Abstract

Research into the Resource-Based View (RBV) and Knowledge-Based View (KBV) of firms has evolved over the last 30 years from being focused on the control of physical resources, through knowledge-based digital resources, to innovation. This paper considers a service perspective of RBV-KBV to help explain differences in the competitive advantage attributable to digital and physical resources. Such an understanding helps explain the evolution of RBV-KBV research over the last 30 years and strengthens the links between the established research themes of RBV, KBV, and innovation. Competitive advantage can be created and retained through digital resources but sustainable competitive advantage for digital service firms relies on those physical resources that provide the dynamic capabilities to innovate, and so continually develop the digital resources.

Keywords: Resource-Based View, Knowledge-Based View, innovation, Service Dominant

Logic, sustainable competitive advantage.

DIGITAL SERVICES AND COMPETITIVE ADVANTAGE:

STRENGTHENING THE LINKS BETWEEN RBV, KBV, AND INNOVATION

1. Introduction

The characteristics of resources and the search for sustainable competitive advantage have received considerable attention in the strategic management literature. The Resource-Based View (RBV) aspires to explain the internal sources of a firm's competitive advantage. More recently, RBV has emphasized the possession of knowledge and the Knowledge-Based View (KBV) as crucial in ensuring sustainable competitive advantage (Arend & Levesque, 2010). Pereira and Bamel (2021) note that the "*transiting of product-based economy to knowledge-based economy and industry 4.0 offer an impetus to the popularization of resource-knowledge based view as a framework, in order to gain performance and competitive advantage"*. Pereira and Bamel (2021) further point out that *"little is known about the future application and extension of resource and knowledge-based view in some of the contemporary contexts and phenomena".* One such phenomena is the process of digitalization, which has resulted in the growth of digital services. In recent years, all firms have had to consider the implications of digitalization. Indeed, leading digital service companies, such as Alibaba, Alphabet (Google), Amazon, Apple, Meta (Facebook), and Tencent are among the most successful firms today. These firms appear to have a competitive advantage today, but do they have a sustained competitive advantage based on their existing resources?

Our research question focuses on whether a service perspective of digital resources helps to inform past and future developments of RBV-KBV theory. Our question is motivated by the increasing importance of digital resources in providing services today compared to the

previous importance of physical resources in creating products when RBV was first under development in the 1950s, and explicated by Barney in 1991. Hence, we explore how RBV-KBV theory has evolved over time, moving from a focus on physical resources for sustaining competitive advantage to resources based on knowledge, which drive innovation. We discuss, with respect to RBV-KBV, how digital resources for providing services are different from the physical resources that underpin products in that they require continual development. We analyze the enduring assumptions of RBV with respect to these more recently introduced digital services and discuss the role of digital resources as a source of sustained competitive advantage from a service perspective. This helps explain the evolution of RBV-KBV research over the last 30 years and strengthens the links between the established research themes of RBV, KBV, and innovation. We conclude by proposing that competitive advantage may be created and retained through digital resources but that sustained competitive advantage for service firms relies on the physical resources that provide the dynamic capabilities to innovate in order to continually develop those digital resources.

2. Literature review

2.1. Evolution of the Resource-Based View (RBV)

The Resource-Based View of management summarized by Barney (1991) has become one of the most influential and cited theories in the history of management. This built on many earlier works, notably by Penrose (1959) and Wernerfelt (1984). Penrose (1959) suggested that growth is constrained when resources are inadequate, while Wernerfelt (1984) highlighted the value of focusing on resources rather than on products, which are as the outputs of resources. Subsequent articles further developed the Resource-Based View, including Mahoney & Pandian (1992), Peteraf (1993), Barney, (1995), Oliver (1997), Teece, Pisano & Shuen (1997), Barney, Wright & Ketchen (2001), Priem & Butler, (2001), Lockett,

Thompson & Morgenstern (2009), and Wan, Hoskisson, Short & Yiu (2011).

In 2001, Barney reviewed the role of RBV in strategic management research and confirmed that it was still of value. In 2012, Barney et al (2012) restated that the central research question for RBV is "*why some firms outperform others"*, as realized through the concept of sustained competitive advantage. A major theoretical contribution of RBV is that it helps explain long-term differences in firm profitability that cannot be attributed to differences in external industry conditions (Peteraf, 1993), thus differentiating it from the Industrial Organization (IO) view of Mason (1939), Bain (1956, 1968), and Porter (1980, 1985). This may be of particular relevance in turbulent times (Emery & Trist, 1965; Ramirez et al, 2008) when the external environment is unpredictable and market structures are unstable, such as during the current period of digital disruption, as well as the global pandemic of Covid-19.

More recently, Barney, Ketchen, and Wright (2021) discuss a number of questions to *"set the stage for the further evolution and application of resource-based theory"*. These questions include: "*Is resource-based theory static?*" and "*Does resource-based theory have strong managerial implications?*" By viewing RBV through Brandenburger and Stuart's (1996) value creation and appropriation model, Barney et al. (2021) seek to answer such questions. While this helps to further explain some of the links between RBV, dynamic capabilities, and management practice, it does so with little reference to how the business context has changed dramatically over the past 30 years. In particular, the terms "digital", "innovation", and "knowledge" are absent from the main text, as well as any reference to the growth of technology firms. While this does not undermine any of the conclusions, it does suggest that there may be scope to better understand RBV by considering the impact of digitization on business over the past 30 years, and the links to a Knowledge-Based View (KBV) and innovation.

The question of whether resource-based theory is static has been an enduring question aimed at RBV. Kraaijenbrink et al (2010) summarized many of the prominent criticisms of RBV, including the need for clearer demarcations between what are and what are not resources as *"there is nothing strategically useful associated with the firm that is not a resource"*. Priem & Swink (2012) supported the view that RBV has adopted a broad and imprecise definition of resource. By viewing RBV through Brandenburger and Stuart's (1996) value creation and appropriation model, Barney et al. (2021) answer this question by explaining that "*dynamic capability theory is a special case of resource-based theory*" and that any dynamic capabilities must still comply with the original ~~VRIN~~ attributes to provide sustained competitive advantage – "*that is, they must be valuable, rare, costly to imitate, and nonsubstitutable*" (abbreviated to VRIN).

The question of whether RBV has strong managerial implications has also endured. Barney et al. (2021) answer this question by explaining that poorly performing firms need to identify the VRIN resources of their superior competitors in order to seek out ways to copy them (making them not VRIN) or to seek out alternative VRIN resources that create economic value in the marketplace. Meanwhile, those firms already with competitive advantage should clearly identify their VRIN resources so that they can extract the most from their potential value.

There are two main assumptions concerning resources in RBV: resource heterogeneity and resource immobility. Given the broad interpretation of resources to include dynamic capabilities, the assumption of resource heterogeneity within an industry is undoubtedly true in that all firms are different in some way within their competitive set. However, it is not always easy to identify which is a VRIN resource in practice. For example, most brands are valuable to some extent, but when are they rare? What makes them inimitable and non-

substitutable? For some consumers, Apple is substitutable for Samsung, for others this is never the case. Moreover, some resources are valuable only at different points in time (i.e. not sustainably valuable). For example, should Travis Kalanick (CEO of Uber 2010-2017) be considered as a VRIN resource that contributed to Uber's early competitive advantage but not to sustaining their advantage? Moreover, what is the competitive set of firms in reality? Is Amazon in the same group of firms as Apple, a tech company, or Walmart, a retailer, or both? In particular, we will consider the VRIN aspects of resources employed in digital services in Part 4 of this paper.

The idea of resource immobility may also be questioned. Access to resources is much more fluid thanks to the digital developments of the 4th Industrial Revolution, where relationships, communication, and connectivity rather than technology per se may be seen as the important elements. Many resources can now be hired by the hour and utilized via digital technology rather than owned. For example, a start-up may now compete with a long established multi-national firm in hiring the best software developers, using state-of-the-art technology, renting prestigious premises, buying into customer and supplier networks, and rapidly scaling production through the gig economy. However, start-ups will often pay excessive rents for such resources, so they need to scale quickly or any short-term competitive advantage will not be sustainable (for example, see Yang et al., 2020). Thus, the concept of a Resource-Based View of management is complex in application.

The original RBV framework proposed by Barney (1991) has been reviewed and extended by scholars over time, responding to the criticisms made and the changing context, often by redefining the meaning of resources, in relation to control, firm boundaries, and organizational activities. As the emergence of digital service firms and the related platform economies and ecosystems have challenged the boundaries of the traditional view of a firm's

resources, many authors consider a more relational view of the firm where critical resources may span firm boundaries, including Dyer & Singh (1998) (and later Dyer, Singh, & Hesterly, 2018), Adner (2006) (and later Adner & Kapoor, 2010, and Adner, 2017), as well as Kohtamäki et al (2019). However, the core VRIN attributes of critical resources remains central to RBV in providing sustainable competitive advantage, and such resources may include knowledge and the dynamic capability to organize non-VRIN resources.

2.2. The development of RBV, KBV, and dynamic capabilities towards innovation

Over the last decade, the Resource-Based View has emphasized possession of knowledge as crucial in ensuring sustainable competitive advantage (Arend & Levesque, 2010). Knowledge includes the transferability of knowledge, as well as the capacity for aggregation and appropriability, thus leading to a rationale that knowledge may be the most critical resource of the firm (Grant, 1996). This rationale led to the development of the Knowledge-Based View (KBV) of the firm (Grant 1997), which postulates that a heterogeneous knowledge base and capabilities are the main determinants of a firm's performance in a knowledge-based economy (Eisenhardt & Santos, 2002). According to knowledge-based theory, a firm's success depends upon its capabilities of knowledge production and relationship management for external knowledge transfer (Low & Ho, 2016).

Pereira & Bamel (2021) have illustrated the temporal evolution of research themes associated with the Resource-Based View (RBV) and Knowledge-Based View (KBV). Their analysis recognized three periods of evolution. In the early years (1994–2001), the core themes of RBV and KBV were set out. A period of expansion (2001–2010) followed when RBV was broadened to include knowledge transfer, KBV to include organizational learning, and change & restructuring to include innovation. More recently, a period of consolidation

(2011–2020) led to the maturing of the more established research themes of RBV and KBV, alongside the emergence of new themes and extensions into more peripheral areas. This raises the question of why some research themes strengthen while others fall away over time.

Pereira & Bamel (2021) also identified some important gaps in the knowledge of RBV-KBV. In their cluster analysis, they identified that papers focusing on product and product development within the RBV-KBV domain were mature in terms of research, which raises the question of whether services have been sufficiently explored. Moreover, Pereira & Bamel (2021) identified three base themes: the Resource-Based View, Knowledge-Based View, and innovation. These three base themes were the largest in terms of number of research papers, with strong external ties to many other areas but weak ties between themselves. This raises the question of how these more mature research themes might be tied together more strongly.

The continuing development of the RBV, KBV, and dynamic capabilities literature over the past three decades leads us to consider what has changed in practice in the business environment since the introduction of such concepts that might provide some clues as to the future evolution of RBV-KBV as well as to strengthen the links between RBV, KBV, and innovation.

Going back three decades, when the concept of RBV was introduced by Barney (1991), General Motors, Exxon, and Ford were the Top 3 most valuable companies in the world, in the era of Big Oil. By 2020, data was the "new oil", with the Top 5 most valuable companies being Apple, Microsoft, Alphabet, Amazon, and Facebook. During these three decades, the importance of resources and knowledge in business has changed significantly, shifting away from product markets dominated by physical resources, such as oil, towards service markets dominated by digital knowledge, such as through the deployment of customer data. This shift

is reflected in the academic research as KBV refocused RBV on knowledge as the most strategically important resource of any organization (Kogut & Zander, 1992) to improve innovation performance (Darroch, 2005). Hence, this paper considers how this change of emphasis in practice from product to service and physical to digital impacts the next evolution of RBV-KBV research.

2.3. The impact of digital services on dynamic capabilities, knowledge, and resources

Firms are moving away from linear decision making and linear organizational models (Ramirez et al. 2008), as they adapt to changes in technology and markets (Velu et al., 2013). A controlled, linear, hierarchical approach to strategic decision-making may help efficiency (Teece, 2001), but is not suitable when firms are moving towards business models based on uncontrollable networks and the co-creation of value (Klijn & Koppenjan, 2000). A more flexible form of strategic decision making is required that encompasses platform ecosystems where the networked value between interconnected customers and organizations (Iansiti & Levien, 2004; Moore, 1993) is mediated through a shared platform (Cusumano, Gawer & Yoffie, 2019; Zhu & Iansiti, 2019).

Firms are relinquishing ownership and control over essential but exchangeable resources, as exemplified by Uber and drivers, or AirBnB and real estate. Moreover, markets are changing with competitors simultaneously competing and co-operating to create networked business models. For example, in the UK, Morrisons grocery supermarkets employ an online competitor (Ocado) to provide the logistics for their own (Morrisons) online grocery offer while also supplying a different retail competitor (Amazon) with product for their (Amazon's) competing grocery service offer. Such networked integration appears to represent a challenge to the traditional view of competitive advantage – less about control and

the competitive advantage of supply-based, physical resources within a well-defined market sector, and more about an uncontrolled network and the competitive advantage of demand-led, knowledge-based resources providing digital services within a loosely-defined marketplace.

Koch & Windsperger (2017) argue that digitization radically changes the nature of products, the process of value creation, and the competitive environment. Nambisan et al (2017) highlight the challenges in sustaining competitive advantage in such an environment with *"continuously shifting structural boundaries for innovation outcomes"*, alongside "*continuously shifting spatial and temporal boundaries for innovation processes"*. Digitization enables networks to be established and to scale (both up and down) quickly and with relative ease, leading to the rise of platforms and the development of business ecosystems based on knowledge (for example, Hagel, Brown &~~, and~~ Davison, 2008; Adner &~~, and~~ Kapoor, 2010), with the result that many firms, large or small, can access a platform of resources.

Thus, the resource capacity of a firm is not limited by its internal resources, such as cash, inventory, patents, technology, and people, but instead limited by the networks that they can plug into or create, such as investors, suppliers, and customers. This has implications for the firm's competitive capacity, as almost any firm can hire a thousand people on a "pay as you go" basis, source incremental funding totaling millions, rent data storage and physical warehousing by the hour, and so on. Hence, resources in terms of "what a firm has" access to has become difficult to quantify and may be similar for competing firms. Meanwhile, resources in terms of "what a firm does" with such resources, their competitive capabilities, including dynamic capabilities, have always been difficult to quantify. This differentiation between "what a firm has" and "what a firm does" from a service perspective may contribute

to a better understanding of RBV-KBV.

In practice, this new reality suggests that a firm may compete (and co-operate) with any other firm, within or outside their existing sector. Thus, booksellers sell coffee, engine manufacturers sell insurance policies, clothing manufacturers sell advertising space, software companies sell taxi rides, and so on.

Firms are not so easily bounded by traditional Industrial Organization (IO) notions of a market. Nambisan and Baron (2021) highlight the challenges for competition in this new innovation-led digital economy. Competition may exist anywhere in such markets - and yet the underlying thinking behind sustainable competitive advantage, alongside the associated competition public policies, remains largely grounded in a physical, product-centric, supply-based world, where competitors are routinely defined by their product categories and geographical space. For example, the giant players in this new digital age, such as Google (Alphabet), Apple, Facebook (Meta), and Amazon, have been positioned as global (geographic), technology (product) firms in competition with one another, even though we may order a book to read on our Apple iPhone via Amazon that was advertised on Facebook that we identified through Google. This is not a world of physical, supply-based, product-centric competitors but of digital, demand-based, service-centric competitors and co-operators. The new reality suggests that these digital giants can largely access the same or similar resources in whatever form.

By considering RBV-KBV in the light of today's digitally-enabled, service-led practice, we may further extend RBV-KBV theory through such an analysis. Hence, this paper proposes to review the VRIN assumptions of RBV from a service perspective when considering resources as either physical or digital.

3. Taking a service perspective of resources

Service Dominant Logic (Vargo and Lusch, 2004, 2016) considers *"the process, patterns, and benefits of exchange"* rather than the tangible products that are bought and sold. Lusch and Nambisan (2015) built on this service perspective by reviewing a tripartite framework for service innovation, consisting of service ecosystems, service platforms, and value cocreation. In particular, Lusch and Nambisan (2015) consider the role of information technology both as an operand resource and as an operant resource, differentiating between technology as an enabler and technology as the leading actor.

This service perspective helps us to differentiate between different types of resources in digital platforms, such as data and algorithms. Data is an operand resource, while algorithms (acting on the data) are an operant resource. This could be considered similar to the differentiation between a basic interpretation of RBV as the resources available to a firm, and the broader KBV perspective of the knowledge to do something useful with those resources. Operand resources could include raw materials, components, capital, real estate, and data. Operant resources could include processes, organization, culture, and algorithms.

This service-based perspective also allows us to build on Pereira & Bamel's (2021) reflections on the distinction between a Ricardian view of competitive advantage, based on operand physical resources, and a Schumpeterian view of competitive advantage, based on operant resource capability.

3.1. Comparing resource-based products with digital knowledge-based services

By taking a service perspective of resources and recognizing the distinction between operand and operant resources, we can consider the differences and similarities of pursuing competitive advantage through digital, knowledge-based resources versus more traditional,

physical resources.

Physical operand resources can be characterized as "materials" that may be exploited to provide competitive advantage, such as Exxon oil reserves in the 1990s. Digital operand resources can be characterized as "data" that may be exploited to provide competitive advantage, such as Google search data in the 2020s. Physical operant resources can be characterized as the "organization" that may be employed to act upon the operand resources to provide competitive advantage, such as the ability of Exxon to organize oil production and distribution. Digital operant resources can be characterized as the "algorithms" that may be employed to act upon the operand resources to provide competitive advantage, such as the ability of Google to apply algorithms within their search engines. This service perspective of resources is summarized in Figure 1.

Insert Figure 1 about here

In order to explore the theoretical shift in RBV-KBV development over the last 30 years, we consider how the origins of RBV theory needed to adapt as business moved from a focus on product-centric, physical resources to service-centric, digital, knowledge-based resources. Thus, through this service lens of digital and physical resources, we examine each of the resource attributes for sustainable competitive advantage identified in the seminal RBV theory that are still applicable today: valuable, rare, inimitable, non-substitutable (Barney et al. 2021).

4. Digital knowledge-based services as sources of competitive advantage

An analysis of each of the four attributes in RBV for sustainable competitive advantage follows.

4.1. The *value* of resources in digital services

There are clear examples of physical, supply-based, product-centric, operand resources that are valuable over a long period of time, such as gold, oil, and the recipe for Coca-Cola. For example, the recipe for Coca-Cola is still relevant today 130 years after its invention. The one documented time that Coca-Cola changed the recipe in 1985, the resulting loss of sales led to a rapid reversal of that decision. Hence, the recipe for Coca-Cola might be considered similar to gold in sustaining value over a long period of time. Building on this operand value, the way in which Exxon and Coca-Cola organize their production and distribution at scale also provides operant value for their firms.

In the digital world, Google also has intellectual property, like Coca-Cola, in terms of its operant Google search engine algorithms. However, unlike Coca-Cola, these algorithms are frequently updated to reflect changing times, such as new technology, new content on the internet, and new user behaviors. Indeed, Google claimed to make over 3,200 changes to their search algorithms in 2018 alone (Sullivan, 2019). Hence, at any point in time Google search algorithms provide value and so may retain the firm's competitive advantage, but over time this competitive advantage is only sustained by continually updating the underlying algorithms.

Likewise, the operand data of these digital platforms is constantly being updated. Facebook advertisers want to know what users are liking today and are less interested in what users liked in the past. Time decays the value of such data. So, at any point in time Facebook data

provides value to advertisers and so may retain the firm's competitive advantage over other media channels, but over time this competitive advantage is only sustained by continually updating the underlying data. Thus, data and algorithms are continually revised and refreshed to retain relevance.

As Kallinikos et al (2013) highlight when considering digital artifacts, digital ecosystems are constantly shifting *"such that they become increasingly editable, interactive, reprogrammable, and distributable. This state of flux and constant transfiguration renders the value and utility of these artifacts contingent on shifting webs of functional relations with other artifacts across specific contexts and organizations."* In other words, their operand and operant value is transitory and is only retained through constant updating, reprogramming and editing, much like a newspaper is reliant on today's (rather than yesterday's) news. It may be useful to know that certain readers have liked celebrity stories in the past but they want new celebrity stories today not the old ones. This suggests that, unlike gold, the value of Google's search algorithm and Facebook's user data decays over time without intervention through further innovation. Unlike gold, this does not provide a stable base for sustainable competitive advantage but a basis for retaining competitive advantage by continually organizing for further innovation.

4.2. The *rarity* of resources in digital services

Again, there are clear examples of physical, supply-based, product-centric operand resources that are rare, such as the eponymously named rare-earth metals commonly used in electronics. Gold is still a relatively scarce resource and continues to be a rare operand resource. While oil may be less rare, the ability to organize supply is dominated by the 13 national oil companies represented by OPEC, thus creating operant rarity. The Coca-Cola

recipe is unique as legally defined by intellectual property rights and Coca-Cola also organizes the mass manufacture and distribution of its products at a rare scale, and so could be considered rare from both an operand and operant perspective.

The platforms, data, and algorithms of digital enterprises are less rare in that there are many firms that could provide similar platforms, capture similar data, and run similar algorithms, from start-ups to global giants. However, the major digital platforms are different in terms of organization at a mass scale, which creates operant rarity. Barrett & Orlikowski (2021) highlight that such scale is obtained through multiple practices over time and is a "*contested, consequential achievement*". In other words, it requires constant attention and innovation to retain competitive advantage. As Law and Urry (2004) recognized, scale is "*made*". It is not a natural consequence of providing a service platform. Hence, successfully organizing at a mass scale is a rare operant resource necessary to retain the value of the underlying digital resources.

4.3. The *inimitability* of resources in digital services

Again, there are clear examples of physical, supply-based, product-centric operand resources that are largely inimitable. Gold still has properties that other materials do not possess and find difficult to imitate in their entirety. Coca-Cola is protected by law and so cannot legally be copied as a product, though it may still be mimicked by other products. However, the operant value of the Coca-Cola ecosystem of mass production and mass distribution is much harder to imitate without the existing scale of the operand resource. Despite the growing push due to climate change to move away from our dependence upon fossil fuels, the ecosystem organized around oil provides an operant resource at a mass scale that is also still difficult to imitate.

Digital algorithms are often covered by legal protections to stop imitation and protect their operant value, however they may still be mimicked if not exactly copied. Moreover, as such algorithms are continually improved and updated, the importance of imitating a particular algorithm decays over time. The operand value in data may also be protected, not only by the firm, but also by public policy - for example in the case of privacy laws concerning customer data. However, such protection is often of fleeting importance because the nature of these digital resources is changing all the time. Witness the number of legal battles between digital companies that are either never resolved or only resolved long after any competitive advantage has been gained or lost. For example, see Nicas (2018) describing the lawsuits between Apple and Samsung.

4.4. The *non-substitutability* of resources in digital services

Again, there are clear examples of physical, supply-based, product-centric operand resources that are largely non-substitutable. The unique properties of gold make it not only impossible to copy but also difficult to replace with a substitute product in many circumstances. Again, the ecosystem organized around oil, including the effective lobbying of governments and key decision-makers, make it difficult to substitute its operant value, even with the pressure of climate change. While there are many substitutable products for Coca-Cola, there are few substitutable brands with similar operand equity. There are few obvious operant substitutes for the way in which Coca-Cola combine marketing effectiveness and production efficiency.

In the digital world, there are operant substitutes for the functional aspects of the service provision, such as data collection and algorithmic analysis. Similar software can be developed to carry out similar functions, even allowing for any legal restrictions due to patents. However, in providing these digital services, there are some physical operant barriers

to exit formed by firms to reduce the attraction of users substituting one competitor firm with another. For example, Amazon already has your delivery and account details for one stop shopping; Facebook already links you to your friends and family; Microsoft is already integrated into your company's existing IT architecture. So, there are operant barriers to substitution for existing users, though maybe less so for new users.

4.5. The organization of resources in digital services

One commonality across both successful physical supply-based product-centric firms and digital, demand-based, service-centric firms is the operant value created by the scale of the organization and the ability to renew and refresh at scale even when individual products or services may be changing. This is usually built on the original operand value that created the demand for scale in the first place.

This is organization in a physical sense. It is the physical attributes of an organization: its leadership, people, their relationships, networks, structures, processes, routines, and cultures. The digital organization in terms of data architecture, databases, and algorithms can more easily be replicated and scaled. The digital organization may possess competitive advantage in the short-term but requires further innovation to retain such competitive advantage. It is the physical manifestation of the organizational resource that is valuable, rare, inimitable, and non-substitutable in the long-term.

4.6. An example analysis

For example, by most measures Google is currently a successful firm. From a traditional resource perspective, it is difficult to identify the VRIN characteristics that make Google such a success. Many other organizations, such as Apple, Amazon, and Facebook have similar

resources at their command. Indeed, it can be argued that in terms of resource capacity, such as that provided through technology, people, and finance, a start-up company backed by investors with the right connections, a great idea, and an implementation plan might also be able to arrange access to similar resources. However, by analyzing the resources related to the dynamic capabilities in order to provide a relevant service, Google's model for success can be identified.

Google provides simple, quick, free, relevant customer experiences; a service system that collects, organizes, analyzes, and delivers mass data in real time; and a business model that relies on indirect revenue from third parties. The value provided by Google to users, advertisers, and investors depends upon the scale of their data and the sophistication of their algorithms, both of which require constant renewal and refreshment in order to stay relevant. The renewed data and refreshed algorithms enable Google to retain their competitive advantage as a search engine. However, it is this dynamic capability to renew and refresh (i.e. to innovate) that sustains Google's competitive advantage over the long term. The threats to Google's success do not lay in whether other firms have the resources to provide search facilities at scale but whether other firms can organize such resources to capture greater data and develop more relevant algorithms.

Such an analysis illustrates that threats may arise from both an internal firm-focused RBV approach to dynamic capability as well as an external sector-focused Industrial Organization (IO) approach to competition and public policy. For example, data, algorithms, and value are all subject to potential threats both internally and externally. The collection of data may be interrupted by an internal error or by external government intervention. The algorithms may produce less relevant search results due to an internal change in coding or due to an external change in customer perceptions. Advertisers may no longer value the insight and targeting

provided due to internal price decisions or external alternatives.

This analysis also highlights the disruption to the product-centric nature of market definitions in the IO approach. Google competes with other search engine providers in terms of customer experiences, while competing with other data firms in terms of its service system, while competing with other advertising channels through its core business model. Hence, Google can compete in the market sectors of search engines, data provision, and advertising simultaneously. It is this dynamic capability to organize similar internal resources in different ways to meet the demands of different markets that allows Google, and its parent company Alphabet, to venture into apparently unrelated products and services from an IO perspective, such as automated vehicles. The external outputs may be very different but the internal dynamic capabilities required may be very similar.

4.7. Summary analysis of VRIN

This analysis of each of the four VRIN attributes in RBV for sustainable competitive advantage above can be summarized in the following diagram:

Insert Figure 2 about here

This VRIN analysis highlights that while digital resources, such as data and algorithms, may be rare, and sometimes difficult to imitate or substitute, their value decreases over time. Hence, even if digital resources can be used to create competitive advantage, the value of that advantage declines over time and therefore cannot be considered sustainable without further

innovation. This illustrates the importance of the organization (O) in providing the dynamic capability to renew and refresh digital resources. Hence, digital resources can provide the basis for a retainable competitive advantage but it is the physical resources of the organization that provide for sustainable competitive advantage.

5. Discussion

By taking a service perspective of RBV in today's digital economy, this paper attempts to clearly differentiate between different resources: physical and digital, operand and operant. This distinction highlights that while digital resources can provide an initial competitive advantage, their value decays over time and so they cannot sustain competitive advantage without further innovation. This improves our understanding of the evolution of RBV-KBV research over the last 30 years as it has moved with the changing business context from product to service and physical to digital. This strengthens the links between RBV, KBV, and innovation, as the need for innovation to retain the competitive advantage of digital resources in service firms becomes clear. Thus, this paper brings a service perspective to RBV-KBV theory, which has increased in importance as developed economies have moved their emphasis from products to services, and in particular digital services.

5.1. Retainable competitive advantage

The VRIN analysis of a service perspective of resources (Figure 2) suggests that digital operand resources, such as data, can be expected to lose value over time, and so while they may provide competitive advantage in the short-term, they appear unlikely to provide long-term competitive advantage without regular renewal. Likewise, the value of digital operant resources, such as algorithms, can also be expected to decay over time, and so do not provide for competitive advantage over the long term without further innovation. Moreover, digital

operant resources may be substituted by similar algorithms or software over time, thus they possess some element of mobility that undermines Barney's pre-condition for imperfect mobility. This is due to their digital, technical nature that can be translated to a competitor firm more easily than translating the physical operant resources of dynamic capabilities from one firm to another, which are underpinned by the complexities of leadership, people, their relationships, networks, structures, processes, routines, cultures, and so on.

Thus, combining a service perspective with a Resource-Based View of digital firms enables us to see that their long-term competitive advantage lies not in their digital developments per se but in their physical dynamic capability to renew and refresh those digital developments – a retainable competitive advantage rather than a sustainable competitive advantage. Digital operand resources must be renewed on a timely basis to remain valuable while digital operant resources require innovation to remain relevant. When digital resources can successfully retain their value and remain rare, inimitable, and non-substitutable (albeit in a different form), then they can retain competitive advantage, as summarized in Figure 3.

Insert Figure 3 about here

5.2. The evolution of RBV-KBV research over the last 30 years

The service perspective of resources for competitive advantage in Figure 3 also informs our understanding of the evolution of RBV-KBV research over the last 30 years as it has moved with the changing business context from product to service and physical to digital. In the early years as presented in Pereira's & Bamel's (2021) analysis, the core themes of RBV

were set out with a focus on a product-centric, physical world (top left quadrant, Figure 3). As RBV was broadened to include knowledge transfer and KBV developed to include organizational learning, the focus shifted towards a service-centric physical world (top right quadrant, Figure 3). More recently, as digital developments became more significant, RBV-KBV theory developed alongside research on change and restructuring, including innovation (bottom left and bottom right quadrants, Figure 3). Thus, taking a service perspective of the changing focus on physical and digital developments over the past 30 years helps to explain why some research themes have strengthened while others fallen away over that time.

5.3. Strengthening the links between RBV, KBV, and innovation

The service perspective of resources for competitive advantage in Figure 3 also helps to strengthen the links between RBV, KBV, and innovation, moving from top left (classic RBV) to top right (classic KBV), to bottom right (innovation). The need for innovation to retain the competitive advantage of digital resources in providing services becomes clear, as sustainable competitive advantage in digital service firms relies on their physical dynamic capabilities based on knowledge-based resources, relating to aspects of leadership, people, their relationships, networks, structures, processes, routines, and cultures. Note that this does not necessarily hold true for digital product firms, where the IPR associated with some digital products may possess VRIN characteristics, and so provide the potential for sustainable competitive advantage - for example, the digital recordings of Elvis, David Bowie, or Taylor Swift, though the value of these exceptions may still decay over time.

In the physical world, VRIN operand resources, such as the Coca-Cola recipe, can provide sustainable competitive advantage, while in the digital world, physical operant resources can provide sustainable competitive advantage through the dynamic capability to refresh and

renew digital resources by the continuing capture of newly relevant operand resources and the ongoing innovation of operant resources as the external environment of markets and technologies change over time. Indeed, it can be argued that all firms, physical and digital, ultimately rely on operant resources, their dynamic capabilities, to sustain their competitive advantage. For example, even with the inherent operand value of the Coca-Cola recipe, Coca-Cola still has to continually develop their production and distribution systems to reflect new market dynamics, technological progress, changing legislation, and so on. This ultimate reliance on operant rather than operand resources reflects the fact that all firms are expected to fail eventually, as recognized by one of the main protagonists involved in digital services, Amazon founder and Executive Chair, Jeff Bezos: *"I predict one day Amazon will fail. Amazon will go bankrupt."* Hamilton, (2018).

In a physical world, a Ricardian view based on operand resource capacity for competitive advantage may be considered more important than a Schumpeterian view (better to have the Coca-Cola recipe on which to build capability); while in a digital world, a Schumpeterian view based on operant resource capability becomes imperative (the need to renew and refresh digital resources). Hence, the focus on innovation of the big tech firms.

For digital services, the strategic focus is less on capturing resources and more on utilizing resources to capture relationships - hence the success of the platform ecosystem approach. Curado and Bontis (2006) noted that KBV integrates this Ricardian view of resource possession with the Schumpeterian view of resource reconfiguration. This paper develops this view through the lens of a service perspective of digital firms by delineating between resource capacity (possession) and resource capability (reconfiguration). In digital services, similar digital resources are available to many firms, while relatively few have the capability to provide long-term value. This further emphasizes the importance of the development of

KBV beyond the initial RBV perspective, as highlighted by Herden (2020). While knowledge as a resource provides capacity for competitive advantage, it is the knowledge to organize those resources that enables the dynamic capability to innovate and so move towards a sustainable competitive advantage. Such innovation may be developed internally or through acquiring other firms with new capabilities. Hence, the $19 billion purchase of WhatsApp by Facebook, and Google's more than 200 acquisitions over the last decade is part of what enables these companies to continue to develop their services and so retain their digital competitive advantage. Thus, the value created through the firm's network of relationships with customers, suppliers, and owners (Furseth & Cuthbertson, 2016), is based on the resource capability of the firm to organize their capacity of resources, as summarized in Figure 4.

Insert Figure 4 about here

The Value-Capability-Capacity Triangle (Figure 4) helps extend the thinking of Barney, 1991; Makadok, 2001; and Varadarajan, 2020, by emphasizing that a firm is a collection of physical and human capital providing the capacity for innovation and value. It is the organizational capital that provides the capability of the firm to manage this collection of physical, human, and digital capital to create value and thus any competitive advantage. This builds on the work of Amit & Schoemaker (1993) and Helfat & Peteraf (2003) who both recognized this distinction between capabilities and assets (resource capacity).

Moreover, this analysis differentiates between: physical, operand, VRIN resources that

provide the capacity for sustainable competitive advantage; physical, operant, VRIN resources that provide the dynamic capability for sustainable competitive advantage; digital, operand, VRIN resources that provide the capacity for retainable competitive advantage; and digital, operant, VRIN resources that provide the capability for retainable competitive advantage Thus, competition between digital service firms cannot be based on digital resources alone; it is their dynamic capability to manage such resources to create value that provides any sustainable competitive advantage.

5.4. Filling the service gap in RBV-KBV theory

This paper has aimed to bring a service perspective to RBV-KBV theory, particularly in the light of digital developments that have increased the importance of such a perspective. The differentiation between operand and operant, physical and digital resources helps us to recognize the importance of innovation to competitive advantage in digital service firms and the importance of stability to competitive advantage in physical product markets.

The contrasting examples of Exxon and Alphabet (Google) highlight these differences in practice. While Exxon's competitive advantage is sustainable through stability, the acceptance of climate change and the subsequent need to move away from a dependence upon oil is now eroding their past advantages. Meanwhile, Alphabet's competitive advantage is based on continual change and their ability to innovate in a more relevant way than their competitors (or to acquire those companies that are innovating in a more relevant way).

In this changing world, the role of traditional physical resources in RBV continues. For example, in transport, we are in the process of replacing a dependency on oil with a dependency on those rare earth metals required for electric vehicle battery production. Those firms with control over these rare earth metals will have a sustained competitive advantage

over the coming years, without further radical innovation. Meanwhile, knowledge and innovation will play an increasingly important role as the global economy shifts from products to services and physical to digital resources.

6. Conclusions and limitations

This paper has attempted to respond to Pereira's & Bamel's (2021) call to understand how the Resource- and Knowledge-Based Views can be applied in the context of new and disruptive technologies. RBV-KBV continues to be relevant today. This paper considers whether a service perspective of digital resources helps to inform past and future developments of RBV-KBV theory. In doing so, this paper provides further clarification on the role of resources, knowledge, and innovation by identifying resources as physical or digital, operand or operant. Resources based on capacity may sustain competitive advantage in a physical world, but in a digital world, knowledge and dynamic capabilities are required to refresh and renew the digital resources that underpin the necessary network of relationships required for sustaining competitive advantage. The core assumptions of RBV, heterogeneity and immobility, do not exist for long in a digital service environment without innovation. Competitive advantage may be created and retained through digital resources but sustained competitive advantage for service firms relies on the physical resources that provide the dynamic capabilities to innovate in order to further develop those digital resources.

This paper seeks to extend RBV-KBV theory to recognize the greater importance in a digital world of developing organizational capital over physical, human, and digital capital per se. i.e. the importance of utilizing resources for innovation rather than the possession of resources by themselves. So, while digital firms rely on technology and data for creating and retaining competitive advantage, it is their dynamic capability in the physical world that is

vital to sustaining competitive advantage. Taking a service-based perspective enables managers to recognize that digital resources may be valuable, rare, inimitable, and non-substitutable in the short-term but can be expected to decay over time. Hence, competitive advantage may be created and retained through digital resources but sustained competitive advantage relies on the physical operant resources that provide the dynamic capabilities to innovate and so further develop those digital resources.

There are many limitations to this research as it has focused on a particular (service) perspective of a particular type of firm (digital). However, these firms are becoming dominant in many marketplaces outside their traditional (technology) Industrial Organization boundaries. This raises many important questions for further research. With such apparently broad dynamic capabilities, what are the boundaries to their activities? What are the organizational and managerial implications of their need to continually refresh and renew to sustain competitive advantage? What are the competition policy implications of the barriers to exit for existing customers? What are the public policy implications for mergers and acquisitions? What does this mean for firms, customers, and suppliers currently outside of this group of firms?

7. References

Adner R. 2006. Match your innovation strategy to your innovation ecosystem. *Harvard Business Review, 84:4,* 98-107.

Adner R. 2017. Ecosystem as structure: An actionable construct for strategy. *Journal of Management, 43:1,* 39-58.

Adner, R., & Kapoor, R. 2010. Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal, 31,* 306-333.

Amit, R., & Schoemaker, P. J. H. 1993. Strategic assets and organizational rent. *Strategic Management Journal, 14:1,* 33–46.

Arend, R. J., & Lévesque, M. 2010. Is the resource-based view a practical organizational theory? *Organization Science, 21:4,* 913-930.

Bain, J.S. 1956. *Barriers to new competition. Their character and consequences in manufacturing industries.* Harvard University Press.

Bain, J.S. 1968. *Industrial organization*. John Wiley & Sons, Hoboken.

Barney, J. 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management, 17,* 99-120.

Barney, J. 1995. Looking inside for competitive advantage. *Academy of Management Perspectives, 9,* 4.

Barney, J. 2001. Is the resource-based "view" a useful perspective for strategic management

research? Yes. *Academy of Management Review, 26,* 41-56.

Barney, J., Della Corte, V., Sciarelli, M., & Arikan, A. 2012. *The role of resource-based theory in strategic management studies: Managerial implications and hints for research.* In Dagnino, G. B. (Ed.), *Handbook of research on competitive strategy,* 109-146. Northampton, MA: Edward Elgar Publishing, Inc.

Barney, J., Ketchen, D. J., & Wright, M. 2021. Resource-based theory and the value creation framework. *Journal of Management, 47:7,* 1936-1955.

Barney, J., Wright, M., & Ketchen, D. J. 2001. The resource-based view of the firm: Ten years after 1991. *Journal of Management, 27,* 625-641.

Barrett, M. & Orlikowski, W. 2021. Practice-Based Studies of Contemporary Digital Phenomena. *MIS Quarterly, 45:1,* 467-472.

Brandenburger, A. M., & Stuart, H. W. 1996. Value-based business strategy. *Journal of Economics & Management Strategy, 5,* 5-24.

Curado, C., & Bontis, N. 2006. The knowledge-based view of the firm and its theoretical precursor. *International Journal of Learning and Intellectual Capital, 3:4,* 367–381.

Cusumano, M. A., Gawer, A., & Yoffie, D. B. 2019. *The Business of platforms: Strategy in the age of digital competition, innovation, and power.* New York, N.Y: HarperCollins Publishers.

Darroch, J. 2005. Knowledge management, innovation and firm performance, *Journal of Knowledge Management, 9:3*, 101-115.

~~D'Oria, L., Crook, T. R., Ketchen, D. J., Sirmon, D. G., & Wright, M. 2021. The evolution of resource-based inquiry: A review and meta-analytic integration of the strategic resources-actions-performance pathway. *Journal of Management, 47:6,* 1383-1429.~~

Dyer, J. H., & Singh, H. 1998. The relational view: Cooperative strategy and sources of inter-organizational competitive advantage. *Academy of Management Review, 23:4,* 660-679.

Dyer, J. H., Singh, H., & Hesterly, W. S. 2018. The relational view revisited: A dynamic perspective on value creation and value capture. *Strategic Management Journal, 39:12*, 3140-3162.

Eisenhardt, K. M., & Santos, F. M. 2002. Knowledge-based view: A new theory of strategy. *Handbook of Strategy and Management. 1:1,* 139-164.

Furseth, P. I., & Cuthbertson, R. 2016. *Innovation in an advanced consumer society*. Oxford University Press.

Grant, R. M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*, 109-122.

Grant, R. M. 1997. The knowledge-based view of the firm: Implications for management practice. *Long Range Planning, 30:3,* 450-454.

Hagel III, J., & Brown, J. S., & Davison, L. 2008. Shaping strategy in a world of constant disruption. *Harvard Business Review, October,* 1-10.

Hamilton, I, A. 2018. 'I predict one day Amazon will fail. Amazon will go bankrupt': Jeff Bezos makes surprise admission about Amazon's life span. *Insider*. Nov.16, 2018.

Helfat, C.E. & Peteraf, M.A. 2003. The dynamic resource-based view: capability lifecycles. *Strategic Management, 24:10,* 997-1010.

Herden, T. T. 2020. Explaining the competitive advantage generated from analytics with the knowledge-based view: The example of logistics and supply chain management. *Business Research, 13:1,* 163–214.

Iansiti, M., & Levien, R. 2004. Strategy as ecology. *Harvard Business Review, 82:3,* 68–78.

Kallinikos, J., Aaltonen, A., & Marton, A. 2013. The ambivalent ontology of digital artifacts. *MIS Quarterly, 37:2,* 357-370.

Klijn, E., & Koppenjan, J. 2000. Public management and policy networks: foundations of a network approach to governance. *Public Management, 2:2,* 135–158.

Koch, T. & Windsperger, J. 2017. Seeing through the network: Competitive advantage in the digital economy. *Journal of Organization Design, 6:6,* 1-30.

Kohtamäkia, M., Paridac, V., Oghazie, P., Gebauerf, H., & Bainesi, T. 2019. Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research, 104*, 380–392.

Kogut, B. & Zander, U. 1992. Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science, 3:3*, 383-397

Kraaijenbrink, J, Spender, J.C., & Groen, A. J. 2010. The resource-based view: A review and assessment of its critiques. *Journal of Management, 36,* 349-372.

Law, J., & Urry, J. 2004. Enacting the Social. *Economy and Society, 33:3,* 390-410.

Lockett, A., Thompson, S., & Morgenstern, U. 2009. The development of resource-based view of the firm: A critical appraisal. *International Journal of Management Reviews, 11,* 9-29.

Low, K. Y. J & Ho, E.-C. 2016. A knowledge-based theory of the multinational economic organization. *Long Range Planning, 49:6,* 641-647.

Lusch, R. & Nambisan, S. 2015. Service innovation: a service dominant logic perspective. *MIS Quarterly, 39:1,* 155-175.

Mahoney, J. T., & Pandian 1992. The resource-based view within the conversation of strategic management. *Strategic Management Journal, 13,* 363-380.

Makadok, R. 2001. Toward a synthesis of the resource-based and dynamic-capability views of rent creation. *Strategic Management Journal, 22:5,* 387–401.

Mason, E.S. 1939. Price and production policies of large scale enterprises. *The American Economic Review, 29,* 61-74.

Moore, J. F. 1993. Predators and prey: a new ecology of competition. *Harvard Business Review, 71:3,* 75–86

Nambisan, S., & Baron, R. A. 2021. On the costs of digital entrepreneurship: role conflict, stress, and venture performance in digital platform-based ecosystems. *Journal of Business Research 125,* 520–532.

Nambisan, S., Lyytinen, K., Majchrzak, A. & Song, M. 2017. Digital innovation management: reinventing innovation management research in a digital world. *MIS Quarterly, 41:1,*

223-238.

Nicas, J. 2018. Apple and Samsung End Smartphone Patent Wars. *New York Times*. June 27, 2018

Oliver, C. 1997. Sustainable competitive advantage: Combining institutional and resource-based views. *Strategic Management Journal, 18,* 697-713.

Penrose, E. T. 1959. *The theory of growth of the firm.* New York: John Wiley.

Pereira, V. & Bamel, U. 2021. Extending the resource and knowledge based view: A critical analysis into its theoretical evolution and future research directions. *Journal of Business Research, 132,* 557–570

Peteraf, M. A. 1993. The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal, 14,* 179-191.

Porter, M. E. 1980. *Competitive strategy. Techniques for analyzing industries and competitors.* New York: Free Press.

Porter, M. E. 1985. *Competitive advantage. Creating and sustaining superior performance.* New York: Free Press.

Priem, R. L., & Butler, J. E. 2001. Is the resource-based "view" a useful perspective for strategic management research? *Academy of Management Review*, *36,* 22-40.

Priem, R.L. & Swink M. 2012. A demand-side perspective on supply chain management. *Journal of Supply Chain Management, 48:2,* 7-13.

Ramirez, R., Selsky, J.W., & van der Heijden, K. (Ed.s) 2008. *Business planning for turbulent*

times: new methods for applying scenarios. Earthscan, Taylor & Francis.

Sullivan, D. 2019. How we keep Search relevant and useful. *Google official blog.* https://blog.google/products/search/how-we-keep-google-search-relevant-and-useful/ Accessed August 2, 2021

Teece, D., Pisano, G. & Shuen, A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal, 18,* 509-533.

Teece, D. 2001. The role of managers, entrepreneurs, and literati in enterprise performance and economic growth. *International Journal of Technological Learning, Innovation, and Development, 1,* 43-64.

Varadarajan, R. 2020. Customer information resources advantage, marketing strategy and business performance: A market resources-based view. *Industrial Marketing Management, 89,* 89-97.

Vargo, S. L., & Lusch, R. F. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing, 68,* 1-17.

Vargo, S. L., & Lusch, R. F. 2016. Institutions and axioms: An extension and update of service-dominant logic. *Journal of the Academy of Marketing Science, 44,* 5-23.

Velu, C., Barrett, M., Kohli, R., & Oliver, T. 2013. *Thriving in open innovation ecosystems: towards a collaborative market orientation*. Cambridge

Wan, W. P., Hoskisson, R. E., Short, J. C., & You, D. W. 2011. Resource-based theory and corporate diversification: Accomplishment and opportunities. *Journal of Management, 37,* 1335-1368.

Wernerfelt, B. 1984. A resource-based view of the firm. *Strategic Management Journal, 5,* 171-180.

Yang S. & Tu C. 2020. Capital and new product quality in high tech startups - an examination in two environmental contexts*,* *Innovation*, *22:1,* 39-55.

~~Yoo Y., Henfridsson O. & Lyytinen K. 2010. The new organizing logic of digital innovation: An agenda for information systems research. *Information Systems Research, 21:4, 724-735.*~~

Zhu, F. & Iansiti, M. 2019. Why some platforms thrive and others don't. *Harvard Business Review, 97:1,* 118-125.

FIGURE 1: A service perspective of resources

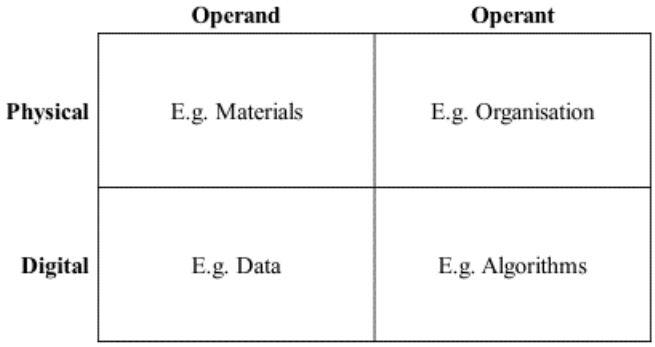

FIGURE 2: A service perspective of resources: VRIN analysis

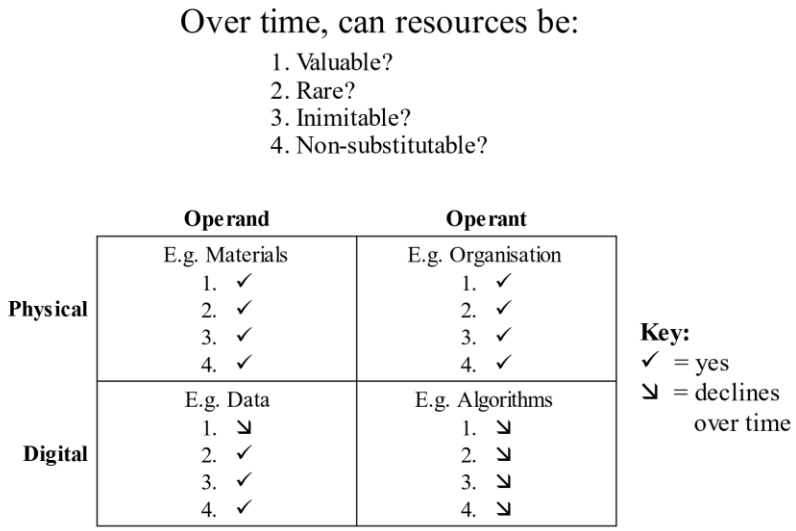

FIGURE 3: A service perspective of resources: potential for competitive advantage

FIGURE 4: Value-Capability-Capacity Triangle