Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Strategic Technology Roadmap for Veolia: Advancing Innovation for Sustainable Resource Management

Sohail Nawaz Sabir[1]

University of Roehampton London UK, Roehampton Ln, London SW15 5PH, United Kingdom1

[1]sohailnawazsabir@gmail.com; https://orcid.org/0009-0001-4565-3887

ARTICLE INFO

Received: 12 Nov 2024

Revised: 24 Dec 2024

Accepted: 20 Jan 2025

ABSTRACT

Firms experience issues like high costs of implementation, threats of cyber-security, and concerns of data privacy, and change resistance that block the triumphant exploitation of novel technologies. Additionally, the quick pace of evolution of technology makes it harder for firms to forecast budding trends and implement accordingly. Without a complete roadmap, firms risk financing in outdated or mismatched technologies, resulting to monetary losses and disruptions of operations. In this study, different theories are used like open innovation theory and resource-based view. In this study, the qualitative research method is used along with case study method. The data is taken from reports, articles, and research papers. The findings show that the leadership of Veolia must emphasis on its efforts on the inclusion of senior leadership in the procedure of change. Apart from this, the firm must emphasis on commencing incremental change. Apart from scanning of environment of technology, it was found that Veolia requires to raise its funds in technology of IoT and Big Data.

Keywords: Leadership; Information Technology; Big Data; Internet of Things (IoT); Cloud Computing

INTRODUCTION

Technological advancements have changed industries by helping mechanization, increasing efficiency, and promoting innovation. Firms across different sectors considering depend on key technologies like blockchain, artificial intelligence (AI), cloud computing, and the Internet of Things (IoT) to increase operations and attain a competitive edge. But, the assimilation of these innovations needs strategic planning to make sure alignment with the objectives of business, risk minimisation, and scalability. A roadmap of technology considers as an organised framework that assesses how a firm plans to implement, deploy, and develop key technologies while expecting probable risks (Chakraborty et al. 2022). By considering trends of technology, main milestones, and investment priorities, a well-described roadmap assists firms steer complicated digital transformations, making sure sustainability and success of long-term.

Apart from the raising dependence on technology, different firms find it harder with the strategic implementation and adoption of innovative solutions. A lack of organised roadmap of technology tends to lead to misaligned investments in technology, inefficiencies, and vulnerabilities of security (Beuchelt, 2025). Firms experience issues like high costs of implementation, threats of cyber-security, and concerns of data privacy, and change resistance that block the triumphant exploitation of novel technologies. Additionally, the quick pace of evolution of technology makes it harder for firms to forecast budding trends and implement accordingly. Without a complete roadmap, firms risk financing

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

in outdated or mismatched technologies, resulting to monetary losses and disruptions of operations (Gomber et al. 2018). Moreover, there is a big need for a well-structured roadmap of technology that not only assesses adoption of technology, however also finds out main threats and offers strategies for their reduction. Assessing this problem will assist firms increase the advantages of innovation of technology, while diminishing possible threats and doubts.

This project assesses the roadmap of technology for Veolia. The roadmap of technology makes sure assessing environment of technology for the introduction of information technologies (IT). The firms like Veolia include the needs of the citizens and they continuously renew the information of the business so that they can form novel items. Apart from this, to accomplish competitive advantage and minimise the costs, it is essential to make novel solutions on continuous basis. Though, Veolia has a robust culture of IT and innovation is an essential element of innovation of Veolia and it is important to scan the international countryside for developing technologies of the internet. The vision of Veolia is to offer different innovative solutions of wastewater and raise the efficiency of resource can be witnessed in the investment of the company in programs of R&D. But, the R&D investment and open innovation alone is not adequate for the adequate implementation of the ICT. Recruiting employees with different set of skills is a way to produce innovation in prospect. Also, the technologies introduced must be aligned with the aim of the firm. The goal of practice of road plotting is to assess technology and business, the roadmap of technology emphasizes on milestones, goals, and blockages to the technology, timelines, and action items

Organisation Overview: Veolia Water

The company selected for the existing project is Veolia Water Technologies. The strategic placement of the company focuses highly on the amalgamated know-how of group of Veolia and its pioneering abilities in the domain of water, energy, and waste. This assists the firm to enhance the possessions while making valuable by reducing the costs. Veolia has broad variety of technologies of water comprising sludge energy treatment, online diagnostic solutions, crystallization and evaporation, mobile water services, and state-of-the-art purification (Veolia, 2016). Veolia is the international leader in reusing and conserving accessible resources, comprising water (Veolia-Water, 2016). The firm has more than 130 units of business throughout the world covering Africa, Europe, Asia, and Middle East markets.

Global Landscape

To resolve the problems of water, Veolia requires to assess the international landscape and increase the process of global warming is producing scarcity of water. Additionally, the increasing benchmarks of living and a raise among people of urban might lead to more waste and pollution and resource depletion creating more heaviness on water resources (Nogrette, 2017). The probability for circular ecnomy (CE) is raspingly being realized particularly in water. More than 98% of wastewater is accessible across the world that can be mobilized and reused to locations where there is scarcity of water. The ratio of investment into the CE services and items can be a competitive advantage source for firms like Veolia (Nogrette, 2017).

Competitive Position

Veolia is operational in KSA for greater than three decades and since 2008 is giving services to around 6 million people in Riyadh. At the level of region, main services are projects of desalination and advocacy to different clients of industries in the gas, oil, and mining industries to minimise the footprints of carbon (Veolia-Water, 2016). In 2015, Veolia Water of share price raised by 50%. Veolia is financing heavily and has coordinated with specialists of IT IBM to make solutions that are environmental friendly for resolving the energy and water problems (Global-Water-Awards, 2016). But, innovation does not consider that a firm makes novel items. It also means that the firm has capability

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

to enhance the efficiency of resources by enhancing the processes. Greater quality of products and services can be accomplished by innovation of process (Sawhney et al., 2006).

LITERATURE REVIEW

Innovative Capacity in Innovation

A firm's capability to utilize and implement innovation is impacted by its culture. The firm like Apple, Amazon, Facebook, and Google not only use highly creative and brilliant minds, however they make a society where the employees' creativity are unchecked, states Nidumolu*et al.*, (2009). To revolutionize, firms require technology, comprising IT, and employees have to be ready to implement the change and technology in the similar essence as the leaders have acknowledged. A firm goes on from affecting IT to make a culture of IT in which innovation flourishes mentions Leidner and Kayworth (2006). It is essential to assess the weaknesses and strengths of the corporate culture to be brought regarding change and innovation.

Cultural Readiness

Based on Rao and Weintraub (2013), they advocate six blocks of building comprising (i) resources, (ii) measuring success, (iii) processes, (iv) values, (v) behaviours and (vi) climate to examine the innovation of cultural readiness. Since values influence behaviours they influence the climate through collaboration that afterwards influence the way success is measured and described in the firms. As a result, it is important to assess all these factors animatedly, mentions Rao and Weintraub (2013). According to model of six-building block, the firm is socially prepared for innovation. Additionally, Martins and Terblanche (2003) found elements of culture of organisation comprising organizational structure, strategy, open communication, support mechanisms, and innovation hpromoting behaviour.

Employee Readiness

The readiness of change is assessed in employees in the manner that they share their notions and coordinate with the firm to produce the process of innovation by being component of program of research of the firm. The readiness of change of the personal employees has raised because of ongoing efforts of Veolia to be a leader in the items of CE. Additionally, the attitude of managers and senior leaders advocate that firm has formed an innovation culture, where notions are pitched and shared by employees at all types of levels (Veolia, 2017).

Strength and Weakness of Company's Culture

Veolia has financed in the development of professional and training growth of the workplace. The firm not only finances in strategy and other types of procedures, however also assists the ehmployees' competence by giving them a single session of training. Around 84% of the operators and technicians have obtained preparation in technology. The training program of Veolia are well-developed to the requirements of employees and to maintain ecological innovation (Veolia, 2017). The efforts ofVeolia to form a culture of IT by financing in IT are important to its success.

Table 1: Corporate Culture of Veolia

Strengths	Weaknesses
Training	Lack of skills of Diversity
Professional Development	Lack of workforce of Diversity
Investment in IT	

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Theoretical Framework

Veolia must bring into line its strategic roadmap of technology with sustainable innovation to assess key challenges of environment. A well-developed roadmap must include key technologies, CE doctrines, and digital transformation to increase water, waste, and management of energy. Considering the Resource-Based View (RBV) and Open Innovation theories, Veolia can assess capabilities of technology to maintain a competitive advantage while promoting collaborative innovation (Martins & Terblanche, 2003).

The RBV theory advocates that companies attain long-term competitive benefit by creating valuable, unique, and inimitable resources, comprising technological assets. For Veolia, financing in AI, IoT, and big data analytics increases efficiency of operations in treatment of waste, water purification, and energy increase. The predictive analytics and smart sensors help actual monitoring of use of resource, enhancing decision-making and minimising impact of environment (Leidner &Kayworth, 2006). For example, AI-based automation in desalination of process of water assists to reduce consumption of energy, while raising efficiency, making sure sustainable management of water. On the contrary, open Innovation theory advocates roadmap of Veolia by focusing on the collaboration with different stakeholders, comprising research institutions, policymakers, and startups. By associating in co-development initiatives, Veolia can increase advancements of technology in different sustainable management of resources (Herlihy, 2010). The collaborations with the companies of technology help to access to breakthrough innovations like tracking of blockchain-based waste that increases transparency in recycling of supply chains. Moreover, collaborative research in bioengineering can result to enhanced treatment of wastewater solutions, minimising pollution and encouraging a CE.

The process of digital transformation of services of Veolia is another main element of its strategic roadmap. The technologies of Industry 4.0 comprising robotics and cloud computing, increase efficiency and automation in waste treatment and collection (Wilson &Doz, 2012). The solutions of smart grid for management of energy, considering by algorithms of machine learning, assist to increase distribution of energy and minimise emissions of carbon. This enhancement assesses with the Triple Bottom Line (TBL) model, which assesses environmental, economic, and social sustainability, remediating commitment of Veolia to responsible practices of business (Park et al. 2011). Additionally, implementing sustainability-based business models like the Product-Service System (PSS) permits Veolia to provide recovery of resource as a service, instead of single time solution. For instance, changing waste into bio-fuel with the models of CE makes sure long-term sustainability, while producing monetary value. Strategic position with policies of government and United Nations Sustainable Development Goals (SDGs) further promotes leadership of Veolia in sustainable novelty.

METHODOLOGY

Research Philosophy

Interpretivism research philosophy is well-developed for assessing strategic technology roadmap of Veolia because it focuses on assessing the social contexts and subjective meanings impacting innovation in sustainable management of resource (Hastie & Hay, 2012). This philosophy assesses that technological enhancements are developed by different stakeholders comprising engineers, policymakers, and environmentalists, whose interactions and perceptions impact the process of decision-making. By using qualitative methods like case studies, interpretivism permits authors to assess nuanced insights into how Veolia assessesrising technologies to increaseresource sustainability and efficiency. It assesses the complications of roadmaps of technology, wherethe process of innovations is not completely technical, however also socio-economically based. With the help of this philosophy, the author can assess how Veolia assesses its strategies of technology with regulatory

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

frameworks, goals of corporate sustainability, and increasingissues of environment (Drury et al. 2011). By emphasising on the prejudiced experiences of stakeholders, interpretivism offers a key assessment of the process of decision-making and its linked challenges in creating a strategic roadmap for sustainable innovation.

Research Approach

An inductive research approach is important for this research because it is based on theories from empirical data and observed patterns instead of testing predefined hypotheses (Hastie & Hay, 2012). By examining case studies, the authors can find how Veolia forms innovative technologies for the sustainable management of resources. This approach helps in the process of discovery of key strategies, influences of stakeholders, and the best practices that assess the technological advancements of Veolia. With the help of iterative collection and analysis of data, inductive research expose novel insights into how the goals of sustainability develop innovation roadmap of Veolia, promoting a more profound assessment of its adaptive strategies in an increasing regulatory and environmental landscape.

Research Method

In this study, the qualitative research method is used. This research assesses the context-based and complex factors impacting innovation in sustainable management of resource. The qualitative research assesses the perspectives of stakeholder, industry challenges, and organizational strategies. This method permits authors to assess how Veolia assesses main technologies, sustainability goals, and regulatory requirements into its roadmap (Smythe, 2012). By emphasising on in-depth insights instead of numerical data, qualitative research offers a robust perspective of processes of decision-making, environmental impacts, and technological adoption providing key knowledge for enhancing innovation in sustainable management of resource.

Data Collection Method

The secondary data collection method is important for examining the study because it assesses current information to enhance innovation in sustainable management of resource. By assessing industry reports, academic research, corporate sustainability reports, and regulatory documents, author can find challenges, trends, and the best practise developing technological enhancements of Veolia. This method offers time-efficient and cost-effective way to examine past data, standardized strategies, and examine the effect of emerging technologies. Secondary data helps a robust assessment of how Veolia assesses its roadmap of innovation with policies of environment, demands of market, and goals of sustainability providing insights for prospective strategic growth (Smythe, 2012).

Search Terms and Databases

Effective databases and search terms are important for studying this research. The related search terms are used that include “sustainable resource management technologies,” “Veolia innovation strategy,” “environmental sustainability solutions,” “strategic technology roadmap”. The main databases like Web of Science, ScienceDirect, Google Scholar, and Scopus offer accessibility to offer accessibility to articles that are based on peer-reviewed journals, case studies, and reports. Moreover, the corporate reports and documents of Veolia from databases like UN Environment Programme resources and OECD iLibrary provide key insights. Using particular databases and keywords ensures relevant and comprehensive information for examining innovation strategies of Veolia.

Data Analysis

A case study approach to the data analysis is appropriate for assessing Veolia and it offers deep insights into actual implementation of sustainable management of resource of innovations (Hollstein, 2011). By examining particular corporate strategies, projects, and industry coordination, the author ca assess how Veolia assesses emerging technologies to increase sustainability. This approach helps a

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

comprehensive assessment of successes, challenges, and stakeholder impacts, providing a holistic assessment of strategic decision-making of Veolia. With the help of qualitative analysis of interviews, reports, and performance metrics, case studies show patterns and the best practices, adding key knowledge for humanizing roadmaps of technology in resource management and environmental sustainability (Vromen, 2010).

FINDINGS AND DISCUSSION

Connecting People, Operations, Products/Services, and IT for Growth and Competitive Advantage

In the modern business environment, information technology has become integral, making it crucial to continuously monitor technological advancements for opportunities to upgrade. Any technological failure can significantly impact a company, potentially leading to revenue loss and damage to its reputation. For IT professionals, staying current by updating software and exploring emerging technologies is vital. As Tapscott (2010) mentions, technology should serve the company, not the other way around.

From an IT perspective, I am particularly interested in exploring the limitless potential of the Internet of Things (IoT), which can assist Veolia in fostering innovation and capturing the CE market within the water and wastewater sectors. IoT refers to the interconnection of physical devices via the Internet, allowing anything, from cars to watches, to be networked. The interconnectedness of these devices facilitates the development of intelligent, automated systems, such as smart grids, making IoT an increasingly essential technology (Oracle, 2014). Moreover, as Tapscott (2010) notes, the volume of data generated over the years has grown exponentially—what once took years to generate now accumulates every 12 hours. To derive valuable insights from this immense amount of data, advanced analytics tools are necessary. Big data revolves around employing data analysis techniques to extract actionable insights from raw data, regardless of its size. The rate at which information is produced continues to surge, originating from various sources, such as social media platforms and smartphones. As the cost of analytics continues to decrease while its value increases, now is an opportune moment for Veolia to invest in big data, enabling the company to enhance its products and services through more refined data (Bughin et al., 2013).

By collecting data from a diverse range of interconnected devices, Veolia can fuel innovation and add value to its business. This approach will allow the company to maintain a competitive edge in the water and wastewater technologies sector. IoT, as an innovative technology, can help reduce costs by improving operational efficiency. Through the use of smart devices, Veolia can automate daily operations, freeing up human resources for more advanced research and development (Oracle, 2014). The company has already made strides in adopting IoT, notably with its introduction of Vigileo, a smart water box utilizing cutting-edge digital technology, including sensors, IoT integration, and data security. This initiative was developed in collaboration with IBM. As Veolia's CEO, Antoine Frérot, asserts, "This technology is crucial and represents the most important tool for the future of water services" (Veolia, 2016). Veolia has committed to saving 33 million liters of water daily in France, a monumental task. The company has invested in big data and smart technologies to achieve this goal. With the growing prevalence of smart cities, which generate vast amounts of data and connect numerous devices, the future is undoubtedly moving towards this technological transformation. Veolia is proactively investing to make this vision a reality (Veolia, 2015).

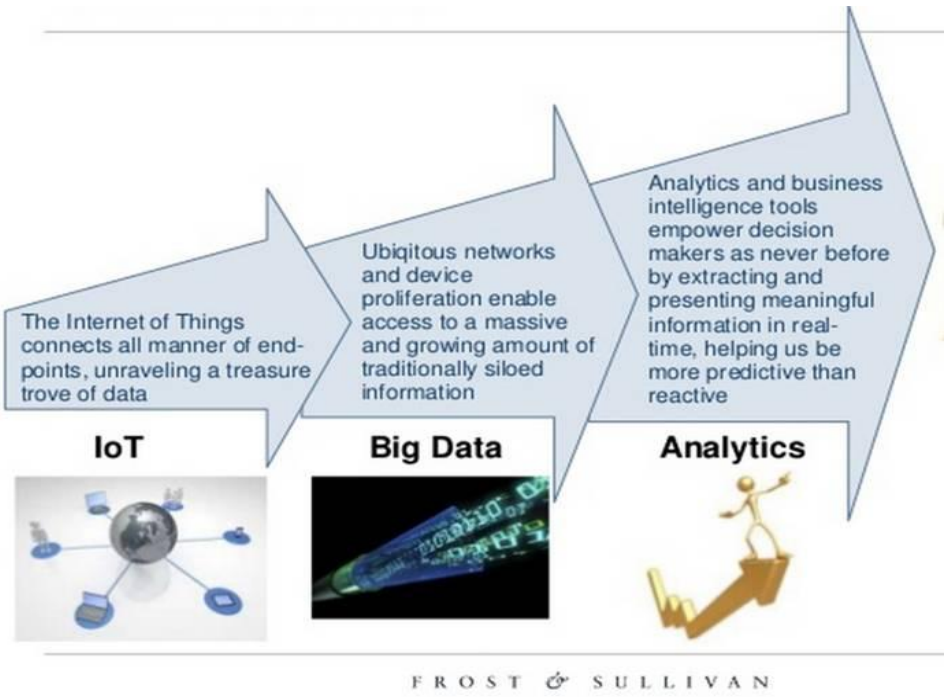
Big data introduces novel data types that surpass the capabilities of traditional RDBMS. In addition to this, new storage techniques and analytical methods are being applied within the IT landscape. Beyond helping businesses uncover insights and trends from massive data volumes, big data plays a crucial role

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

in standardizing decision-making by quantifying information. It can also complement traditional data sources and business intelligence tools used by organizations. Thus, the process of discovering new insights through available data is itself an innovative practice. Moreover, big data supports advanced analytics such as data mining, predictive analytics, and text mining, enhancing capabilities like financial forecasting and what-if analysis. Additionally, big data aids IoT technology by making sense of the vast information generated from IoT devices (Oracle, 2013).

Fig 1: Internet of Things (IoT): The Third Wave.



Source: Banafa (2015), *Internet of Things (IoT): The Third Wave*.

Potential Benefits

Veolia can exploit IoT technology to invent new commodities and services across its diverse industries, such as sewage treatment and power. The organization has consistently been a pioneer in reducing environmental impacts, and IoT can assist in attaining environmental efficiency while overseeing machinery. Real-time information from IoT can likewise contribute to cutting operational expenditures and enhancing consumer value. By examining patterns and collecting intelligence from various outlets, including social media and forums, Veolia can provide superior service quality (Oracle, 2014). As Veolia's head, Antoine Frérot, asserts, combining their knowledge with IBM's analytics-driven wisdom enables the organization to develop more effective consumer solutions (Veolia, 2014).

Large-scale data not only delivers significant consumer perspectives but also facilitates the mechanization of elementary and sophisticated operations, decreasing expenses. By optimizing data accumulation techniques, Veolia can discern patterns, detect movements, and forecast based on the gathered information (Oracle, 2014).

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Fig 2: S-E-N-S-E Module

S-E-N-S-E	What the Internet of Things does	How it differs from the Internet
Sensing	Leverages sensors attached to things (e.g. temperature, pressure, acceleration)	More data is generated by things with sensors than by people
Efficient	Adds intelligence to manual processes (e.g. reduce power usage on hot days)	Extends the Internet's productivity gains to things, not just people
Networked	Connects objects to the network (e.g. thermostats, cars, watches)	Some of the intelligence shifts from the cloud to the network's edge ("fog" computing)
Specialized	Customizes technology and process to specific verticals (e.g. healthcare, retail, oil)	Unlike the broad horizontal reach of PCs and smartphones, the IoT is very fragmented
Everywhere	Deployed pervasively (e.g. on the human body, in cars, homes, cities, factories)	Ubiquitous presence, resulting in an order of magnitude more devices and even greater security concerns

Source: Banafa (2015), *Internet of Things (IoT): The Third Wave*.

Adoption Experiences

Numerous organizations embrace new technologies as an essential competitive strategy, often without conducting an in-depth cost-benefit assessment (O'Callaghan, 2005). Thoughtfully integrating innovative technologies is crucial for unlocking their full potential (Swanson &Ramiller, 2004). The Internet of Things (IoT) has already gained widespread adoption, with firms like FedEx utilizing the 'Sense Aware' system to monitor variables like temperature, light, and humidity in packages, particularly for delicate items such as electronics or biological materials. In a similar vein, electric utility firms implement smart grids to oversee repair activities in electrical networks. Veolia can leverage these intelligent devices to track products and services (Bughin et al., 2013). Numerous utility companies are also utilizing smart meters, enabling consumers to better manage their energy usage (Oracle, 2014).Big data is revolutionizing operations across various sectors. Whether in the automotive or financial industries, organizations are employing analytical tools to process large volumes of data, converting it into a more manageable form to uncover patterns that may influence products and competitive positioning (Bughin et al., 2013).

For successful IoT deployment, organizations must ensure robust data security, data normalization for better interoperability, and a strong analytics infrastructure. While the costs associated with IoT implementation are significant, the benefits depend on the technology's acceptance and proper use (Sheppard, 2016). Integration of IoT with IT systems and applications across platforms like ERP and CRM is essential for maximizing its impact (Oracle, 2014). Similarly, big data can only deliver the desired outcomes if organizations address its technological complexities, including data visualization, wireless communications, and cloud infrastructure—each of which involves considerable investment (Bughin et al., 2013).

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

To achieve strategic goals, companies often create business strategies. However, these strategies may fall short when it comes to addressing innovation and technology. A technology roadmap is necessary for effectively guiding technological adoption and identifying potential risks associated with new innovations. Such roadmaps illustrate the relationship between technologies and products over time, helping companies to plan for the future (Rinne, 2004).

The technological roadmap's objective is to lay out concrete steps for incorporating cutting-edge IT systems like the Internet of Things and big data. Veolia has already explored the possibility of using robots and artificial intelligence into its production procedures. According to Veolia (2016), the company understands the value of smart utility meters and other cutting-edge solutions. In current times when we should be taking stock of these technologies as a whole, identifying the potential dangers of adoption, and moving forward with strategic innovation. Veolia can successfully adopt big data analytics and IoT technologies by establishing defined goals, deadlines, and overcoming challenges to technology implementation. To guarantee customer happiness and improve service quality, the organisation must invest in its IT infrastructure, data security, and information management (ITS, 2012).

In response to rapid technological change, organizations must continuously adapt their internal and external competencies (Teece et al., 1997). IT, being pervasive and increasingly affordable, has become a driving force for process innovation across industries. While IT can automate routine tasks, it is the integration of innovative technologies that fosters process improvement and innovation (Davenport, 1993).Veolia should focus on process innovation by redesigning key operations using available resources and innovative IT. The company's core functions, such as information management, R&D, HR, financial management, marketing, and customer relationship management, are prime candidates for process optimization.

Proposed Implementation Strategy

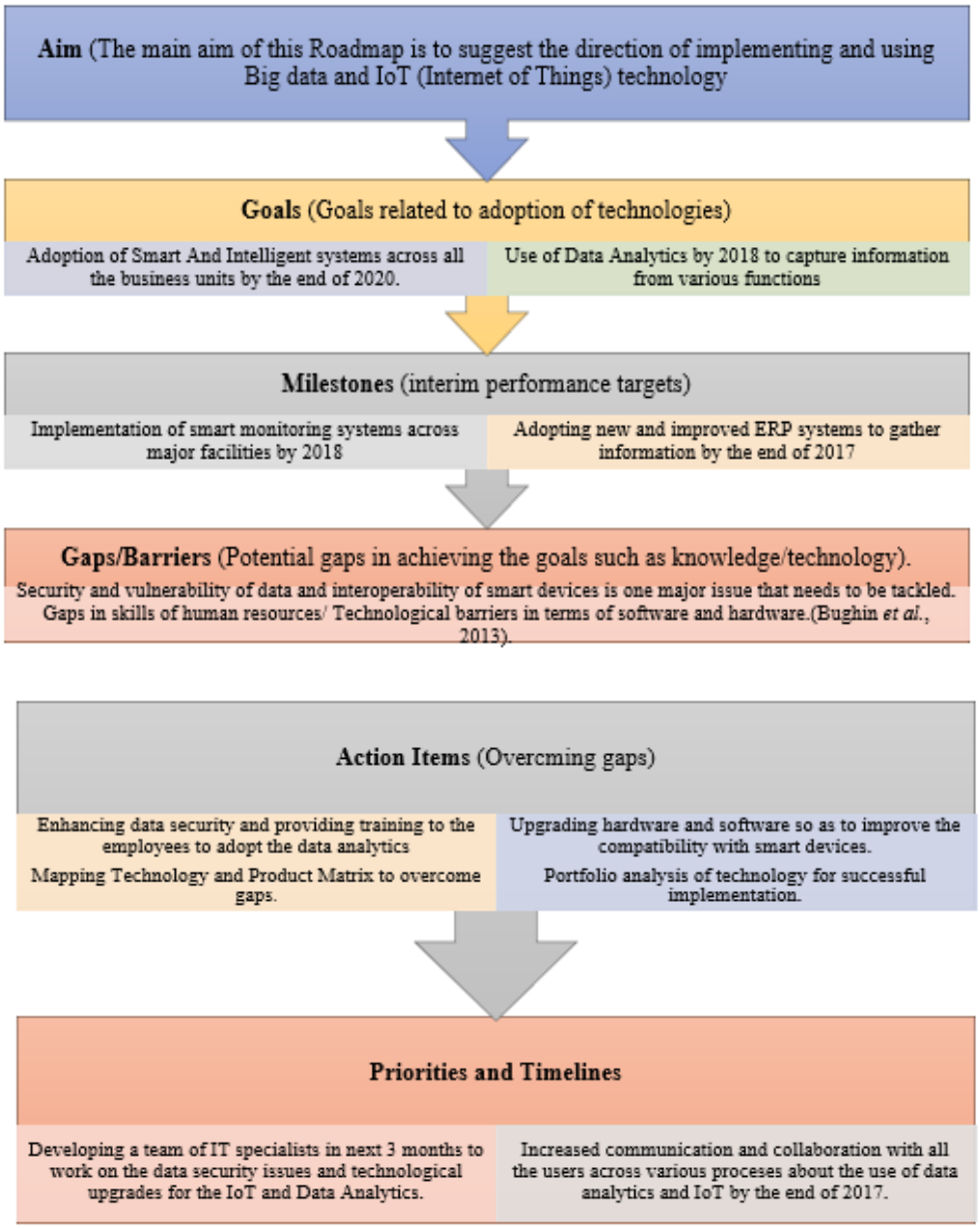
Achieving a balance between technological resources and organizational goals requires seamless communication and integration between business and technological functions. To maximize the benefits of innovative technologies, organizations must learn how to identify, acquire, and protect new technologies. While many companies lack formal technology management processes, those that incorporate them into their business practices see significant advantages (Phaal et al., 2004). Veolia can reduce operational gaps and improve product and service quality by fostering collaboration across departments. The ultimate aim of process innovation is to reduce costs and time while enhancing flexibility, quality, and service levels (Davenport, 1993).

Effective communication and team collaboration are crucial to the success of technology implementation. The goal of technology adoption should be to enhance the user experience rather than just adding features (Sawhney, 2009). Ultimately, the success of adopting radically new technologies depends on careful risk assessment and management.

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Fig. 5.1: Technological Roadmap



CONCLUSION

Innovation is crucial for organizational growth, but identifying the right technological advancements and aligning them with operational processes is even more vital. With both the long-term interests of the organization and its customers in mind, Veolia must continue innovating while balancing both marketing and technological perspectives, locally and globally. However, the company's leadership should emphasize involving senior management in the change process. Additionally, introducing incremental changes should be a focus for the company.

Journal of Information Systems Engineering and Management
2025, 10(4)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Veolia must increase its investments in Big Data and the Internet of Things (IoT) after analysing the current state of technology. Data security and seamless interaction with existing IT systems and apps are of the utmost importance for the effective use of these technologies. Users must be prepared to accept these new technologies, because of the high expenses. It is critical to set clear goals, identify gaps, and handle adoption hurdles to guarantee the effective distribution of these technologies at all levels. The key to overcome these obstacles will be to define and prioritise particular actions.

Practical Implications

A strategic roadmap of technology for Veolia increases sustainable management of resource by assessing digital solutions, AI-based analytics, and IoT to increase water, energy, and waste operations. Applying systems of smart monitoring enhances efficiency, minimizes waste, and improves regulatory compliance. The models of CE encourage recovery of resource, while blockchain makes sure there is transparency in the process of supply chains. Financing in green technologies like renewable energy integration and advanced filtration, advocates goals of carbon neutrality. These types of innovations help the process of cost savings, improved service delivery, and operational resilience, reinforcing the leadership of Veolia in environmental solutions while promoting coordination with industries, municipalities, and stakeholders for sustainable future.

Future Research Areas

Future research must assess AI-powered predictive protection for efficiency and longevity of infrastructure. The enhancements in bio-focused purification methods of water and nanotechnology for treatment of waste can revolutionize recovery of resource. The study on decentralized grids of energy assessing battery storage of hydrogen assesses with goals of carbon neutrality. Improving machine learning for actual monitoring of environment can enhance regulatory compliance and responses of crises. Moreover, assessing policy-based frameworks for digital-twin technology in the process of urban planning can increase allocation of resources. Collaborative researches on shifts of consumer behavior towards sustainability will help in making different adaptive strategies, making sure Veolia is at the forefront of responsible and innovative management of resources.

REFERENCES

[1] Adams, R., Bessant, J. & Phelps, R. (2006) Innovation management measurement: A review. *International Journal of Management Review,* 8(1), p. 21– 47.

[2] Archard, A. (2009) *Use IT for Innovation,* [Video, Online], SkillSoft.

[3] Banafa, A. (2015) *Internet of Things (IoT): The Third Wave*. [Online] Available at: https://www.bbvaopenmind.com/en/internet-of-things-iot-the-third-wave/ [Accessed March 2017].

[4] Beuchelt, G. (2025). Information Technology Security Management. In *Computer and Information Security Handbook* (pp. 475-508). Morgan Kaufmann.

[5] Brands, R. F. (2015) *The Key to Successful Innovation Is Proper Implementation*. [Online] Available at: http://chiefexecutive.net/the-key-to-successful-innovation-is-proper-implementation/[Accessed February 2017].

[6] Bughin, J., Chui, M. & Manyika, J. (2013) Ten IT-enabled business trends for the decade ahead. *Mickensey Quarterly,* Issue: May.

[7] Burkus, D. (2013) *10 Practices from the Most Innovative Organizations*. [Online] Available at: http://www.creativitypost.com/business/10_practices_from_the_most_innovative_organizations[Accessed February 2017].

[8] Carroll, J. (2010) *Balancing Security with Convenience,* [Video, Online], Skillsoft.

[9] Chakraborty, S., Nijssen, E. J., & Valkenburg, R. (2022). A systematic review of industry-level applications of technology roadmapping: Evaluation and design propositions for roadmapping practitioners. *Technological Forecasting and Social Change*, *179*, 121141.

[10] da Cunha, J. V. & Orlikowski, W. J. (2008) Performing Catharsis: The Use of Online Discussion Forums in Organizational Change. *Information and Organization,* 18 (2), pp. 132-156.

[11] Damanpour, F. & Wischnevsky, J. D. (2006) Research on Innovation in Organizations: Distinguishing Innovation-Generating from Innovation-Adopting Organizations. *Journal of Engineering and Technology Management,* 23(4), pp. 269-291.

[12] Davenport, T. H. (1993) *Process Innovation: Reengineering Work Through Information Technology*. Harvard Business Press.

[13] Director-Magazine. (2014) *Veolia UK executive vice president Estelle Brachlianoff on new revenue streams*. [Online] Available at: http://www.director.co.uk/10043-interview-veolia-estelle-brachlianoff/ [Accessed February 2017].

[14] Drury, R., Homewood, K., & Randall, S. (2011). Less is more: the potential of qualitative approaches in conservation research. *Animal conservation*, *14*(1), 18-24.

[15] Flaherty, T., Schwieters, N. & Jennings, S. (2017) *2017 Power and Utilities Trends*. PwC.

[16] Garcia, R. & Calantone, R. (2002) A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management,* 19(2), pp. 110-132.

[17] Global-Water-Awards. (2016) *Water Company of the Year*. [Online] Available at: http://www.globalwaterawards.com/2016-shortlist#WaterCompanyOfTheYear [Accessed February 2017].

[18] Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of management information systems*, *35*(1), 220-265.

[19] Govindarajan, V., & Trimble, C. (2010) Why Apple Beats Microsoft At Change Management. *Forbes*, 8 September, 2010.

[20] Gressgard, L. J., Amundsen, O., Aasen, T. M. & Hansen, K. (2014) Use of information and communication technology to support employee-driven innovation in organizations: a knowledge management perspective. *Journal of Knowledge Management,* 18(4), pp. 633 - 650.

[21] Groenveld, P. (2007) Roadmapping Integrates Business and Technology. *Research Technology Management,* Issue November-December, pp. 49-58.

[22] Groenveld, P. (2007) Roadmapping Integrates Business and Technology. *Research Technology Management,* 50(6), pp. 49-58.

[23] Gumusluoglu, L. & Ilsev, A. (2009) Transformational leadership, creativity, and organizational innovation. *Journal of Business Research,* 62(4), pp. 461- 473.

[24] Hanna, J. (2009) *The Challenges of Investing in Science-Based Innovation*. [Online] Available at: http://hbswk.hbs.edu/item/the-challenges-of-investing-in-science-based-innovation[Accessed February 2017].

[25] Hansen, M. T. & Birkinshaw, J. (2007) The Innovation Value Chain. *Harvard Business Review,* 85(6), pp. 1-13.

[26] Harvard-Business-Press. (2003) Types of Innovation: Several Types on Many Fronts. In: *Managing Creativity and Innovation*. Boston: Harvard Business School Press, pp. 1-13.

[27] Hastie, P., & Hay, P. (2012). Qualitative approaches. In *Research methods in physical education and youth sport* (pp. 79-94). Routledge.

[28] Herlihy, D. (2010) *How IT Can Trigger a Business Innovation,* [Media], Skillsoft.

[29] Hollstein, B. (2011). Qualitative approaches. *The SAGE handbook of social network analysis*, *1*(01), 404-416.

[30] IEA, (2014) *Energy Technology Roadmaps: A Guide to Development and Implementation,* Paris: International Energy Agency.

[31] ITS, (2012) *City of Ottawa: Technology Roadmap*. City of Ottawa.

[32] Klein, K. J. & Knight, A. P. (2005) Innovation Implementation: Overcoming the Challenge. *Current Directions in Psychological Science ,* 14(5), pp. 243-246.

[33] Kotter, J. P., & Schlesinger, L. A. (2008) Choosing Strategies for Change. *Harvard Business Review,* Issue: July-August.

[34] Leidner, D. E. & Kayworth, T. (2006) Review: A Review of Culture in Information Systems Research: Toward a Theory of Information Technology Culture Conflict. *MIS Quarterly,* 30(2), pp. 357-399.

[35] Liao, A., Hull, C. E. & Sriramachandramurthy, R., 2013. The Six Facets Model of Technology Management: A Study in the Digital Business Industry. *International Journal of Innovation and Technology Management,* 10(4), pp. 1-24.

[36] Martins, E. C. & Terblanche, F. (2003) Building Organisational Culture that Stimulates Creativity and Innovation. *European Journal of Innovation Management,* 6(1), pp. 64-74.

[37] Mumford, M. D. (2000) Managing Creative People: Strategies and Tactics for Innovation. *Human Resource Management Review,* 10(3), pp. 313-351.

[38] Nidumolu, R., Prahalad, C. K. & Rangaswami, M. R. (2009) Why Sustainability Is Now the Key Driver of Innovation. *Harvard Business Review,* 87(9), pp. 56-64.

[39] Nogrette, J. F. (2017) *Interview Jean-François Nogrette* [Media/Interview]. [Online] Available at: http://www.veoliawatertechnologies.com/en/media/articles/interview-jean-francois-nogrette [Accessed February 2017].

[40] O'Callaghan, R. (2005) Technological Innovation in Organizations and Their Ecosystems. In: W. H. Dutton, ed. *Transforming Enterprise: The Economic and Social Implications of Information Technology*. MIT Press, pp. 1-12.

[41] Oracle, (2013) *Big Data Analytics: Advanced Analytics in Oracle Database,* Redwood Shores: Oracle Corporation.

[42] Oracle, (2014) *Oracle's Internet of Things Platform- Solutions for a Connected World,* Redwood Shores: Oracle Corporation.

[43] Park, K., Ali, M. & Chevalier, F. (2011) A spiral process model of technological innovation in a developing country: The case of Samsung. *African Journal of Business Management ,* 5(13), pp. 5162-5178.

[44] Phaal, R., Farrukh, C. J. & Probert, D. R. (2004) Technology Roadmapping—a Planning Framework for Evolution and Revolution. *Technological Forecasting and Social Change,* 71(1), pp. 5-26.

Research Article

[45] Rao, J. & Weintraub, J. (2013) How Innovative Is Your Company's Culture?, *MIT Sloan Management Review,* Issue: 19 March 2013.

[46] Rinne, M. (2004) Technology Roadmaps: Infrastructure for Innovation. *Technological Forecasting and Social Change,* 71(1), pp. 67-80.

[47] Sarros, J. C., Cooper, B. K. & Santora, J. C. (2008) Building a Climate for Innovation Through Transformational Leadership and Organizational Culture. *Journal of Leadership and Organizational Studies,* 15(2).

[48] Sawhney, M. (2009) *The Innovative Legacy of Steve Jobs* [Interview, Media]. WOBI

[49] Sawhney, M., Wolcott, R. C. & Arroniz, I. (2006) The 12 Different Ways for Companies to Innovate. *MIT Sloan Management Review,* 47 (3), pp. 75-81.

[50] Schein, E. H. (1990) Organisational Culture. *American Psychologis,* 45(2), pp. 109-119.

[51] Sheppard, R. (2016) *Best practices for implementing the Internet of Things.* [Online] Available at: http://www.theinquirer.net/inquirer/sponsored/2373771/best-practices-for-implementing-the-internet-of-things [Accessed 05 March 2017].

[52] Smythe, L. (2012). Discerning which qualitative approach fits best. *New Zealand College of Midwives Journal*, (46).

[53] Somech, A., & Drach-Zahavy, A. (2013) Translating Team Creativity to Innovation Implementation: The Role of Team Composition and Climate for Innovation. *Journal of Management,* 39(3).

[54] Swanson, E. B. & Ramiller, N. C. (2004) Innovating Mindfully with Information Technology. *MIS Quarterly,* 28(4), pp. 553-583.

[55] Tapscott, D. (2010) *The Positive Effects of Technology* [Interview, Video, Online], WOBI.

[56] Teece, D. J., Pisano, G. & Shuen, A., 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal,* 18(7), pp. 509-533.

[57] Veolia, (2014) *New prospects for "smart cities": Veolia and IBM join forces.* [Online] Available at: http://www.veolia.com/en/veolia-group/media/news/new-prospects-smart-cities-veolia-and-ibm-join-forces [Accessed April 2017].

[58] Veolia, (2015) *Annual-Sustainability Report 2014.* [Online] Available at: http://www.veolia.pt/sites/g/files/dvc621/f/assets/documents/2015/12/2014-annual-sustainability-report_0.pdf [Accessed April 2017].

[59] Veolia, (2016) *Sustainability.* [Online] Available at: https://www.veolia.co.uk/sustainability [Accessed March 2017].

[60] Veolia, (2016) *The European Metropolis of Lille (MEL) is introducing Vig'iléo.* [Online] Available at: http://www.veolia.com/sites/g/files/dvc181/f/assets/documents/2016/10/PR-Vigileo-MEL-Veolia-101016-EN.pdf [Accessed April 2017].

[61] Veolia. (2016) *About Veolia.* [Online] Available at: http://www.veolia.com/en[AccessedFebruary 2017].

[62] Veolia. (2017) *Approach.* [Online] Available at: http://www.veolia.com/en/veolia-group/profile/approach [Accessed February 2017].

[63] Veolia-Water. (2016) *Veolia chosen to engineer and deliver a large scale wastewater treatment plant for Aramco's Jazan refinery in Saudi Arabia.* [Online] Available at: http://www.veoliawatertechnologies.com/en/press-releases/veolia-chosen-engineer-and-deliver-

large-scale-wastewater-treatment-plant-aramco-s-jazan-refinery-saudi-arabia [Accessed February 2017].

[64] Vromen, A. (2010). Debating methods: Rediscovering qualitative approaches. *Theory and methods in political science*, *3*, 249-266.

[65] Wilson, K. & Doz, Y. (2012) 10 Rules for Managing Global Innovation. *Harvard Business Review,* Issue: October 2012.