies. Major corporations like Google, Amazon, and Microsoft, for instance, offer their surplus resources to other businesses, creating a mutually beneficial scenario. This resource-sharing is naturally positive for all involved. Additionally, cloud computing has generated new economic opportunities and jobs, such as cloud solution architects and cloud engineers. Also, one of the authors, Persefoni Mitropoulou, is a PhD candidate at Harokopio University of Athens and has contributed to 11 articles.

Maresova, P., Sobeslavband, V., & Krejcarc, O. (2017). Cost-benefit analysis - evaluation model of cloud computing deployment for use in companies. *Applied economics*, 49(6), 521–533. <https://.tandfonline.com/doi/full/10.1080/00036846.2016.1200188>

This source provides a detailed analysis of how enterprise companies can leverage cloud computing to cut costs and save time. By eliminating the need to maintain their own servers, these companies can significantly reduce expenses related to hardware, maintenance, and energy consumption while streamlining their IT operations. This reduction in overhead allows resources to be allocated more effectively, enabling a focus on core business activities. Additionally, companies can dynamically scale their IT infrastructure based on demand, optimizing resource usage and minimizing waste. Outsourcing server management to cloud providers also means that enterprise companies can reduce the size of their IT departments, leading to further savings in salaries and training costs. As a result, startup companies adopting cloud computing from the beginning can avoid the same mistakes made by larger corporations. They can implement best practices in cloud utilization, ensuring agility, cost-effectiveness, and smooth scalability, thereby avoiding common pitfalls that hinder growth and sustainability. One

listed author, Petra Maresova, a professor and the dean of the Faculty of Informatics and Management at the University of Hradec Kralove, has contributed to 23 articles.

Mac an Bhairda, C. & Lynn, T. (2023). Seeding the cloud: financial bootstrapping in the computer software sector. *Venture Capital*, 17, 151–170. <https://research-ebsco-com.ezp.lib.cwu.edu/c/ilo4yp/viewer/pdf/2kwrlivvdz>

This study examines how computer software companies utilizing cloud computing for application development and delivery manage their resources. The adoption of this innovative technology can influence firm financing due to significantly lower initial infrastructure investment requirements compared to traditional packaged software, reduced time-to-market, and the ability to scale instantly. To explore these impacts, we conducted in-depth interviews with founders of 18 independently owned early-stage enterprises. One of the authors, Ciarán Mac an Bhaird, who earned his PhD from Trinity College Dublin, is an Associate Professor of Business and Management at Dublin City University. His research and teaching focus on the resourcing of small firm economies, enterprise policy, and innovations in entrepreneurial finance and he supervises PhD students.

Nawrocki, P. & Smendowski, M. (2024). Optimization of the use of cloud computing resources using exploratory data analysis and machine learning. *Journal of Artificial Intelligence and Soft Computing Research*, 14, 287–308. <https://doi.org/10.2478/jaiscr-2024-0016>

The growing popularity of cloud computing has been driven by the increasing demand for scalable IT solutions that offer a cost-effective approach to managing software development and achieving business goals. A critical challenge in cloud computing is optimizing resource usage to enhance efficiency and flexibility, reduce costs, ensure security, and maintain high service availability. This paper introduces a novel concept called the Cloud Computing Resource Prediction and Optimization System. This system leverages exploratory data analysis, emphasizing the value of outliers and dynamic feature selection. The optimization process focuses on long-term forecasting, categorized as a dynamic and proactive optimization approach. One of the listed authors, Piotr Nawrocki is a Professor in the Faculty of Computer Science at AGH University in Krakow, Poland. His research focuses on distributed systems, computer networks,

mobile systems, machine learning, cloud computing, and service-oriented architectures.

Ouh, E. L. & Gan, B. K. S. (2023). Are you cloud-certified? preparing computing undergraduates for cloud certification with experiential learning. *Proceedings of the 3rd International Conference on Big Data and Computing*, (pp. 46–57). <https://doi.org/10.1109/ICSE-SEET58685.2023.00011>

Understanding AWS is crucial, as cloud computing demands practical experience. This paper investigates the use of project-based experiential learning through SMU-X (simulator - X) and the experiential risk learning (ERL) model to equip computer science undergraduates for the AWS-SAA (Amazon Web Services - Solutions Architect Associate) certification, which typically requires a minimum of one year of AWS work experience. The listed author, Ouh Eng Lieh, serves as an Associate Professor of Computer Science (Education) and the Director of the BSc (IS) Information Systems Major program at Singapore Management University.

Phaphoom, N., Oza, N., Wang, X., & Abrahamsson, P. (2012). Does cloud computing deliver the promised benefits for it industry? *Proceedings of the WICSA/ECSA 2012, Companion Volume*, 45–52. <https://dl.acm.org/doi/10.1145/2361999.2362007>

Cloud computing offers transformative benefits for startups, enabling them to compete with larger enterprises through cost efficiency, scalability, and innovation. And this source highlight how pay-as-you-go models reduce upfront IT costs, allowing startups to allocate resources more effectively, while also discussing risks such as vendor lock-in and security concerns. One of the authors, Dr. Nilay V. Oza serves as a senior researcher at the Software Business Laboratory, Helsinki University of Technology (TKK), Finland.

Rawat, A., Singh, S., & Singh, P. (2023). Cloud resource management: Monitoring. *Proceedings of the 5th International Conference on Information Management Machine Intelligence*, (pp. 1–4). <https://dl.acm.org/doi/10.1145/3647444.3647899>

Effective monitoring of resource usage is crucial for companies to understand and manage their consumption. This article provides a comprehensive guide on how to monitor resources efficiently using Amazon Web Services (AWS), which is one of the most popular cloud providers. It emphasizes the importance of keeping track of resource utilization to ensure optimal performance and cost-efficiency. The article details various monitoring tools and techniques available in AWS, such as CloudWatch, which helps in tracking metrics, setting alarms, and generating logs. By utilizing these tools, companies can gain insights into their resource usage patterns, identify potential issues early on, and make informed decisions to optimize their cloud infrastructure. Also, the listed author, Pawan Singh serves as an Associate Professor in the Computer Science Engineering department at Amity School of Engineering and Technology (ASET).

Rangaiyengar, R. (2023). Cloud software engineering. *ISEC '23: Proceedings of the 16th Innovations in Software Engineering Conference*, (pp. 1–2). <https://doi.org/10.1145/3578527.3581746>

When designing a cloud application, architects must consider infrastructure requirements and deployment strategies from the outset. Unlike traditional applications with static infrastructures and manually scaled data and services, cloud-based applications automatically scale data independently. Built on Service-Oriented Architecture principles, these applications are designed to work seamlessly with dynamic frameworks. Rupashree Rangaiyengar is pursuing a PhD in the Department of Computer Science and Automation at the Indian Institute of Science, Bangalore, and has authored two academic publications.

Yan, L., Hao, X., Cheng, Z., & Zhou, R. (2018). Cloud computing security and privacy. *Proceedings of the 3rd International Conference on Big Data and Computing*, (pp. 119–123). <https://doi.org/10.1145/3220199.3220217>

The protection of user data is of utmost importance for businesses, making data privacy in cloud computing a top priority. This source underscores the significance of robust privacy measures and outlines various methods to ensure the safety of user information. Among these methods is two-factor authentication, which adds an extra layer of security by requiring two forms of verification before granting access. Additionally, major cloud service providers implement rigorous security protocols and advanced encryption techniques to safeguard data. These providers, such as Amazon Web Services (AWS), Microsoft Azure, and Google Cloud, invest heavily in security infrastructure to prevent unauthorized access, data breaches, and other potential threats. By leveraging these comprehensive security measures, businesses can protect their user data and maintain trust with their customers. One of the authors, Zelei Cheng, is a PhD candidate in Computer Science at Northwestern University. He obtained his master's degree from Purdue University and his bachelor's degree from Beijing University of Posts and Telecommunications (BUPT).