Response to disruptive innovation with hybrid products: transition of Oracle's business applications to cloud computing

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Abstract: Success and failure of the incumbent's response to disruptive technologies have been in the focus of innovation and strategy research for decades. Recent papers have suggested that developing a hybrid product, which combines old and new technology, can be a stepping stone towards fully embracing new technology. This paper explores the role of hybrid products in the response of Oracle Corporation, to cloud computing, a disruptive innovation. The development of a hybrid product allowed Oracle to successfully transition its business applications to a cloud offering while not abandoning the needs of its customers with respect to traditional products. The findings show that changing the positioning of a hybrid product by moving the focus from old technology entirely to the new can support an evolving response to disruptive innovation. The paper also considers the implication of cloud computing on Oracle's business in emerging countries.

Keywords: disruptive innovation; incumbent response; cloud computing; cloud strategy; hybrid products; business applications; Oracle Corporation.

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1   Introduction

Disruptive technologies often have a profound impact on markets and on incumbent market players. The examples of Kodak, Polaroid, and Nokia demonstrate that successful companies can be destroyed by new entrants who are using new, disruptive technology. Based on the seminal work of Christensen (1997) in *The Innovator's Dilemma*, extensive research has been done to better understand the nature of disruptive technologies and

disruptive innovation. Still, 30 years after his book was published, the core concept of disruptive innovation theory 'remains misunderstood' [Christensen et al., (2016), p.2].

Established companies respond heterogeneously to the challenges of disruptive innovation (Kammerlander et al., 2018; Sandström et al., 2009); some suffer fatal consequences, while others cope with it and are able to benefit from it. Incumbents have different options for their response. They can:

1   focus on and invest in traditional business

2   ignore innovation

3   attack back

4   adopt innovation by playing both games at once

5   embrace innovation completely (Charitou and Markides, 2003).

The optimal response is impacted by several antecedents: firm size and experience, complementary assets, commitments and cannibalisation, cognition and identity, top management characteristics, organisational structure, stakeholders, ecosystem and environment, and employee mobility (Eggers and Park, 2018). It can be difficult to select the optimal response based on those antecedents, but the unpredictable future path and market impact of new technology make the decision even more complex (Furr and Snow, 2015).

Recent research has shown that the transition from an old technology to a new one can be smoothened by bringing a hybrid product to the market (Furr and Snow, 2014). Hybrid products, which combine old and new technology, can be a stepping stone towards a world dominated by new technology, all while lowering the risk associated with the unknown. On the other hand, hybrid products can tie established companies to old technology and prevent them from making the necessary bold moves to new technologies (Suarez et al., 2018).

This study explores how the development of a core hybrid product enabled the transition of a leading IT firm to a new disruptive technology. Based on a longitudinal case study, the author concludes that by developing a hybrid product, the studied company built a bridge between old and new technology, and their hybrid product enabled the creation of a new business model. As the success of disruptive technology became inevitable on the market, the company gradually repositioned the hybrid as a 'product of the new technology', solely using the new technology and business model.

The underlying new disruptive technology in the study is cloud computing (Müller et al., 2015). Cloud computing has a significant impact on the IT services market globally (Statista, 2020), and presents specific opportunities and challenges for emerging economies (Murugesan, 2011; Yeboah-Boateng and Appiah-Nketiah, 2016).

This study contributes to the incumbent's response to disruptive innovation research in two ways: it extends the literature by analysing a real-life example of a successful transition using a hybrid product, and it demonstrates that a hybrid product can evolve in time to exploit the full benefits of the new technology it uses and the business model it enabled.

2   Review of literature

2.1   Disruptive innovation

The terminology of 'disruptive technologies' became widely known after Christensen (1997) introduced it in his book *The Innovator's Dilemma*, in which he differentiates between sustaining and disruptive technology improvements. The concept of a sustaining technology improvement refers to the gradual development of product performance and quality. Sustaining development can be continuous or even radical but shares the common feature of achieving improvement in such features that are critical for the major customer segment. According to Christensen, this type of innovation is the most popular across different industries.

Disruptive technologies are initially inferior to traditional technologies in dimensions that are important for mainstream customers, but they provide unique new features or services that create new value for both existing and new customers. Driven by growing demand, the development of disruptive technology continues, and eventually – but not necessarily – may reach the quality of the previous technology it disrupts (Christensen et al., 2015).

Christensen expands the concept of disruptive technologies to products and business models, introducing the concept of 'disruptive innovation' (Christensen and Raynor, 2003). Chesbrough, meanwhile, highlights the importance of business models, arguing that "a mediocre technology pursued within a great business model may be more valuable that a great technology exploited via a mediocre business model" [Chesbrough, (2010), p.354].

Disruptive innovations first target the least profitable, low-end segment of the market, or create a new market segment that is unattractive for the incumbent to focus on (Christensen, 2006). The market disruption occurs when the disruptive innovation – despite its inferior performance in some key parameters – becomes acceptable for mainstream customers and replaces traditional products (Yu and Hang, 2010).

The disruptive innovation theory was built on four key elements:

1   incumbents improving their products with sustaining innovation

2   incumbent products overshooting customer needs

3   incumbents possessing the capability to respond to disruptive innovation

4   as the result of the disruptive process, incumbents face serious consequences
     (King and Baatartogtokh, 2015).

However, King and Baatartogtok (2015) find that in most disruptive cases, not all four elements of the disruptive innovation theory are present. Only 9% of the cases they surveyed and identified as disruptive contained all four elements. Based on this result, they questioned the assumptions of Christensen's disruptive theory and suggested that disruptive theory can give guidance to managers in understanding what is happening but does not substitute for critical thinking and detailed analysis.

Disruption appears to be a broad definition for many researchers and practitioners (Gobble, 2016). Most definitions focus on market impact, not the distinctive characteristics of the disruption process (Nagy et al., 2016). To reduce confusion, Markides (2006) differentiates between disruptions via technological innovation,

business model innovation, and product innovation. These three different disruptions each represent a fundamentally different phenomenon; however, they may have a similar impact on established companies. Still, the debate as to whether Uber is disruptive or not demonstrates the existing uncertainty around the definition of disruption (Kavadias et al., 2016; Smith, 2016; Christensen et al., 2015).

2.2 Incumbent's response to disruption

Academic literature has recognised the importance of disruptive innovation for more than two decades (Weeks, 2015; Paap and Katz, 2004; Markides, 2012; Govindarajan and Kopalle, 2006), but several firms still react too late to disruptive innovation (Deloitte Research, 2004; Christensen and Raynor, 2003; Assink, 2006). Incumbents are often aware of the disruptive threat (Utterback, 1994), but do not treat it as serious until it impacts their mainstream customers. On the other hand, Christensen et al. (2015) warns that incumbents should not overreact to disruption by abandoning their profitable businesses too early. Markides and Oyon (2010) point out that simply mimicking a disruptor's business model almost always leads to failure.

Disruptive innovation does not necessarily put established companies out of the market (Osiyevskyy and Dewald, 2015; Christensen et al., 2016). When those have the necessary financial and managerial resources, they are capable of adapting to innovation (Christensen and Bower, 1996). For instance, the emergence of the internet was a disruptive innovation, but companies like Microsoft or IBM were able to build the new technology into their portfolio and maintain their positions as market leaders (Rothaermel, 2001).

Established companies should respond to the challenges of disruptive innovation, but not necessarily by adopting it completely (Markides, 2006). Charitou and Markides (2003) identify five ways in which incumbents can respond to disruptive innovation:

1 *Focusing on and investing in traditional business* – in most cases, disruptive innovation can only take over a certain part of the market, not the whole. For example, low-cost airlines could only take over 20% of the market between 1995 and 2002, while the rest was still dominated by traditional airlines.

2 *Ignoring the innovation* – the impact of the innovation can be distant or appear to be distant from the business of a company. Disruptive innovation can create a new market which can be different from the existing target market, and therefore may not be appealing for a firm to enter. For instance, the insurance company Hartford Life is focusing on the top 5% of income-earning Americans, and has chosen not to sell their products over the Internet or phone, as their customers require in-person contact and are willing to pay an extra price for it.

3 *Attack back and disrupt the disruption* – incumbents can attack the disruptors by introducing their own disruptive innovation. For example, Apple responded to the disruption of cheap computers by emphasising the style and design of its Apple iMac as a special attribute.

4 *Adopting the innovation by playing both games at once* – adopt the innovation, but also keep the traditional technologies and products. Of the 98 companies Charitou and Markides surveyed, 68 embraced disruptive innovation in their industries while continuing with traditional business.

5   *Embrace the innovation completely* – the company can give up their traditional
     business, take full advantage of the innovation, and successfully scale it up on the
     market.

The optimal choice of the five potential responses depends on several factors, such as a
company's position on the market, its competencies, and the nature and progress of the
disruptive innovation (Charitou and Markides, 2003). Besides those factors, a stream of
literature highlights the importance of a company's top manager's role in responding
(Danneels, 2004; Henderson, 2006; Kaplan and Tripsas, 2008). Managerial cognition
(Osiyevskyy and Dewald, 2015) and motivation (Eggers and Kaul, 2018) play an
important role in developing a firm's response. False manager beliefs about customer
needs may lead to inappropriate response (Vecchiato, 2017).

    Based on a systematic review of the literature, Eggers and Park (2018) identify
ten antecedents which impact incumbent adaptation: firm size and experience,
complementary assets, commitments and cannibalisation, cognition and identity, top
management characteristics, organisational structure, stakeholders, ecosystem and
environment, and employee mobility.

2.3   The hybrid approach

Adopting disruptive innovation in some way for an established firm – fully embracing it,
playing both games at once, or disrupting the disruption – requires significant investment.
Investment can happen in several ways: it can be financial investment into R&D, the
establishment of a new organisational unit or reorganisation of the company, additional
training and marketing costs, acquisitions, etc. Either way, it requires reallocation of the
firm's resources, which can be a difficult and high-risk decision. Due to the disruptive
nature of the innovation, it is usually difficult to forecast the future revenue that will be
generated by the new products. The lack of revenue forecast makes the decision even
more difficult and increases the risk.

    To lower the risk of moving to an unknown territory while utilising existing
knowledge and assets, firms can use 'bridges' during the technology transition (Cohen
and Tripsas, 2018). Cohen and Tripsas identify three types of integrational bridges at
different levels of analysis:

1   inventor bridge, where inventors of the old technology work on development of the
     new technology

2   technology bridge, where inventions are built by using knowledge from the old
     technology

3   hybrid product bridge, where the firm develops a product using both old and new
     technology.

Their research shows that due to inertia, inventor and technology bridges on average lead
to a lower performance for the new generation product. However, for companies with
strong R&D capability, technology and hybrid bridges were associated with higher
inventive performance. Other research results suggest that creating a high-performing
hybrid product helps incumbents to produce better-performing next-generation products
(Furr and Snow, 2014).

As Furr and Snow (2015, p.104) defined, "hybrids combine elements from a potentially disruptive technology with the current technology to create a new product, service, or business model that sits between competing innovation generations." Edison's electric lightbulb is a good example of bridging hybrid product concepts. When Edison introduced his invention to the market, existing gas lighting firms borrowed his filament technology to improve their traditional products. Edison and his electric bulb prevailed in the end, but the introduction of the hybrid product by the incumbents nearly led Edison's venture to bankruptcy.

A more recent example of a bridging hybrid product is the Toyota Prius. Toyota introduced the Prius in 1977 as the world's first mass-produced petrol-electric hybrid vehicle, when the future of electric cars was more uncertain than it is today. Instead of developing a full electric vehicle (EV), the Prius, which uses both an electric and combustion engine (Høyer, 2008), was a lower risk step towards the new disruptive technology (Furr and Snow, 2015).

Hybrid products can be considered as an implementation of Markides' 'playing both games at once' response strategy. Inter-generational hybrids can be viewed as sophisticated learning mechanisms that allow companies to test the new market and gain more time to learn the new reality and adjust to it.

On the other hand, hybrid products can lead to a trap as well. By producing a hybrid product, companies may get the false illusion that they are responding to a disruptive threat, while in reality, they are not. Hybrid products can tie incumbents to old technology, which may become a liability (Suarez et al., 2018). Moreover, while incumbents are focusing on the hybrid solution, new entrants can use this time to grow and expand. For example, while Toyota and other traditional car manufacturers were testing the EV car market with hybrid solutions, Tesla built its quick-charging network across the USA. As a result, despite the fact that Toyota was the first company to mass-produce a petrol-electric hybrid vehicle, in the first three months of 2019, Tesla had 50.7% market share in newly-sold EV cars in the USA, while Toyota Prius only had 6.7% (Insideevs.com, 2019).

Hybrid products can thus be a useful option for companies responding to a disruptive threat and transitioning to a new technology, but they can also lead to a trap. The existing literature does not provide clear guidance on which situations and under what conditions companies should develop hybrid products. This research aims to contribute to the literature by analysing a real-life example. In the following sections, I introduce and analyse a case study of a successful response to disruptive innovation using a hybrid product.

3   Methodology

This research is based on a single case study of Oracle Corporation. This methodology was selected because single case studies can be used to effectively build and test theories (Eisenhardt, 1989).

Oracle was the leader of the global software market when, in the middle of the first decade of the 2000s, cloud computing disrupted the market. After a transition period, Oracle responded to the disruptive innovation by embracing it and scaling it up. To track the company's transition to cloud computing, I conducted a longitudinal study of the company between 2002 and 2018.

3.1   The research company

In 1977, three engineers in California's Silicon Valley, Larry Ellison, Bob Miner, and Ed Oates, founded Software Development Laboratories (SDL) and signed a contract with the CIA to develop a special database. The codename of the database was 'Oracle'. The CIA database used 'relational database' technology, which allowed the users to manage the data more flexibly than traditional databases allowed. After the CIA project, SDL developed the technology further, and in 1979 they introduced the first commercially available relational database management system (RDBMS) to the market (Oracle, 2019c). The company changed its name to Relational Software Inc. (RSI) in 1978 to reflect the company's core product, which was named 'Oracle database'. RSI changed its name again in 1982, and become Oracle Systems Corporation, or Oracle Corporation. At that time, the company had 35 employees. During the following years, Oracle was experiencing growth in revenue and employment size, and it became a public company on the New York Stock Exchange in 1986 (www.crunchbase.com, 2019). By 1989, Oracle had become a major player in the software industry and part of the Standard&Poor's 500 index.

The core product remained their highly innovative database (Mendelsohn, 2013), which was used by software applications developed by other companies – the German SAP for example – to provide business functions to companies (SAP, 2019). In 1987, Oracle established an application division with seven employees to enter the business applications market. The application division created a new product line, which became the second leg of Oracle's portfolio. After the lunch of the application division, Oracle was investing heavily into their applications portfolio, aiming to build a complete, integrated suite of business applications for the 'integrated enterprise'. As a result, in a successful quarter in 2000, Oracle's application revenue surpassed the market leader SAP's for that quarter. However, this lead was not sustained, and SAP kept the global business application market leader position during the coming years (Pellegrin-Boucher et al., 2013).

During the internet boom in the second half of the '90s, Oracle was embracing new technologies and built new innovations into its products. The goal was to deliver products to the market which provided a complete solution and simplified running a business. As CEO Larry Ellison said "our underlying strategy can be described in three words: completeness, thus simplicity" (Lattig, 2000).

3.2   Data collection

The data for this research was collected from publicly available sources:

- *EBSCO research databases:* business source complete, academic search complete, regional business news, newswires.

- *Oracle corporate website:* contains a wide range of information about the company's history, company announcements, press releases, financial results, product and solution descriptions, white papers, and business programs.

EBSCO databases were systematically searched and analysed between 2002 and 2018, inclusive. The initial search for the phrase 'Oracle' returned 36,548 results. To narrow down the results, I filtered for English language results with full-text availability. I left all

other filters (publication type, document type, number of pages, etc.) in their default settings. I used two search fields on the EBSCO host site with an 'AND' relationship (only those search results which contain both phrases are returned) in Boolean/phrase search mode (EBSCOhost, 2019). The word 'Oracle' was always one of the search phrases; the other phrase was one of the following:

- *'Strategy', 'cloud', 'acquisition'* – relevant topics for the research. Search results with those search phrases contained relevant and important information about the company strategy, the evolution of cloud business and strategic acquisitions.

- *'Fusion'* – a specific Oracle product family, which had a key role in transforming Oracle's business to cloud computing.

- *'Ellison', 'Phillips', 'Hurd', 'Catz'* – family names of Oracle CEOs and presidents during the research period. Presentations, interviews, and conference speeches of key executives are a good source of company strategy information (Thro, 2009). Larry Ellison was CEO until 2014, when he transitioned to chairman and chief technology officer (Konrad, 2014). Charles Phillips was president between 2004 and 2010 (Brown, 2004; Davis, 2010). Mark Hurd became president in 2010 and transitioned to CEO in 2014 (Reuters, 2010). Safra Catz was president until 2014, when she transitioned to CEO in 2014 (Konrad, 2014). There were no other CEOs or presidents of Oracle during the research period.

The search for the phrase 'Oracle' and one of the eight phrases (strategy, cloud, acquisition, Fusion, Ellison, Phillips, Hurd, Catz) produced 9,666 results for the research period (2002–2018), which is 569 results/year on average.

In the next step, I reviewed the search results year by year. Based on the title and abstract, I excluded articles which were irrelevant for the research or were unrelated to Oracle Corporation. Example: "Proceedings of the Twenty-Eighth Annual ACM-SIAM Symposium on Discrete Algorithms." I also excluded articles which were related to Oracle executives but were not relevant to the research topic. Example: "Oracle CEO Larry Ellison buys Hawaiian airline." I also excluded articles with deep technical focus. Example: "Octree-based indexing for 3D pointclouds within an Oracle spatial DBMS."

Amongst the relevant articles, there was a significant amount of overlap and content duplication. For example, several newspapers reported on the speech of the CEO of the annual conference. Similarly, the information about an acquisition of a company was reported in dozens of articles in different newspapers, without additional or different information. When the same content appeared in several search results, I selected the most relevant source, based on its position on the EBSCO list.

As a result of this thorough and systematic process, I selected 320 articles to read. I read those articles in detail and documented the key content in research memos. I built the case study based on the content of those articles. I used a set of those articles as a reference in the paper to ensure and support factual correctness.

In the final step of the data collection, I used triangulation to validate and refine the content found in the selected articles by cross-checking and comparing the information with Oracle's corporate website.

4 Findings

4.1 Early 2000's – era of acquisitions

Since its foundation, the increase of Oracle's revenue was based on organic growth. The value of the largest acquisition Oracle made before 2003 was only $150 m (Millstone and Subramanian, 2007). That strategy changed in 2003 when Oracle made a bid to acquire a rival business application company, PeopleSoft, for $5.1 Bn (Millstone and Subramanian, 2007; Junqueira and Cook, 2015). The PeopleSoft acquisition took more than two years, after which Oracle finally purchased 97% of PeopleSoft's outstanding common stock in January 2005. After the PeopleSoft acquisition, two major players remained on the global enterprise resource planning (ERP) market, Oracle and SAP (Jacobs, 2007).

The PeopleSoft acquisition was the first in a row of Oracle's major acquisitions, followed by 24 others between 2004 and 2006 (Oracle, 2019e).

Amongst others, Oracle acquired the retail software provider Retek in 2005, after offering a higher price for the company than SAP (Economist, 2005). The last major purchase in that era was the acquisition of the market leader sales automation company Siebel for $5.85 Bn (Flynn, 2005). During the process of the Siebel acquisition, Ellison said, "we don't have another (major) acquisition in mind" (Menezes, 2005).

Oracle acted like GE, buying and integrating a large number of companies. As Ellison said in 2004, "we are the primary consolidator in the software industry" (Bank, 2004). The declared goal was to grow faster with acquisitions than SAP and beat them on application revenue (Veverka, 2008).

The acquisitions gave the desired boost. The reported growth of Oracle's application revenue was 66% in FY06 (the period between 1st June 2005–31st May 2006) and 31.7% in FY07. In the same period, the organic growth of application revenue (without the acquisitions) was 23.4% in FY06 and 11.8% in FY07 (Di Bona et al., 2007).

4.2 Integration of product lines – project fusion

The portfolio of different acquired products presented a challenge to Oracle. Previously, Oracle's message to customers was that they should optimise their IT system by running Oracle applications on the Oracle database. The company was arguing for the benefit of monolith architecture against a best-of-breed strategy, whereby users buy different IT components from different vendors. Ellison used the Boeing 747 as an example, saying it would fall apart if the user purchased the parts from different vendors and tried to assemble them piecemeal (Ferguson, 2008).

After the acquisitions, the focus became on integration between the (Oracle) database, Oracle, and other acquired business applications. As Ellison commented on the new direction: "we're not giving up on what we were saying before, [but] not everyone in the world wanted to go that way. We've got our fair share of wins. Now we live in a heterogeneous world" (Kerstetter and Lacy, 2005).

Some acquired products had overlapping functions. For example, the ERP function was part of both PeopleSoft, JD Edwards (which was part of the PeopleSoft deal) and Oracle E-Business Suite (EBS) applications. Similarly, the customer relationship management (CRM) function was covered by Siebel and Oracle EBS CRM.

To address the integration and co-existence of different application product lines, the company announced 'project fusion' in 2005, with the goal to merge Oracle EBS, PeopleSoft, and JD Edwards products into a new application (Kerstetter and Lacy, 2005). Siebel was also added to the product list after its acquisition. The goal with the new application was to merge the best functionality of each product suite. Ellison highlighted that fusion "will offer strong technological incentive because it will be built entirely on computer programming standards such as Java and hypertext markup language (HTML). That would make the new software easier to manage and easier to connect to other, standards-based programs" (Kerstetter and Lacy, 2005).

Simultaneously, Oracle was committed to further developing each individual platform, thereby not forcing customers in the short-term to upgrade to this new application. As Ellison said "I'm going to try and persuade you that we can do both. We are very large, with 50,000 employees. We can do both. We can develop three lines while simultaneously developing a new suite. We can do it. We have enough people and enough resources" (Ferguson, 2005).

Project fusion was a very complex task and required significant resources. "It will be a tremendous challenge for them to develop, market and sell upwards of four major product lines", said Christa Degnan Manning, an analyst at AMR Research. Oracle confirmed their commitment to project fusion in a statement: "the sheer size of the company – and its $2 billion annual research and development budget – allow the company to commit the resources necessary to building out its product lines" (Frauenheim, 2006).

Oracle announced the general availability of fusion applications (FA) in November 2011 (International_Business_Times, 2011b). The new FA included seven modules: financial management, procurement and sourcing, human capital management (HCM), CRM, supply chain management (SCM), governance risk and compliance (GRC), and project and portfolio management (PPM). It was a massive development effort. Oracle's engineering team built 20,000 objects, 10,000 business processes, and 100 modules from scratch (Wang, 2010).

Oracle exploited the latest technology trends during the eight years development period of FA, which resulted in fundamental technology advances. For example, the standard-based design allowed customers to make customisations using Java language instead of a proprietary programming language, the use of standard Java programming language lowered the implementation cost.

4.3   *Disruptive innovation – cloud computing*

Between the announcement of 'project fusion' in 2005 and the general availability of FA in 2011, the environment had changed significantly. A new phenomenon, 'cloud computing', had disrupted the market.

Traditionally, companies owned the IT systems they used. They built their own data centres, purchased the hardware (servers, storage) and software components for different layers of their software architecture, and developed customised solutions according to their business needs. The IT systems were usually installed on the premises of the customer purchasing them. Hence, this is called the on-premise model.

During the past decade, a new way of using IT has emerged as a disruptive innovation (Sultan and van de Bunt-Kokhuis, 2012; Sultan, 2013). Due to newly-developed IT technologies (such as virtualisation) and availability of high-speed, reliable internet

connection, consumers no longer need to have their own IT systems; they can use IT as a service. This model is called 'cloud computing' (Mell and Grance, 2011). According to sources, the name 'cloud computing' was first used by Google CEO Eric Schmidt at a conference presentation in 2006 (Sultan and van de Bunt-Kokhuis, 2012). In this new model, consumers (both companies and private users) become subscribers to cloud service providers (Marston et al., 2011). Cloud providers install their own data centres, which include the necessary hardware and software parts to provide the service.

For a consumer, using cloud computing services is like using electricity (Buyya et al., 2010). When we plug an appliance into an outlet, we do not care how the electricity is generated and transferred to us. Simply, we just use the service of the complex electric power grid, and we pay for the consumption.

There are three main service models for cloud services: infrastructure-as-a-service (IaaS), platform-as-a-service (PaaS), and software-as-a-service (SaaS) (Mell and Grance, 2011).

From a deployment point of view, when the services are provided for the general public, it is called a 'public cloud'. There are also 'private clouds,' which are built for a specific set of users, such as companies, organisations, or government entities in a given country. There is a possibility to use a part of a public and a part of a private cloud for complex architecture; this deployment model constitutes the 'hybrid cloud' (Armbrust et al., 2010; Chang et al., 2013).

The key advantages of cloud computing (Marston et al., 2011; Jones et al., 2017; Chang et al., 2013; Lin and Chen, 2012; Avram, 2014; Truong, 2010):

- Subscription-based service does not require a large upfront investment. Services are paid as an operational expense (op-ex), not from cap-ex.

- Service can be scaled up and down rapidly, based on the needs of the consumer.

- Lower barrier to innovation.

- The complexity of IT systems moves from the consumer to the cloud provider.

Large cloud service providers have a significant R&D budget to support the development of new functions and services. Smaller firms can become beneficiaries of those new services, despite their modest R&D expenditure (Sinha et al., 2019).

The users of cloud services can use the benefit of innovations rapidly. They do not have to go through a lengthy upgrade process; new features and functions become available immediately as soon as the cloud provider introduces those. This process entails closer cooperation and partnership between the service provider and the customer, which allows an improved response to technological change (Mokhtarzadeh and Faghei, 2019).

Compared with traditional, on-premise computing, cloud computing uses new technical standards to allow several customers to use the same infrastructure, which is called multi-tenancy (Tsai et al., 2010). With the development of cloud technology, new standards have been defined for security, identity management, and mobile access (Rittinghouse and Ransome, 2016; Parasher et al., 2018).

Cloud computing uses a different business model than on-premise does. Customers do not purchase and own the IT assets; instead, they pay a subscription fee for the service provided by the cloud provider.

Therefore, cloud computing is based on a set of technological innovations, and those technology innovations enable a new business model, which leads to a disruptive business model innovation.

In 2012, the worldwide revenue of public cloud computing services was only 9.3% of enterprise software revenue, not yet significantly impacting the market (Statista, 2020). However, the worldwide revenue of public cloud computing services grew to 41.7% of enterprise software revenue by 2017 and is expected to further increase to 58.7% in 2019 (Statista, 2020). The size of the public cloud market has become comparable with the enterprise software market, which traditionally was the key target market of Oracle. While the enterprise software market grew by 54% between 2012 and 2019, the public cloud services market grew by 880% during the same period (Gartner, 2018). An additional 113% growth of worldwide public cloud revenue is expected between 2019 and 2027 (Statista, 2020).

4.4   Cloud computing in the emerging markets

Emerging markets responded positively to cloud technology. One study found that decision-makers in Brazil, China, and India view the new technology more beneficial than the ones in the UK or the USA (Murugesan, 2011). Companies and public institutions in developing countries often do not have the computing power and infrastructure to build robust on-premise systems; therefore, cloud solutions can be optimal for them (Veigas et al., 2012). Emerging markets have significantly fewer legacy systems than developed countries; costly migrations are not necessary. Consequently, cloud solutions can be implemented faster.

However, underdeveloped infrastructure, low bandwidth, unreliable internet, and power networks can slow down cloud penetration in emerging economies (Yeboah-Boateng and Appiah-Nketiah, 2016; Adendorff and Smuts, 2019). The concern to lose control over their own data and lack of technical skills, legal, and regulatory uncertainties can also slow down cloud adoption in developing countries (Adane et al., 2019). Those areas should be recognised and addressed by cloud providers and government policymakers.

Although the benefits and risks of cloud computing are similar across countries, 'one size fits all' approach should not be used for emerging economies (Anyanwu, 2019). Differences in infrastructure development, innovation management (Guimón, 2018), government regulations and policies, knowledge, and skills must be considered to improve cloud adoption.

4.5   Oracle's response to cloud computing

During the early 2000s, some cloud features, such as providing IT solutions to the customers as-a-service instead of selling the software, become part of Oracle's strategy. Larry Ellison declared in 2002 that hosting web-based applications for customers in Oracle's own data centre had become a priority for the company. Oracle sales prospects were presented with the hosting alternative before they bought a new software. As Ellison said, "guaranteed, you will never have to pay for another upgrade. You will never pay for another piece of software. You will never pay for another piece of hardware" (Kerstetter et al., 2002). He also argued that the location of the server is not relevant: "our first task was to adopt modern technologies. That means where the computer is (that runs the

database) is largely irrelevant" (Pritchard, 2002). This approach was similar to the technology which appeared years later – cloud computing.

Foreseeing that SaaS type solutions will become a major trend, in 1998 Ellison personally invested in NetSuite, a company provided hosted software solutions in the pre-cloud era. Through his investment fund, he became the largest investor of the company in 2007 (Goldman, 2007).

Another predecessor of cloud, 'grid computing', became an important agenda for Oracle. Similarly to cloud computing, grid computing uses a distributed server architecture at multiple locations instead of a single server, and computing capacity can be allocated on-demand based on the current needs of the user (Foster and Kesselman, 2003; Foster et al., 2008). When version 10 of Oracle's flagship database products was released, it was named '10g', where the letter 'g' referred to the grid (Saran, 2003). Highlighting the importance of grid and on-demand computing, Ellison called it "the biggest thing in IT for 40 years" (Computer_Weekly, 2003).

Ellison was pioneering the new technology, and elements of cloud computing have been part of Oracle's strategy since before the terminology 'cloud computing' became widely used.

Based on the building blocks in its portfolio, in 2009 Oracle announced that it would offer SaaS solutions (Weier, 2009). After that, the overall corporate strategy gradually became cloud-oriented. In 2010, at the company's major annual conference, several new cloud products were announced, focusing on the private cloud segment (eWeek, 2010). In 2011, Oracle unveiled its PaaS and SaaS offering to host many of its key software products, called the Oracle public cloud (International_Business_Times, 2011b, 2011a).

By 2012, cloud became the central element of Oracle's strategic communication. Oracle positioned itself as the leader in the cloud business. Larry Ellison was confident that Oracle is "announcing the most comprehensive cloud on the planet Earth" (Mlot, 2012). As Mark Hurd, Oracle President, said, "we're just getting started. You will see a steady stream of application software become available as SaaS over the next 18 months. Every couple of months you will see modules become available. We are ahead of everybody with a cloud suite of capabilities. I mean, who's ahead of us? Who's even close?" (Glick, 2012).

After 2012, Oracle executives reinforced the cloud message on several occasions. The new version of the database was named '12c', referring to the cloud (Oracle, 2013). Larry Ellison confirmed in 2013 that, "our strategy is to be a player in all three parts of the cloud. All three levels of the cloud; SaaS cloud applications, platform and infrastructure" (Fair_Disclosure_Wire, 2013). In 2014, when Oracle was second to Salesforce.com in global SaaS revenue, Mark Hurd stated that Oracle's goal was to become the largest SaaS vendor globally (IDG-Computerworld, 2014).

4.6 FA – cloud option

When project fusion was announced in 2005, Oracle did not highlight the cloud features of the new application suite... In the company's communications, the key benefits of the to-be-developed FA were:

- complete

- standards-based

- combined the best features of Oracle EBS, PeopleSoft, JD Edwards, and Siebel.

That message significantly evolved from 2005 to 2011, as cloud become a major trend on the market. Building on the modern architecture and the advanced technology developments of FA, in 2009, Larry Ellison announced that FA "will be deployable both on-premises and as SaaS" (Kanaracus, 2009). After the announcement, the cloud deployment option became an important part of the communication of FA's benefits. Oracle's Profit Magazine highlighted that "Oracle fusion applications offer a hybrid approach to deployment. The applications are all software-as-a-service-ready, so customers can choose on-premises, public or private cloud, or a combination of these to suit their business needs" (Joch, 2010). Thomas Kurian, with Oracle, explained: "fusion applications... can be used both in an on-premise deployment, but equally importantly, ... they can be delivered in a software-as-a-service fashion" (Fair_Disclosure_Wire, 2010).

   As time passed, Oracle put less emphasis on their on-premise deployment options and communicated FA as a SaaS product. In 2012, Thomas Kurian positioned FA clearly as a SaaS solution: "fusion applications is the broadest and most complete software-as-a-service solution available in the market today" (Fair_Disclosure_Wire, 2012). Co-CEOs Safra Catz and Mark Hurd said that the development of cloud applications was specifically part of the original fusion initiative (Needle, 2015).

   By 2017, more than 5,000 companies used fusion ERP cloud, some flagship amongst them, such as Bank of America and AT&T (PR Newswire, 2017; Needle, 2017).

4.7   *Cloud acquisitions*

As Oracle's strategy became cloud-focused, the company started acquiring cloud companies to quickly expand its cloud portfolio. In October 2011, Oracle acquired RightNow technologies, a cloud-based customer service software developer, for $1.43 Bn (Rusli and Hardy, 2011). In 2012, Oracle continued their cloud acquisitions. In that year, Oracle acquired Taleo Corp., a cloud-based talent management company, for $1.9 Bn (Oracle, 2012b), collective intellect to bolster its cloud capabilities for SaaS functions (International_Business_Times, 2012), and Eloqua to add a modern marketing platform to the Oracle cloud (Oracle, 2012a). Oracle continued to acquire cloud companies after 2012 (Oracle, 2019d). The largest of those acquisitions were micros (a maker of cloud solutions to manage hotels, food and beverage facilities and retailers) for $5.3 Bn (Euclid-News, 2014), and NetSuite (cloud provider of ERP solutions for small to midsize businesses, in which Ellison was a major investor) for $9.3 Bn (Burkitt-Gray, 2016).

4.8   *The dominance of cloud in Oracle strategy*

After 2012, the cloud became the key element of Oracle's strategy. The focus of product development and acquisitions was on the cloud, and cloud-related messages dominated Oracle executives' communication.

   This shift also impacted the competitive landscape of Oracle. As Ellison said, "our two biggest competitors in the last two decades have been IBM and SAP, and we no longer pay any attention to either one" (Preimesberger, 2015). Salesforce.com, Amazon web services, and Microsoft with Azure Cloud became key competitors.

Besides focusing on new cloud customers, Oracle launched a program to target its large existing customer base with cloud products, offering to convert their support fee to cloud subscription (IDG-CIO_Australia, 2014).

In 2015, Oracle announced that 95% of its products were already available as cloud options, and its intent was to make all of its products available on the cloud. Not only would the products be available, but the company expected that customers would move 100% of their legacy applications to the cloud. "It's not a question of if, but when", said Steven Miranda, Oracle's SVP of applications development (Darrow, 2016).

At Oracle Open World in 2016, the key message of Ellison's keynote speech was as the "the world's most complete, open and integrated cloud computing platform" (Euclid-News, 2016). In 2018, Oracle announced a new program named 'Soar' to encourage customers to move to the cloud (Petersen, 2018).

4.9 Financial results

After 2012, the cloud topic dominated the top manager's communication and by FY17 cloud revenue had reached 71% of on-premise revenue totals.

Before FY14, Oracle did not report the revenue of its cloud services separately (Oracle, 2019b). In their annual reports in FY12 and earlier, 'new software licenses' were reported instead. In FY13, the same revenue item in the annual report was described as 'new software licenses and cloud software', but only a combined figure was reported. Between FY14 and FY17, Oracle reported 'new software licenses', 'cloud SaaS and PaaS' and 'cloud IaaS' separately in the 'income statement' tab of their 10-K Annual Report. In FY18, Oracle announced that going forward, the company would not report cloud and on-premise license revenue separately.

Oracle's on-premise license and cloud subscription revenues during the FY02–FY17 period are presented in Figure 1.

While the combined new license and cloud subscription revenue stayed between $10 Bn and $11 Bn in the FY12–FY17 period (when Oracle reported the two revenue lines separately), the cloud subscription portion's growth was a positive trend for Oracle. Cloud subscription revenue is more beneficial in the long-term than revenue from on-premise licenses. When a customer purchases an on-premise license for $1 m, Oracle recognises the revenue immediately, then collects additional $3 m maintenance and support fees over the next ten-year period. However, when a customer signs up for a $1 m annual cloud subscription, in the first year, Oracle recognises $1 m in revenue, but the contract will deliver an additional $1 m annually over the next ten years. "It's a much better business for us", summarised Ellison (Niccolai, 2015).

4.10 Oracle's cloud expansion in the emerging markets

To implement Oracle's cloud strategy, the company first built data centres in North America in 2011, followed by data centres in Europe (in the UK and the Netherlands) and in Australia (Sverdlik, 2012). As Oracle's cloud business expanded, more data centres were implemented globally. In 2019 the company announced to open a new data centre region every 23 days, and reach 36 regions globally by the end of 2020. The new data centre regions included emerging countries, such as South Africa, Brazil, India, and Chile (Haranas, 2019).

Figure 1   Oracle new license and cloud subscription revenue
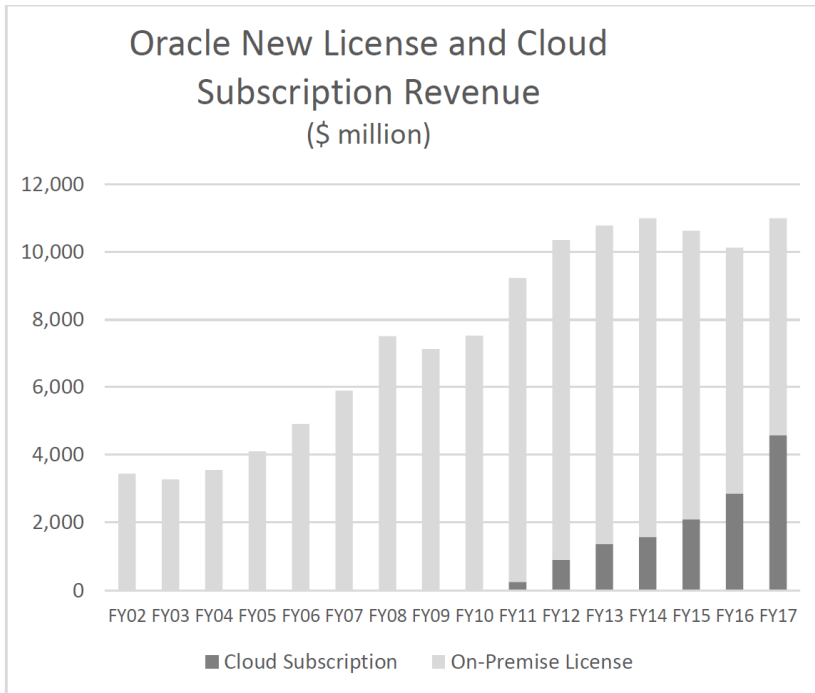
In-line with the corporate strategy, local subsidiaries in developing countries moved their focus to cloud. Oracle's aim was to have a strong presence in the emerging markets, and this aim was received positively by the customers.

For example, when the Brazilian economy's 2015 first-quarter GDP declined 0.2% after growing in the previous two quarters, several local companies turned to cloud computing – including Oracle's services – to reduce costs (Oracle, 2015).

According to Chris Chelliah (group vice-president and chief architect for core technology and cloud at Oracle Asia-Pacific) in the Asia-Pacific region "most customers...have some form of cloud development environment or cloud strategy. So, there's no need to preach to them about why they need to go the cloud." Some large customers in the emerging region already moved to Oracle cloud (Tan, 2020). For example, JNE, an Indonesian logistics firm moved its real-time logistics tracking and warehouse management systems to Oracle cloud. Similarly, Thailand's Metropolitan Electricity Authority was planning to move all their on-premise workloads to the Oracle cloud.

Companies in emerging markets were able to use the benefits of Oracle cloud to become more agile and innovative. As Lin Kaihui, co-founder and executive president of Shenzhen Fadada Internet Technology Co., Ltd., said, "the use of electronic contracts is changing the speed and accuracy at which business is done, giving users a huge competitive advantage" (Oracle, 2019a). Another example from India, where Venkatakrishnan Janakiraman, MD, Huron Consulting Group said, "emerging technologies help companies like us to bring in a differentiating factor to the services we offer" (Oracle, 2019a).

Oracle also targeted other emerging territories with cloud offerings, for example, Eastern Europe (Polak, 2015) and Latin America. In 2016, Oracle was selling more cloud-based business software than traditional on-premise products in Latin America. According to Mark Hurd, Oracle CEO, the rapid growth in enterprise markets was supported by the fact that clients without large hardware budget and qualified professional IT staff were able to use cloud services (Reuters, 2016).

Oracle also offered localisation for emerging countries related to local fiscal and tax requirements. Localisation teams based on Brazil, Colombia, India and Argentina were creating such assets for Argentina, Brazil, Chile Mexico and 12 other Latin American countries (Oracle, 2020).

5 Discussion

Oracle went through a period of major acquisitions between 2003 and 2006, with a goal to become the primary consolidator in the industry. The partially overlapping product lines of the acquired companies created uncertainty regarding which product lines would be part of Oracle's portfolio long-term and which would be discontinued. Oracle decided to build a new application product line (FA) using the best features among its existing portfolio. Simultaneously, Oracle kept existing product lines available for customers and made the transition to FA a 'business-value-driven decision' based on customers' preferences.

When cloud computing, with its disruptive nature, impacted Oracle's market, at first, Oracle's response was "focusing on and investing in traditional business." This is one of the response options identified by Charitou and Markides (2003). Oracle's priority was to focus on their traditional on-premise market by building a new product line (FA). Developing FA and their existing portfolio simultaneously required significant resources.

As Eggers and Kaul (2018) pointed out, motivation to pursue radical innovation weakens when performance is substantially below or above aspirations. The fact that Oracle's performance was strong after the acquisitions may have had an impact on lowering their motivation to embrace a new disruptive innovation.

Moreover, Oracle's influential CEO's view was that key elements of cloud computing (providing IT as a service from a centralised data centre opposed to build it and own by the customer) had been part of Oracle's strategy already, and that cloud was nothing more than just a new buzzword for exactly that.

Oracle's communication regarding cloud changed significantly between 2009 and 2012. The shift started in 2009, when the company announced its first cloud products (Weier, 2009), and was completed in 2012, when Larry Ellison announced Oracle's offering as "the most comprehensive cloud on the planet earth" (Mlot, 2012).

By offering cloud services, Oracle's response to a disruptive innovation had changed. Using the categories of Charitou and Markides (2003), the response changed from 'focusing on and investing in traditional business' to 'adopting the innovation and playing both games at once'. Oracle offered cloud-based products but did not discontinue selling on-premise licenses. In FY17 (the last year the company reported on-premise and cloud revenue separately), Oracle's on-premise revenues were still higher than cloud subscription revenues.

After 2012, Oracle's top manager's communication became entirely cloud-focused. Oracle introduced a specific program to hasten the transition of customers to the cloud. Oracle was still offering on-premise products and did not force customers to the cloud, but its strategy became clearly cloud-oriented. Therefore, Oracle's response after 2012 can be best described by the 'embrace the innovation completely' category.

According to Eggers and Park (2018), large firms are more likely to possess the relevant resources that can be used in responding to disruptive innovation. Oracle's example is in line with that; the company used significant resources to develop a new product line and acquire cloud companies. Eggers and Park also point out that willingness to cannibalise revenue from traditional products increases a firm's ability to reconfigure its business. Between FY09 and FY12, when the company's response strategy was 'adopting the innovation and playing both games at once', on-premise revenue steadily grew year by year; the total growth was 32.7% in three years. Despite the significant growth of this on-premise business, Oracle strengthened its cloud direction, and was willing to cannibalise traditional business.

Figure 2   Timeline of Oracle's response to cloud computing with its business application portfolio (see online version for colours)
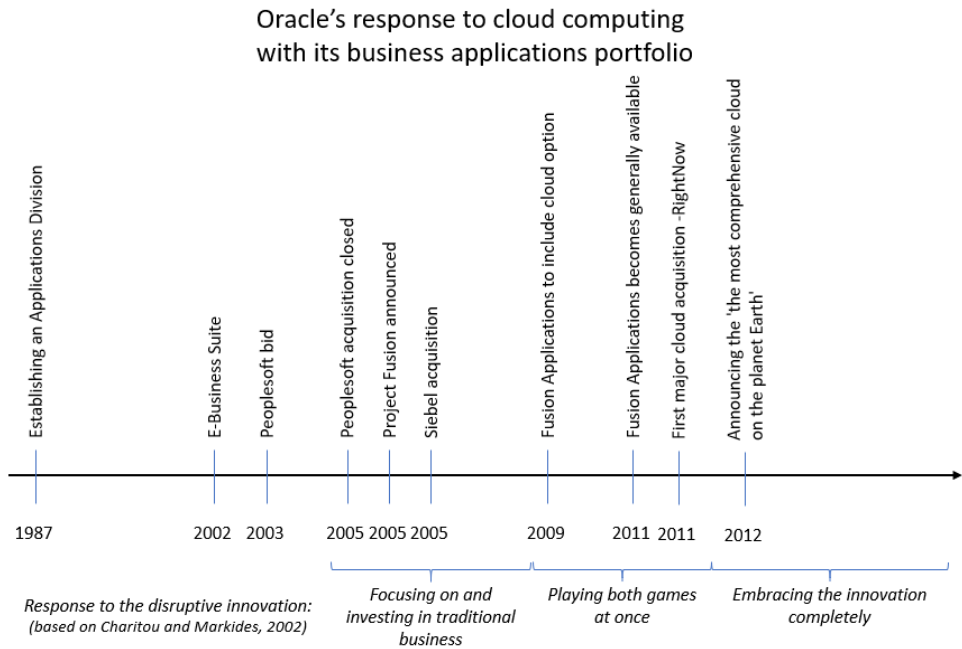
Eggers and Park (2018) also find that a firm's experience increases the firm's ability to respond. Oracle has always had an innovative culture; the company was able to create new knowledge and develop highly innovative products throughout its history. That experience supported Oracle in assimilating new knowledge related to cloud and responding to the new technology.

5.1 *FA – a hybrid product*

FA played a key role in Oracle's response to cloud computing. Oracle started to develop FA to combine the best features of its own EBS and other acquired applications (PeopleSoft, JD Edwards, and Siebel) into a new product line, based on standards and modern architecture. When the development of FA was announced in 2005, the cloud deployment option was not mentioned in the communication. As Oracle's cloud strategy evolved, the cloud deployment options of FA came to the focus. In 2011, when it became generally available, FA was a hybrid product – it was available for purchase both as on-premise software and as a cloud subscription. By creating a hybrid product, Oracle responded to a disruptive innovation by utilising an existing core technology asset. The hybrid product allowed Oracle to 'play both games at once', serving the needs of both on-premise and cloud customer segments.

As Oracle's strategy became fully cloud-oriented, the on-premise option of FA became less important; new communication focused on the cloud deployment mode only. The shift can be characterised as changing the positioning of the product between different technologies and business models. FA development was launched for a non-hybrid product, based on traditional technology and a traditional business model. As the company's cloud strategy evolved, FA became a hybrid product, offering a cloud option but also continuing availability of the traditional on-premise model. After this stepping stone phase, it finally became positioned as a non-hybrid, fully cloud product.

As Suarez et al. (2018) argue, hybrid products can tie incumbents to the old technology, which may become a liability. By changing the positioning of FA, Oracle avoided this trap. Oracle's successful transition to the new technology is in line with the findings of Cohen and Tripsas (2018), who suggested that a strong R&D program can be leveraged to build new knowledge and a new product. Oracle built on its robust R&D capabilities and used modern technologies when starting the development of FA. This allowed Oracle to build new technology into the product at a later stage of its development.

When its strategy become entirely cloud-oriented, Oracle decided to more quickly grow its cloud revenue beyond what FA and other cloud products in Oracle's existing portfolio could provide. Acquisitions can be a tool to help survive a disruptive innovation (Sandström et al., 2009), and Oracle had significant experience in purchasing companies. In 2011, Oracle acquired a major cloud company (RightNow), and several other cloud acquisitions followed. With these acquisitions, Oracle was able to fully embrace the innovation of cloud computing and scale it up faster than it could have with its own, in-house developed product portfolio.

Oracle's example shows that the hybrid product approach complemented with acquisitions can create an effective response to disruptive innovation by an incumbent.

6 Conclusions

Incumbents respond heterogeneously to disruptive innovation. Some survive, but a large portion of them do not react properly to innovation; this can have fatal consequences on their business. It is very difficult to predict and forecast the impact of disruptive innovation, making it particularly difficult to define the correct response for any company.

Hybrid products, which combine old and new technologies, can be used as a stepping stone towards fully embracing an innovation. Hybrid products can lower the cost of developing new solutions and can serve as a learning mechanism for the new technology in question. However, hybrid products can also give a false illusion of responding well to disruptive innovation, while in fact tying the company to old technology.

This study tracked Oracle Corporation's response to cloud computing, a disruptive innovation. At first, Oracle focused on its traditional business. In the second phase, Oracle developed a hybrid product (FA) as part of its business applications portfolio, which became available both as an on-premise license and a cloud subscription. The hybrid product allowed Oracle to respond to the disruptive innovation by using its core technology asset and a strong R&D program. In the third phase, Oracle fully embraced cloud computing and re-positioned FA as an entirely cloud product. To scale up its cloud business, Oracle complemented its response to this disruptive innovation with several acquisitions. The acquisitions helped Oracle to faster grow their cloud revenue, increase its cloud customer base, and establish itself as a cloud vendor.

As this single case study showed, hybrid products can be part of an effective response to disruptive innovation. Changing the market positioning of a hybrid product can then be an effective tool when transitioning to the new technology as the company strategy evolves and fully embraces the innovation. Acquisitions can complement such a hybrid product approach to achieve faster revenue growth in the new innovative solution area.

This study focused on the transition of the business applications portfolio of Oracle Corporation. As part of their coherent cloud strategy, Oracle transitioned its other product lines (databases, fusion middleware) to cloud as well. Due to the limitations of the current study, the details of that transition is not described here.

This study is based on a single case study; therefore, the generalisability of the results is limited. Future research on the topic can help us better understand the benefits and potential risks of hybrid products acting as bridges between old and new technology.

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