

# Module 14: Digital Transformation and Innovation for Enabling Reconfigurable Production Systems

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# 14.5. Business Models of MODAPTO



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# Use of St. Gallen Business Model Navigator for Modapto

## Methodology Applied:

- **St. Gallen Business Model Navigator** framework to explore over 55 proven business model patterns (<https://businessmodelnavigator.com/explore>).
- The aim is to identify relevant **business model archetypes** that align with Modapto's capabilities and value proposition in modular automation.
- The patterns were evaluated based on their ability to support:
  - Value creation via modularization
  - Scalable delivery through digital enablement
  - Value capture through services and recurring revenue models



### Performance-based Contracting # 38

A product's price is not based upon the physical value, but on the performance or valuable outcome it delivers in the form of a service. Performance based contractors are often strongly integrated into the value creation process of their customers. Special expertise and economies of scale result in lower production and maintenance costs of a product, which can be forwarded to the customer. Extreme variants of this model are represented by different operation schemes in which the product remains the property of the company and is operated by it.

Examples: Amazon Web Services

Rolls-Royce BASF Xerox

General Electric



### Solution Provider # 47

A full service provider offers total coverage of products and services in a particular domain, consolidated via a single point of contact. Special know-how is given to the customer in order to increase his or her efficiency and performance. By becoming a full service provider, a company can prevent revenue losses by extending their service and adding it to the product. Additionally, close contact with the customer allows great insight into customer habits and needs which can be used to improve the products and services.

Examples: Google Abbot Downing

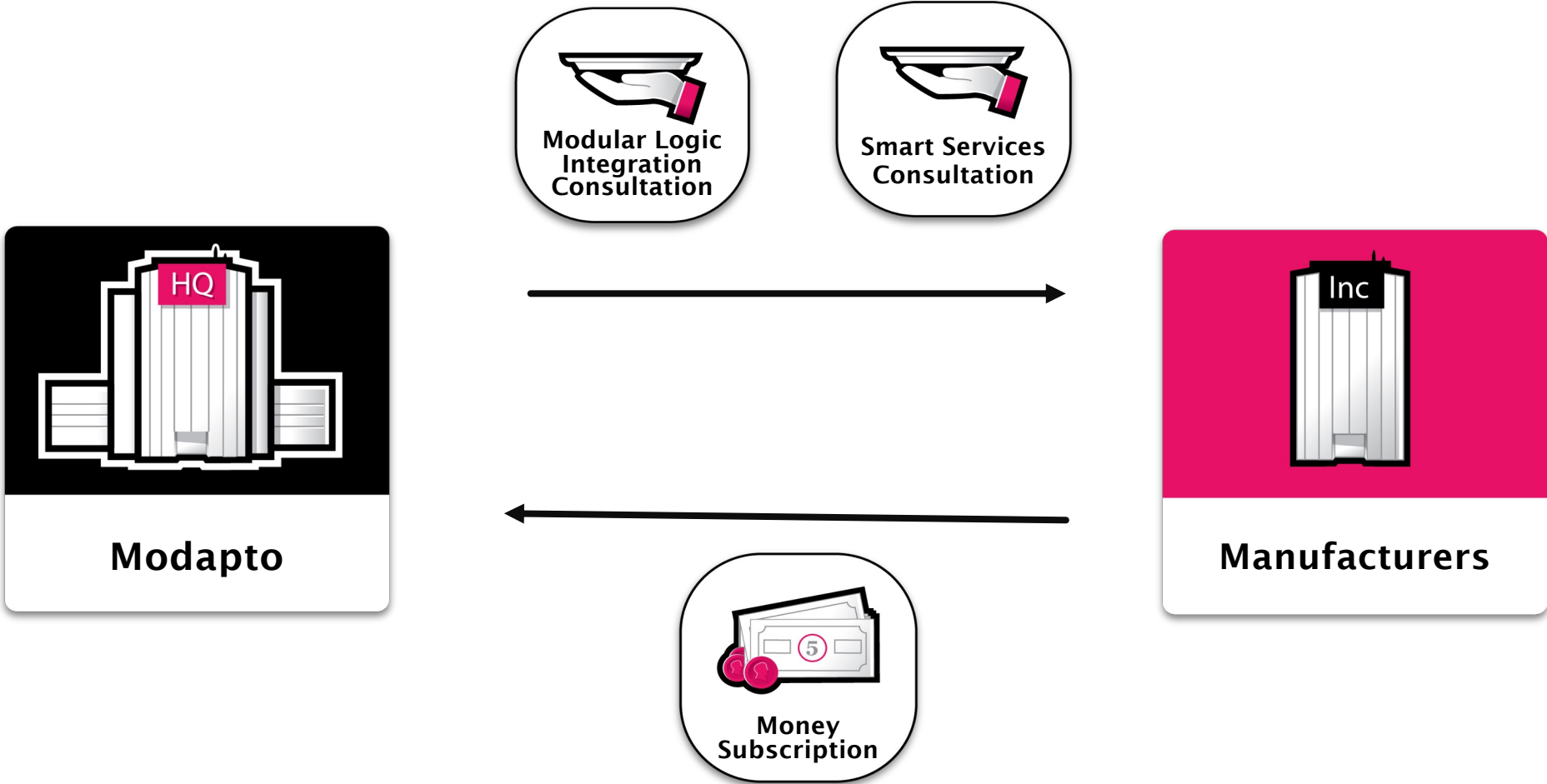
Microsoft Hilti Cisco



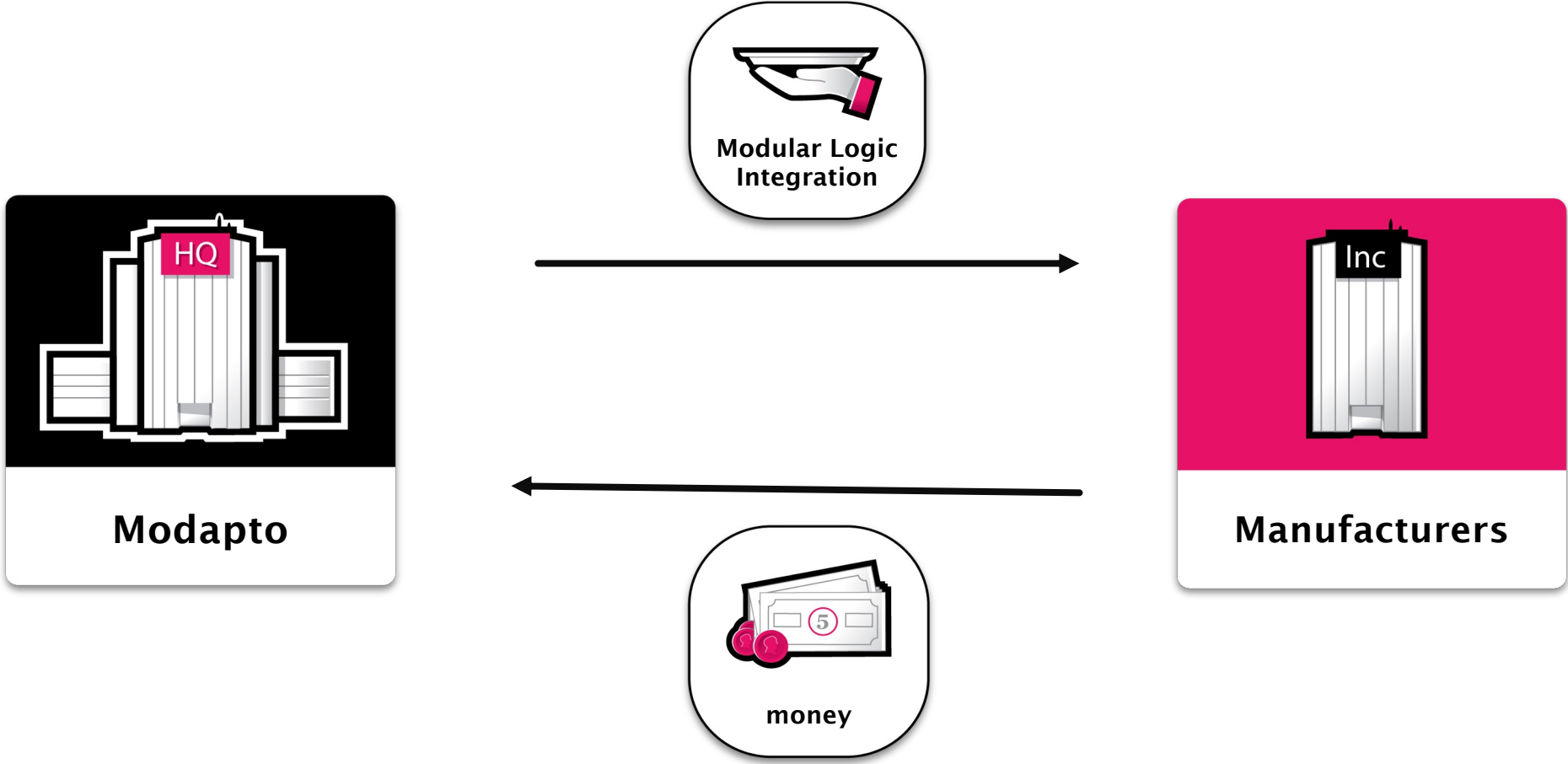
# Archetypes Identified as Modapto Applicable:

- 1. Solution Provider / Integrator:** Custom consulting and modularization strategies tailored to client factories. Seamless integration of production modules into a unified, platform-driven system. Further development needed to “tailor” to each new client. Outcome belongs to Modapto
- 2. Digitization:** MODAPTO KERs “decomposition” and on-demand / per-case offering. Offering of MODAPTO main and “Some” smart services (e.g., simulation, predictive maintenance) as per customers’ needs.
- 3. Performance-Based Contracting:** Potential to evolve into outcome-based offerings (e.g. productivity gains).
- 4. Open source:** Source code of a software product is not kept proprietary, but is freely accessible for anyone. Money is typically earned with services that are complimentary to the product, such as consulting and support.
- 5. *Modapto as an educational organization through the commercial exploitation of the (updated) training material***

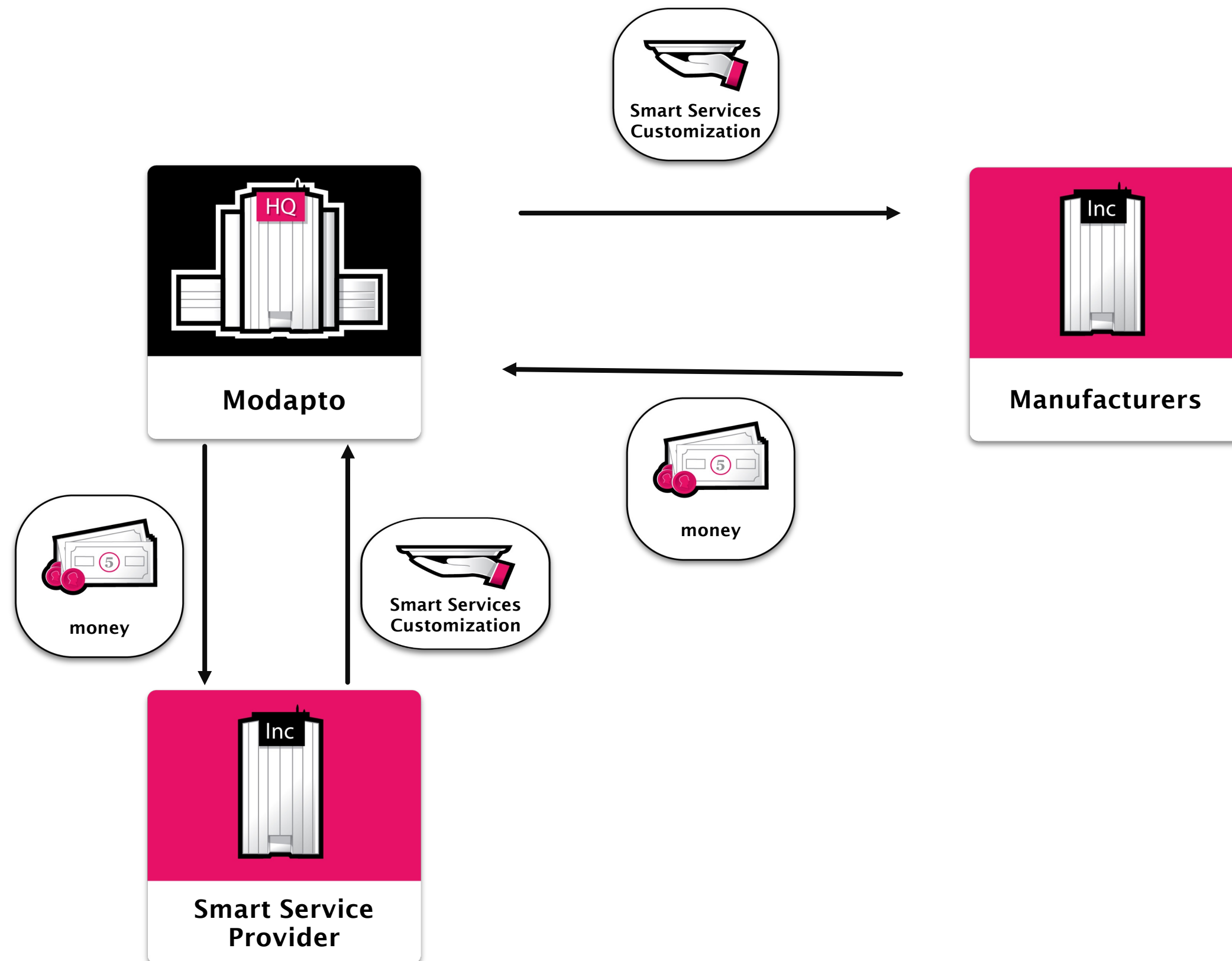
# The Consultant Business Model



# The Integrator Business Model



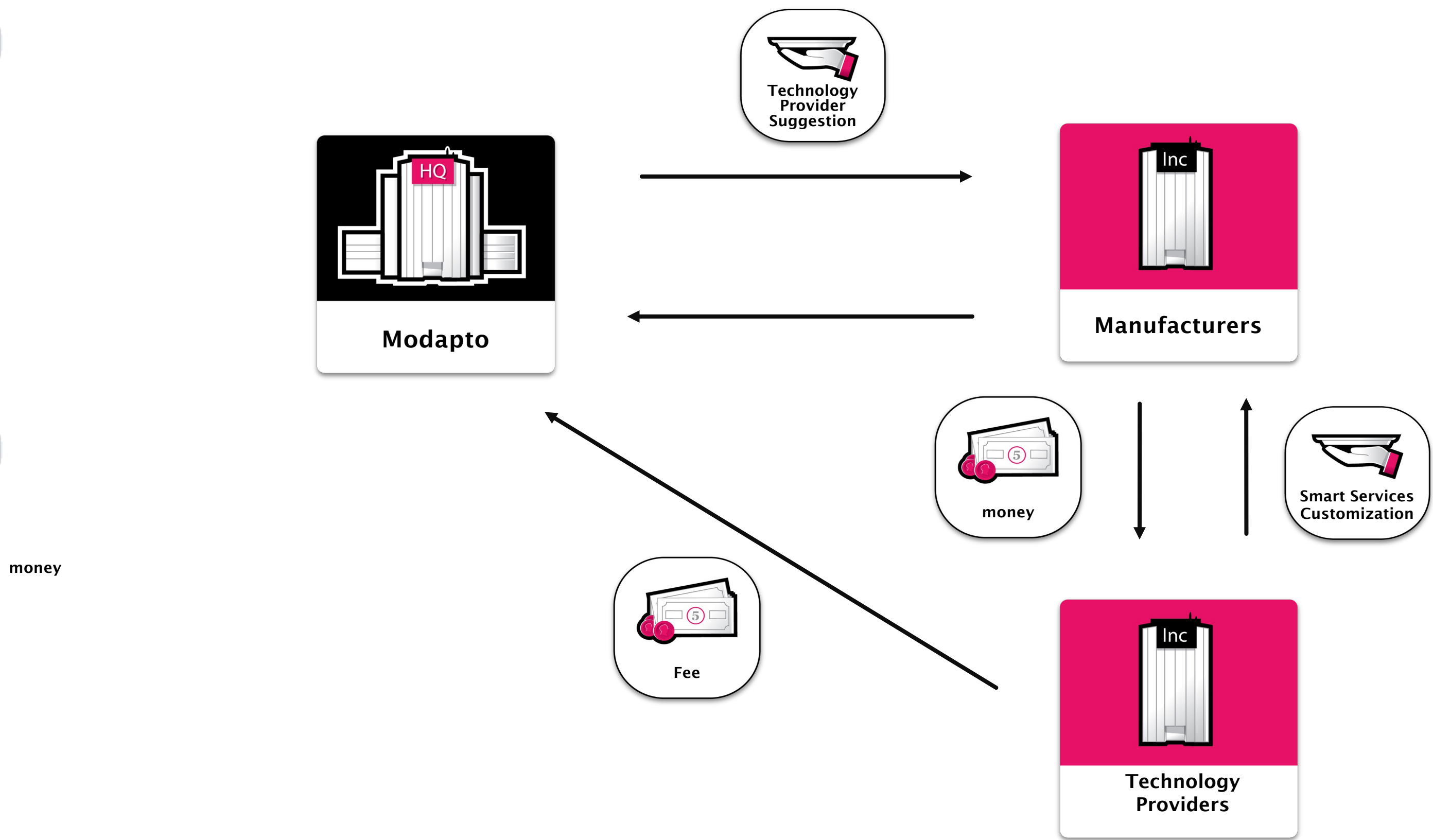
# The Smart Service Provider Business Model



## Smart Services:

- Optimization algorithms
- Digital simulation
- Analytics and Sustainability
- Monitoring 24/7
- Control
- Self-awareness & Predictive Maintenance
- Other

# The Open Source Business Model





# 14.6 References – Extra Reading Material



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# References

- ‘DigComp Framework - European Commission’. n.d. Accessed 25 November 2024. [https://joint-research-centre.ec.europa.eu/scientific-activities-z/education-and-training/digital-transformation-education/digital-competence-framework-citizens-digcomp/digcomp-framework\\_en](https://joint-research-centre.ec.europa.eu/scientific-activities-z/education-and-training/digital-transformation-education/digital-competence-framework-citizens-digcomp/digcomp-framework_en).
- Doukidis, G., Farmakis, T., Fraidaki, K., (2024). The digital readiness of small businesses at times of crisis: the case of COVID-19. In: Prastacos, G., Pouloudi, N. (eds), *Leading and Managing in the Digital Era*. LMDE 2023. Lecture Notes in Information Systems and Organisation, vol 69. Springer, Cham [10.1007/978-3-031-65782-5\\_7](https://doi.org/10.1007/978-3-031-65782-5_7)
- Doukidis, Georgios, Diomidis Spinellis, and Christof Ebert. 2020. ‘Digital Transformation - A Primer for Practitioners’. *IEEE Software* 37 (5): 13–21. <https://doi.org/10.1109/MS.2020.2999969>.
- Farmakis, Timoleon, Stavros Lounis, Ioannis Mourtos, and Georgios Doukidis. 2024. ‘Digital Twins as an Integral Part of Manufacturing Digital Transformation’. In *Leading and Managing in the Digital Era*, edited by Gregory Prastacos and Nancy Pouloudi, 173–87. Cham: Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-65782-5\\_12](https://doi.org/10.1007/978-3-031-65782-5_12).
- Farmakis, Timoleon, Stavros Lounis, Ioanna Sofia Georgoutsou, Anastasios Koukopoulos, and Ioannis Mourtos. 2024B. ‘Innovations in Manufacturing Business Models Enabled by Digital and AI-Driven Transformation: A Conceptual Framework’. In *2024 IEEE International Conference on Engineering, Technology, and Innovation (ICE/ITMC)*, 1–8. Funchal, Portugal: IEEE. <https://doi.org/10.1109/ICE/ITMC61926.2024.10794358>.
- Farmakis, Timoleon, Alexandri Eleni, and Georgios Doukidis. 2025. ‘Implementing Digital Transformation Through Robotic Process Automation’. In *Business in a Turbulent Era, Volume I: Organisations, Industries and Markets*, edited by Demetris Vrontis, Alkis Thrassou, Leonidas Efthymiou, Yaakov Weber, S. M. Riad Shams, and Evangelos Tsoukatos. Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-89798-6\\_2](https://doi.org/10.1007/978-3-031-89798-6_2).
- Farmakis, Timoleon, Georgios Papanikolaou, and Georgios Doukidis. 2025B. ‘The Role of Enterprise Resource Planning Systems in the Digital Transformation Journey of Businesses’. In *Information Systems*, edited by Marinos Themistocleous, Nikolaos Bakas, George Kokosalakis, and Maria Papadaki. Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-81325-2\\_10](https://doi.org/10.1007/978-3-031-81325-2_10).
- Farmakis, Timoleon, Stavros Lounis, Efstathios Plitsos, et al. 2025C. ‘Identifying the Value Proposition of Modular Manufacturing Information Systems for Digital Transformation’. In *Advanced Perspectives and Trends in Digital Transformation of Firms, Networks, and Society*, edited by Francesco Schiavone, Nessrine Omrani, and Heger Gabteni. Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-80692-6\\_36](https://doi.org/10.1007/978-3-031-80692-6_36).
- Farmakis, T., Doukidis, G., Pramataris, K., & Krasonikolakis, I. (2025D). Digital transformation, digital organisational culture and business model innovation: Evidence from trade, service, and manufacturing firms in Greece. *EuroMed Journal of Business*. <https://doi.org/10.1108/EMJB-06-2025-0220>
- Gong, Cheng, and Vincent Ribiere. 2021. ‘Developing a Unified Definition of Digital Transformation’. *Technovation* 102 (April):102217. <https://doi.org/10.1016/j.technovation.2020.102217>.
- Kraus, Sascha, Susanne Durst, João J. Ferreira, Pedro Veiga, Norbert Kailer, and Alexandra Weinmann. 2022. ‘Digital Transformation in Business and Management Research: An Overview of the Current Status Quo’. *International Journal of Information Management* 63 (April):102466. <https://doi.org/10.1016/j.ijinfomgt.2021.102466>.
- Kim, D.-Y., J.-W. Park, S. Baek, K.-B. Park, H.-R. Kim, J.-I. Park, H.-S. Kim, et al. 2020. ‘A Modular Factory Testbed for the Rapid Reconfiguration of Manufacturing Systems’. *Journal of Intelligent Manufacturing* 31 (3): 661–80. <https://doi.org/10.1007/s10845-019-01471-2>.
- Maddikunta, Praveen Kumar Reddy, Quoc-Viet Pham, Prabadevi B, N Deepa, Kapal Dev, Thippa Reddy Gadekallu, Rukhsana Ruby, and Madhusanka Liyanage. 2022. ‘Industry 5.0: A Survey on Enabling Technologies and Potential Applications’. *Journal of Industrial Information Integration* 26 (March):100257. <https://doi.org/10.1016/j.jii.2021.100257>.

# References

- Maganha, Isabela, Cristovão Silva, and Luís Miguel D. F. Ferreira. 2019. 'The Impact of Reconfigurability on the Operational Performance of Manufacturing Systems'. *Journal of Manufacturing Technology Management*, June. <https://doi.org/10.1108/JMTM-12-2018-0450>.
- Müller, Julian Marius, Oana Buliga, and Kai-Ingo Voigt. 2018. 'Fortune Favors the Prepared: How SMEs Approach Business Model Innovations in Industry 4.0'. *Technological Forecasting and Social Change* 132 (July):2–17. <https://doi.org/10.1016/j.techfore.2017.12.019>.
- Oludapo, Samson, Noel Carroll, and Markus Helfert. 2024. 'Why Do so Many Digital Transformations Fail? A Bibliometric Analysis and Future Research Agenda'. *Journal of Business Research* 174 (March):114528. <https://doi.org/10.1016/j.jbusres.2024.114528>.
- Plitsos, S., K. Giannakos, T. Farmakis, P. Eirinakis, T. Hohmann, O. Jotz, and G. Vivo. 2025. 'Enabling Production Re-Configurability through Digital Twins: A Case Study Approach'. *Journal of Intelligent Manufacturing*, April. <https://doi.org/10.1007/s10845-025-02611-7>.
- Silva, Rui P., Célia Saraiva, and Henrique S. Mamede. 2022. 'Assessment of Organizational Readiness for Digital Transformation in SMEs'. *Procedia Computer Science, International Conference on Industry Sciences and Computer Science Innovation*, 204 (January):362–69. <https://doi.org/10.1016/j.procs.2022.08.044>.
- TRISCHLER, MATTHIAS FABIAN GREGERSEN, and JASON LI-YING. 2022. 'EXPLORING THE RELATIONSHIP BETWEEN MULTI-DIMENSIONAL DIGITAL READINESS AND DIGITAL TRANSFORMATION OUTCOMES'. *International Journal of Innovation Management*, August. <https://doi.org/10.1142/S136391962240014X>.
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Qi Dong, J., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889–901. <https://doi.org/10.1016/j.jbusres.2019.09.022>
- Vial, G., 2019. Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, SI: Review issue 28, 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>
- Warner, Karl S. R., and Maximilian Wäger. 2019. 'Building Dynamic Capabilities for Digital Transformation: An Ongoing Process of Strategic Renewal'. *Long Range Planning* 52 (3): 326–49. <https://doi.org/10.1016/j.lrp.2018.12.001>.