




'It's a natural drift alright': From needs-based demand to technology-driven demand in business



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Dates:

Received: 16 Mar. 2023
 Accepted: 09 May 2023
 Published: 30 June 2023

How to cite this article:

Stone, P., Goldman, G.A. & Thomas, P., 2023, "It's a natural drift alright": From needs-based demand to technology-driven demand in business', *Acta Commercii* 23(1), a1143. <https://doi.org/10.4102/ac.v23i1.1143>

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Orientation: It is apparent that the conventional view of business ideas being born out of the needs of society is being re-conceptualised with the introduction of new technologies and as the business environment increases in complexity.

Research purpose: This study set out to understand how rapid advances in technology have impacted the basic assumptions for business demand, as expressed in, for example, van der Heijden's Business Idea model, and to comprehend how these assumptions have changed over time.

Motivation for the study: This study stems from an intention to comprehend how technology has become a creator of demand.

Research design, approach and method: An interpretive, grounded theory approach was followed, soliciting views from 14 senior-level managers of a global, technology-driven company by using semi-structured interviews. Interviews were analysed using a three-stage coding process. This involves subjecting data to open coding, axial coding, and selective coding.

Main findings: The analytic process revealed four themes: (1) business and demand, (2) business competitiveness, (3) technology and society and (4) technology and customers. Engagement with these themes revealed that technology is changing the nature of business models, business strategy and business processes. The pace of technological development has given rise to dynamic marketplace changes, where companies use new technologies to develop innovative product offerings that lead to more dynamic business models, processes and structures. In so doing, technology has become a driver of demand.

Practical/Managerial implications: Business leaders should take note that technological changes have a potential impact on the future strategy of companies, as this requires an alignment of these changes with supporting business processes.

Contribution/Value-add: With cognisance of the central role technology is playing in the contemporary business environment, as a driver of demand, this study proposes a technology-driven demand (TDD) framework, as a re-evaluation of van der Heijden's Business Idea model.

Keywords: technology; demand; innovation; business model; disruption.

Introduction

According to Van der Heijden (1996), business ideas (BIs) start with understanding the needs and requirements of society. This, in turn, creates demand for certain products and services to fulfil these needs and requirements. Typically, businesses act upon these manifested needs and requirements to develop products and services that satisfy the associated demand created. However, it would seem as though this 'conventional' outlook is being transformed with the advent of new technologies and as the business environment becomes ever more complex (Reyes, Visich & Jaska 2020). Technology is ostensibly viewed as a potential creator of demand and therefore also of product offerings and business opportunities. Responding to new opportunities in the contemporary business environment is associated with high levels of uncertainty in finding suitable strategies to integrate new value propositions with business processes (Bui & Villiers 2017).

Optimising the value creation potential of change necessitates both identifying and adapting key business processes. Van der Heijden's (1996) seminal BI model seeks to understand the interrelatedness of business processes. The BI model depicts a causal system, seen for many years

Note: 'It's a natural drift alright' is a lyric excerpt from 'The Paradigm Shift' (1994) by Alphaville.

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as relevant in describing business sustainability elements, and demonstrates how value is created for the market by developing products in response to customer needs. This gives the company a distinctive competency and competitive advantage with increased revenue and profits. The model describes invention as a response only when customer needs are recognised. The applicability of this model has been well-documented (Amer, Daim & Jetter 2012; Brown 2007).

Innovation and invention for the satisfaction of customer needs have been the basic impetus for business since the development of trade. However, the advent of new technologies has seen organisations introducing technologies as cell phone manufacturers do to their product offerings that act as a 'push' to the market, in contrast to societal needs, which have always acted as a 'pull' to the market. This push to market posits a technologically driven demand, whereby customer demand is influenced by technological innovation, intensified by the speed of technological advancement, which suggests that technology can create business demand (Dieuaide 2018), not merely fulfil customer needs. Adapting to the dynamic associations between technology, customer needs and business processes is complex, as it often alters companies' external and internal systems (Moşteanu, Faccia & Cavaliere 2020). Technology integration into business processes allows businesses to seek personalised solutions for customers, anticipating and creating needs before customers realise them for themselves (Kohtamäki & Rajala 2016). This study highlights the necessity for a framework that emphasises keen awareness of developing products and services customers have not asked for, as well as managing the associated risks. The relevance of such a framework will depend on concurrently optimising concomitant business processes. This requires re-evaluating the applicability of the BI model in an evolving world in which technology plays a greater role than ever before. To understand the association between business processes and this new phenomenon of technology-driven demand (TDD), a more relevant model should recognise that TDD impacts business processes in their entirety (Dincer & Yüksel 2020).

Understanding how to strategically implement digital technologies to develop internal and external collaborative knowledge platforms would allow businesses to innovate new products and services that create customer demand such as happens with mobile technology features advancement on cell phone models. Alignment between businesses and industries to create a technology strategy to address future needs is recognised as a key driver of company performance (Diez-Olivan et al. 2019). Co-creation by internal and external collaboration allows for multiple avenues for customer value creation, with multiple inputs at every stage of the process (Chatterjee, Rana & Dwivedi 2021). The concepts of collaboration (working with others to achieve an end goal), continuous innovation (incremental upgrades to existing products and services) and distinctive competencies (competencies that set a business ahead of its competitors) emerged as key aspects of the study and are central in the study's aim to reconstruct a framework for TDD.

The present study made use of a qualitative case study design and grounded theory analysis. The case organisation was a technology- and engineering-driven manufacturing company (referred to as Company X in this article to respect the company's wish to remain anonymous) established over 30 years ago. Part of a global holding company, over the past 10 years, Company X has established 11 subsidiaries around the world, creating a global presence, with a manufacturing facility in Europe which is key to their success.

Company X sees itself as a technology-driven business that leads its business transformation inventing specialised, bespoke, intelligent and inimitable electrical heat tracing (EHT) systems (industrial temperature control for transportation, storage and usage of mediums in production processes) and solutions for any industry requiring them. These include the power generation, oil and gas, chemical, pharmaceutical, food and beverage, automotive, measurement and control technology, construction technology, security technology, medical engineering and life science, infrastructure and logistics technology and energy and environmental engineering industries. Maintaining a complete system at a certain temperature requires a well-developed engineering and design department that constantly identifies the latest technologies available. Company X has continuously evolved EHT technology and unique solutions that customers aggressively adopt; in other words, it uses new technologies to create distinctive business competencies for others and, in so doing, improves demand for its own products, services and systems. Through the application of TDD, Company X has improved demand for its products by offering new technologies. This in turn has assured the company's position through highlighting inimitable competencies to its market, making for a very competitive edge.

Rationale for the study

As previously stated, conventional thinking (as underscored by the BI model) describes how demand originates and how product offerings are developed to meet this demand. Against the backdrop of the preceding discussion, this study identifies and delves into the research problem that this conventional thinking is no longer entirely true, given the exponential rate of technological proliferation and disruptive changes that typify the contemporary business environment. It is apparent that demand is also fuelled by technology itself with examples such as artificial intelligence (AI) finding uses from consumers such as intelligent assistance or the metaverse connecting people in a virtual world. This is coupled with the ability of companies to use technology to develop product offerings and improve the way things are handled in the market that is not yet, seen as a scarcity.

Stemming from this research problem, the study endeavours to answer the following research question:

How have rapid advances in technology necessitated a rethinking of how companies develop their business processes in pursuit of opportunities, where technology is the main agent in developing product offerings that are taken to market?

To answer this research question, the following research objective is posed:

To understand how technology has become a creator of demand by creating need.

This article focuses on the BI model of van der Heijden (1996) and attempts to comprehend how the landscape of business has changed because of technological advancements to the extent that the basic assumptions that were prevalent when van der Heijden's model was developed need to be re-evaluated.

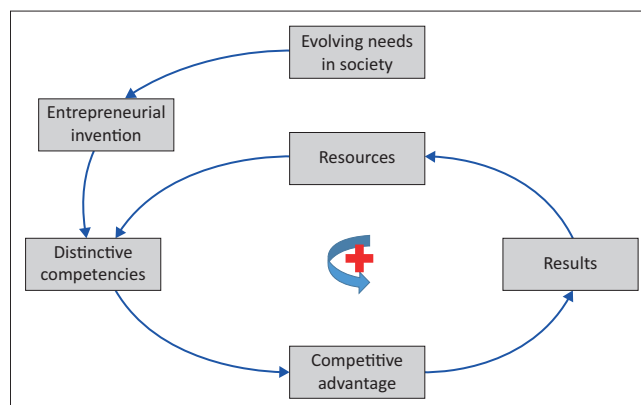
Literature review

Rapid advances in technology are changing the way business is conducted, as companies constantly face new challenges. Companies need to comprehend the extent of this technological revolution, as it necessitates the implementation of new processes, business models and strategies (Aagaard, Andersen & Presser 2019). Through revolutionary technologies, the Fourth Industrial Revolution (4IR) is creating change in all forms of business because of new advances in interconnectivity via the Internet and automation that keeps tasks running in a business without human labour leading to this new industrial era.

Societal needs and wants

Technology has given consumers access to a global market by facilitating purchases online; customer needs are also being transformed by recognising what they do not have by exposure to advanced technologies. Digital innovations in product and service offerings are exposing customers to new and innovative technologies, which are altering their needs. We no longer physically enter a bank to conduct daily banking; we order food and groceries online for doorstep delivery; we book taxis through an app, and the predetermined fare is deducted directly from our bank account. All these developments have changed customer needs and expectations. Many of these innovations emanated from companies that possessed the technology to develop product offerings from which the customer would derive value. This, in turn, created a demand for these and similar offerings in the market.

Conventional thinking has always dictated that product offerings are born out of scarcity in the market (customers express definite needs that are not yet catered for), which is the impetus for entrepreneurial initiative (companies act upon these needs to develop product offerings), which starts with understanding the evolving needs of society. Demand is therefore centred in the customer. Van der Heijden's (1996) BI model (Figure 1) employs this underlying logic. The BI model describes how companies create value by inventing a product, giving the company a distinctive competency, resulting in a competitive advantage that should create value through increased revenue. The BI model shows a strong association between evolving needs of customers and entrepreneurial invention. Thus, as the needs of customers change, so too do the company's entrepreneurial initiatives.



Source: Van der Heijden, K., 1996, *Scenarios: The art of strategic conversation*, John Wiley and Sons Ltd., Chichester

FIGURE 1: The business idea model.

The changing business landscape

The Fourth Industrial Revolution has the potential to reduce barriers between inventors and markets through new technologies, such as three dimensional (3D) printing (Westerman & Bonnet 2015). Changes resulting from 4IR are taking place so rapidly that companies cannot ignore their impact. Companies are using digital technology to co-create innovative products and services that integrate digital technologies and are revolutionising their markets and industries, leading to new business models, processes and structures that can enable TDD (Gurbaxani & Dunkle 2019; Jurgielewicz 2019; Yunis, Tarhini & Kassar 2018). The Fourth Industrial Revolution and the rapid pace of technological developments such as drone development, machine learning and industrial robots to name a few, have an impact on the social construct and sustainable development of business, as social media develops new social concepts that present new business opportunities (Adamczyk et al. 2019; Betlej 2017).

The effect of disruptive innovation

When science and technology meet social and economic systems, a 'punctuated equilibrium' occurs (Mudambi & Swift 2011). This describes a rapid and disruptive evolutionary change after long periods of stability, but which settles into a new equilibrium. Examples include Gutenberg's printing press, urban electrification, the automobile and the internet. Each of these innovations disrupted a relatively stable society and changed the way society functioned at the time. The combination of globalisation and 4IR creates unlimited possibilities, with mobile devices connecting businesses, unprecedented processing power, storage capabilities and knowledge access. Emerging technological breakthroughs in AI, robotics, the internet of things (IoT), autonomous vehicles, 3D printing, nanotechnology, energy storage and quantum computing will enable companies to develop processes that will impact product offerings, their delivery and the overall sustainability of companies (Hermann et al. 2016).

The potential benefits of these disruptive innovations are vast and can impact the value chains of many sectors and industries, including defence, education, financial services,

healthcare, manufacturing, retail and telecommunications (Qiu et al. 2020). Porter and Heppelmann (2014) envision a world where smart, connected devices represent a dramatic change in the fundamental dynamics of competition. Here, for example, the IoT is not an instrument to leverage competitive advantage; it is an essential building block of business survival integrated into a company's systems, processes and products.

Fourth Industrial Revolution

This is a term coined by Schwab (2016), founder and chairman of the World Economic Forum. Schwab describes a world where individuals move between digital and physical domains by using connected devices to manage their lives. Of the many challenges companies face today, a pressing one is understanding and playing a constructive role in the technological revolution that has the potential to fundamentally transform the way humans live, work and relate to one another.

The IoT is expected to offer advanced connectivity of devices, systems and services that goes beyond machine-to-machine communications and covers a variety of domains (Holler et al. 2014). The interconnection of these devices is expected to usher in widespread automation, while also enabling advanced applications such as a smart grid, expanding to areas such as smart cities.

Leadership in the changing business landscape

Today's most successful companies are those that continually search for new and innovative processes and technologies that will allow them to adapt to the ever-changing business environment; examples include Amazon, Google, Apple and Facebook (Gimpel et al. 2018). This requires visionary leadership and an entrepreneurial mindset from those in charge of the companies (Govender 2019). Those who do not embrace change or have a strategic vision of opportunities for operational and product improvements will most likely experience a loss of market share, revenue and profits.

Technology-driven demand

The concept of TDD is best understood as adapting and improving business systems through the application of new technology (Saleh & Dalla 2020; Güncan & Durdu 2020). The dynamic development of technology is replacing the traditional societal demand for the supply of economic goods and services. Technology-driven demand is the basis for companies' implementing certain types of technologies to create demand for the products and services of the company; this creation of demand results in the development of further technologies (He et al. 2019) or the fusion of technologies (Xu, David & Kim 2018).

Technology in the contemporary business environment is not only changing business and major trends in society, but these new capabilities associated with new developments of technology are also impacting upon business processes.

Thus, the impact of technology on business is more pervasive than ever, affecting every aspect of the company, including information technology (IT), business strategy, business processes and the business model (Dincer & Yüksel 2020). The strategic direction of companies needs to reflect this and enable companies to develop platforms that allow collaboration to improve the customer experience (Chen 2017). Technology allows companies to collect and analyse data, to identify and forecast trends that drive innovation. Technology allows companies to engage customers and suppliers in content development, creating stronger associations and potential competitive advantage.

One can conclude that the world has ostensibly changed as van der Heijden presented his BI model. The nature of business and the role that technology plays in business have adapted to an environment dominated by technological advances. In this digital era, the demand outlook has also altered, and technology is increasingly being utilised to create demand, as opposed to the conventional view of acting upon the evolving needs of the market to create demand.

Research methods and design

The University of Johannesburg granted ethical clearance for the study, and research participants were assured that all data gathered would be treated with the necessary sensitivity and that responses would remain anonymous. Each participant signed a participant consent form agreed to by the University of Johannesburg ethics committee that highlighted opt-out at any time and audio-recording of interviews.

The study aimed to understand how rapid advances in technology have impacted the basic assumptions of business demand (e.g. as expressed in van der Heijden's BI model) and how these assumptions have changed over time. Thus, the study was essentially exploratory, which is typically well-suited to interpretivist inquiry (Neuman 2014).

A qualitative research approach was employed, as qualitative research is best suited to exploratory studies that want to ascribe meaning to social phenomena (Creswell 2014). A qualitative case study design was followed, as case studies allow for in-depth investigations of real-life phenomena in their natural settings (Yin 2014). In this instance, the impact of technology on business demand was observed from the perspective of Company X, which, as alluded to, is a technology-driven company.

Semi-structured interviews were conducted with 14 senior-level employees of Company X. These research participants were selected on a purposive basis according to the potential contribution they could make to the research. A further consideration in the selection of research participants was to provide a voice to several of the localities of Company X, including South Africa, three countries in Europe, two in Southeast Asia and one in North America. Although 20 interviews were originally planned, we achieved category

saturation (Goulding 2002) after 14 interviews and so decided not to engage in further interviewing. During the interviews, data were collected utilising the methods of audio-recording and note-taking. The notes captured non-verbal responses and the first author's thoughts during interviews (Fox & Bayat 2007). The recordings, complemented by the notes, served as the basis for the interview transcripts.

The transcribed interviews were analysed by means of grounded theory coding techniques. Grounded theory was used as an analytical process, as opposed to using it as a research design, because we wanted to position this study first and foremost as a case study and not as a grounded theory study.

Strauss and Corbin's (1990) analytical process was used in this study. This involves assigning initial data to a few tentative categories and continually adding new data to them while asking whether new data fit the parameters of the existing categories or whether new categories must be added. This process is referred to as constant comparison (Williams & Moser 2019). In the end, categories emerge from the data, rather than having a preconceived idea from the literature of what these categories should be (Glaser & Strauss 2014; Neuman 2014).

Strauss and Corbin's approach involves a three-stage coding process:

- *Open coding*: Involves inspection of data to break it down into units of meaning (Given 2016; Strauss & Corbin 1990). This happens by assigning labels (which eventually become categories) to concepts as they occur in the data. Open coding starts by deciding on what to code, that is, breaking data down into units of meaning (Struwig & Stead 2013), whatever these units might be. The most popularly used are sentences or paragraphs (De Vos et al. 2008), but in this research, it was decided to use groups of sentences to capture complete thoughts. The assigned labels are not rigid, as new ones are constantly added and existing ones are changed. In this study, the process of open coding resulted in a total of 608 labels being ascribed.
- *Axial coding*: In this stage, data are not only innovatively reconnected by making connections between categories but also scrutinised within each category in terms of the dimensions and properties that the category possesses (Scott & Medaugh 2017; Strauss & Corbin 1990). Therefore, it is not only the nature of each category that is scrutinised but also how categories link up with others (Scott & Medaugh 2017). In this study, the process of axial coding led to a further reduction to 14 categories.
- *Selective coding*: This implies the selection of pervasive core categories that link up with every other identified category and marks the origin of theory in the form of an 'essential narrative' developed from the findings (Saldaña 2013; Strauss & Corbin 1990). The essential narrative was based on four core categories (as follows) in this study.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Johannesburg Department of Business Management Research Ethics Committee (No. 2019BM84).

Results

As mentioned, data were gathered through semi-structured interviews with 14 research participants from seven of the 11 countries in which Company X operates. All participants were fully briefed on the aims of the research by the first author, who also furnished them with a copy of the interview guide for reference purposes. All interviews were audio recorded, and field notes were taken during the interviews to complement the recordings. Interviews lasted between 1 and 2 h each.

As mentioned, four core categories or themes emerged during the analytical process: (1) business and demand, (2) business competitiveness, (3) technology and society and (4) technology and customers. These form the basis of the ensuing discussion and will each be expounded upon, in turn. In the interest of brevity, a limited number of supporting excerpts from interviews are presented. More evidence is available from the authors upon request.

Theme 1: Business and demand

In this theme, it was practically evident that Company X's products and services must meet the needs of the customer and the industry to remain competitive. Participants agreed that the process of developing products and services is driven by technological advancements, as companies that embrace technology seem to be able to generate ideas and concepts that form the basis of new and innovative product offerings that are eventually put to market. Participants thought that demand was linked to technology in that technology has altered the way customer demand is created, stating that small companies can use technology such as 3D design and printing systems to offer innovative, unique products from these processes to create demand globally. Technology is seen as creating demand in both the business-to-consumer (B2C) and business-to-business (B2B) segments, the latter being seen as more complex and dependent on stakeholder technical skills.

Some participants mentioned that certain companies were established as a result of technology. The demand that exists for these companies' products and services exists solely because of developed technology. Amazon™ and Google™ were cited as examples. One participant felt very strongly that ideas are the starting point of innovative technologies that could be translated into products and services yet unknown, and therefore, ideas need to be nurtured and developed into new technologies. Participants also mentioned that 4IR and digital technologies are accelerating innovation and, in some instances, even fusing technologies. This has the potential to create new markets and business demand, as companies that make use of

first-mover advantage are dictating these new opportunities (Nanda et al. 2019).

Participants identified development in all aspects of the business as an important condition of international business success. Internal and external processes and systems should be improved to support new products and services. This idea of development centres on an expectation among research participants that associations with both internal and external stakeholders must improve for the deployment of innovative technology. These close associations are primarily with customers, understanding the customer's business and innovating to enhance the customer experience. These associations also include other role players that impact technology-driven companies, such as competitors, suppliers and the competitive environment. These associations are seen as an essential component in sustaining competitive advantage.

Most research participants opined that in current times, the notion of competitive advantage is assuming a more innovative stance. More specifically, the term 'innovation' was coupled to technologies that have a significant impact on business, such as social media, big data, cloud computing, digitisation, robotics, 3D printing and website development. Participants saw these innovations as a requirement for companies to offer value-added services and products that will trigger demand, as society may lack the ability to be creative and create demand for itself. Company X has applied technological innovation to develop products and services to open new markets for itself. Here, a significant association has been observed between technological innovation and income growth. Participants have stressed that innovation has impacted their business model, structures, processes, systems, products and services. All of these enhance the distinctive competencies of Company X.

The following excerpts from the interviews support the views expressed above:

'There are a number of companies that have created demand only because of technology. Amazon would not exist if it wasn't for technology. Google was formed on the back of the development of universities that created the internet to communicate. Technology-driven companies invest in university research and invest in knowledge so that they can develop technologies to stay ahead of the competition and to establish new business. The shift from companies using universities to develop technology to in-house development is driven by the increased demand of technology that companies need and the speed of new developments to remain competitive.' (Participant 6, Material Requirements Planning, Germany)

'Generate demand, not create. Create is when you have the Steve Jobs approach – revolutionise technology. Ideas drive innovation, which drives demand. There will be collective development. Technology enables innovation, and innovation creates demand.' (Participant 1, Director International Projects, Germany)

'Technology will require development of associations. It can be used to revolutionise the organisation and, if not, it could be the

demise. The speed of change will become faster.' (Participant 3, Managing Director, Canada)

'Innovation is created to drive the lifestyle of society. Society cannot drive demand as it will lack innovation and creativity.' (Participant 2, Managing Director, Asia Pacific)

Theme 2: Business competitiveness

Under this theme, participants reflected on aspects that impacted the competitive position of Company X and other technology-driven companies. Technological change is the main force that pervades this theme, as it is a reality in the business environment. When considering the competitive position of companies, a pivotal issue for management is how to manage this change and craft and implement a vision and strategy that integrates relevant technology as part of the essential being of a company.

Participants opined that companies understand the importance of certain technologies (e.g. AI, IoT and big data), and some companies have adjusted their strategy and implemented radical technology change that completely transformed the competitive advantages for the company. However, it followed from the interviews conducted, that many companies have not implemented new technologies that would reflect such a strategic shift. Participants shared that the strategy in Company X is to implement technologies that allow the company to compete in certain industries and certain projects. If technologies are not implemented, there is a risk of not remaining competitive. Participants also stressed the importance of the correct support structures being in place for success in implementing technologies, including dedicated human resources (HR) and functional structures. It was their view that strategy must be flexible enough to adapt to technological changes. Digital transformation involves changing company strategy and thus business structure, processes and capabilities (Gurbaxani & Dunkle 2019). This implies that technology is now seen as a strategic tool, not merely an operational one.

Most participants believed innovation and technology can be employed to improve current systems, which would ensure the development of new, innovative products and solutions. These new systems are viewed as being more engaging for customers, reinventing supply chains to provide the customer with a more customised product offering. Most participants were clear that the development of these 'sustainable systems' would support the company to achieve its goals, even if other technologies are causing disruptions in the market.

Participants also mentioned that seemingly unrelated concepts such as systems, technology, knowledge, associations, development and unique product offerings all contribute to the competitive potential and position of a company. Together with new developments in information and communications technologies (ICTs), company strategy is becoming less product or service focused and more information focused. Participants also felt that this digital development of business

will result in new business models, based on data-driven platforms, that will enable new ways of decision-making, using AI and big data. Competitiveness is seen as the ability to compete successfully in a market and to generate economic benefits in relation to competitors (Milusheva 2020). The competitiveness of a company is therefore a dynamic process that needs to be consistently analysed and reviewed to establish its position in the market relative to its competitors (Fagerberg, Srholec & Verspagen 2010).

Participants reiterated that technology-driven companies need to constantly change and improve existing processes and products to maintain or develop their market positions to survive. Technology and innovation are thus pivotal in contributing to business advantage, which occurs best when a company creates a positive, self-reinforcing loop, increasing income and market share by using technologies to create unique products and services that attract customers (Ranjith 2016). Participants felt that Company X had a business advantage, as the company innovates solutions for problems customers do not necessarily know they have but realise upon seeing the created solution.

The following quotes from the interviews support the views above:

'Companies are becoming more productive and more innovative. Technology improves connectivity to the customer and sharing of information. Key client relations are developed and possible using certain technologies; changing mindset, people and technology and the structure must be the vision and strategy or companies will close.' (Participant 10, Business Development, Germany)

'Technologies are in every aspect of business and used to optimise the business, innovate products, differentiate, improve systems, improve communications and establish associations.' (Participant 4, Managing Director, Italy)

'Systems that will co-create – no brochures, catalogues, or data sheets – just a device with a screen and the customer can create and configure what they want with your company and your products.' (Participant 3, Managing Director, Canada)

'Improve processes, increase output and make companies more visible in the world. Very small companies can use technology to make themselves global. Even football clubs in Spain are using technology to develop strategies per opposition game.' (Participant 11, Global Projects Director, Spain)

Theme 3: Technology and society

This theme takes a slightly broader look at the impact of technology. The impact of technology on the markets and consumers of technology-driven companies is explored, as well as how society relates to technology in general.

Participants agreed that technology-driven companies develop innovative products and services for existing customers. They added that companies are using technology to develop products and services that create new markets and new demand, for example, by developing technological add-ons to existing systems, thereby converting them into intelligent products or systems. Thus, technology will

enable new product offerings that will unlock unexplored and unknown needs and requirements in customers, thereby creating demand. Uber, Google and Apple, among others, are creating products and using technology to offer revolutionary services and products, thereby creating new demand. This process is extending the companies' offering to the market, which improves competitiveness (Chuang, Morgan & Robson 2015).

Participants also see the 4IR as something that has the potential to fundamentally change the way technology-driven companies operate, using technologies such as IoT, which impacts the way people go about their lives in a personalised relationship with technology. This has had a generational influence, and participants mentioned that society has developed a culture that purchases and consumes technology, not because it is needed but because it is fashionable and has become part of daily life.

This is especially true of Generation Z, who grew up and identify with technology (Gaidhani, Arora & Sharma 2019). Generation Z is entering the workplace with new worldviews, different approaches to previous generations and different expectations as customers, employees and citizens. Companies therefore need to develop cross-generational strategies to develop values that will ensure that each generation contributes to the business goal (Knoll 2014).

Herewith excerpts from the interviews to support the views above:

'Innovation will create technologies that will change products and systems and needs.' (Participant 10, Business Development, Germany)

'Technology can mimic human behaviour, radical changes over the past 20 years. Making life simpler and a basis for creativity. AI will go through its own change and include things like culture and emotion.' (Participant 1, Director, International Projects, Germany)

'Technology will continue to evolve, and it will change lives and business, causing redundancy in certain sectors but, at the same time, establish opportunities for business and society. Generations X, Y or Z need to be studied. Certain people will need to upgrade their skills, which will become a challenge for governments in the world.' (Participant 2, Managing Director, Asia Pacific)

'Certain technologies that work in the USA will not work in Germany, like drone medication deliveries. In the USA, it is being implemented and tested, but in Germany it will take years, possibly decades, to implement this. There is an impact of culture and countries and regulations. The fully autonomised vehicle could be launched in the USA or China in 5 years, but in Germany it would probably take 20 years, purely because of the culture of Germany and the regulatory system.' (Participant 6, Material Requirements Planning, Germany)

Theme 4: Technology and customers

It was found that participants believed that technology impacts the entire supply chain and how companies and customers relate to one another. The areas of business in which technology seems to be making the greatest impact are in technologies that improve internal business processes, customer satisfaction,

internal and external communication and collaboration to innovate and develop new products (Lekovic & Bobera 2018).

Research participants unanimously agreed that digitisation shapes technology's influence on customers. Participants viewed digitisation as the biggest driver of business change currently, as it presents new avenues to define inimitable competitiveness. Innovation through digital technologies is seen as having a profound impact on the association between business and the customer, driving aligned improvement of the competencies of a company. Digitisation is thus seen as a driver of innovation in business, a sentiment echoed by Li, Hou and Wu (2017). Participants with technical know-how opined that the implementation of smart intelligent systems (SiS), communicating and computing through IoT (Stojkoska & Trivodaliev 2017) would allow companies to develop even more innovative strategies and business models, resulting in distinctive competencies.

Most of the participants were also of the opinion that technology, in the form of AI, will increasingly be used to enhance processes and systems, and that companies will form networks of intelligent self-organising systems. At a societal level, participants noticed a shift in societal values regarding the acceptance of such technological advancements, leading to cultural adaptation or possibly a backlash toward technology, which will have implications for business. This is a view shared by Adamczyk et al. (2019).

The following excerpts from the interviews support the views expressed above:

'Technology can and will increase the demand for a product or service. If our product with certain technologies can offer a new service like remote monitoring, this will create global demand across a wide variety of industries. The industries don't want to do the R&D themselves; they just want a product that helps them do better. Technology can improve speed to market of new innovations that provide new business opportunities for customers and the business's close association with the client, sharing and supporting this new technology opportunity, which will increase demand.' (Participant 3, Managing Director, Canada)

'Just like the iPhone created demand, new heating systems for Company X can collect data and sense and advise on changes needed to balance systems. This will create customer demand. Technology will create new disciplines and new business processes that will be influenced by business employees' ideas for technology application. Technology with product and innovation will create demand.' (Participant 7, Sales Director Customer Effort Score Manager, Germany)

'[... A]re the introduction of software systems to improve data analysis and client information, which creates demand. The introduction of technology maybe didn't result in a new product but maybe a different and more of.' (Participant 8, Information technology Manager, Germany)

'The development of social media has changed society to be more like a robot. There is no human communication, it is done via technology. Technology is changing the entire world; there are no differences in age or society.' (Participant 4, Managing Director, Italy)

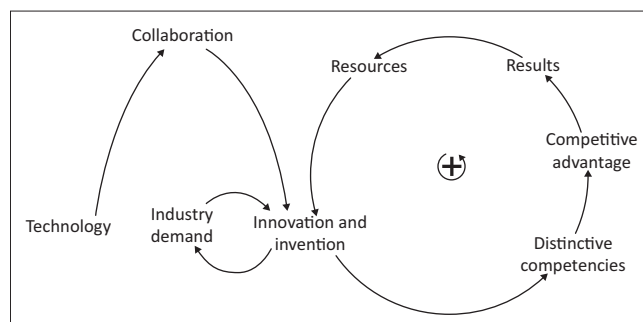


FIGURE 2: The technology-driven demand framework.

Presenting the technology-driven demand framework

The analytic process described led to the development of the TDD framework (see Figure 2). Figure 2 is a causal loop diagram showing a high-level perspective of influences in TDD, as they interact. This framework recognises the central role of technology in contemporary business organisations, especially those that are technology driven. The TDD framework can also be seen as a re-evaluation of van der Heijden's 1996 BI model, accounting for rapid advances in technology since then. The TDD framework acknowledges that products and services are developed based on new, evolving technologies to push the product offering to the market, as opposed to the traditional 'pull' view upon which the BI model was based.

The TDD framework is based on the technology implemented and used in companies to collaborate on and co-create products and services, thereby creating demand. It relies on three types of technologies as a fundamental basis:

- internal technologies developed within the company
- external technologies developed and shared by the industry and its customers
- digital technologies that evolve constantly

The basic premise of the framework is that technology is the starting point that enables a company to address its market relevance. This is based on real-time information that a company can gather, often through collaborative arrangements. Technologies put companies in a position to analyse large amounts of data, thereby offering opportunities for improving systems and processes to push offerings of customer value timeously to the market. Collaboration allows a company to develop (innovate and invent) products and services with inputs from all types of stakeholders. Digital technologies and platforms allow meaningful collaboration with customers, specialists and suppliers to innovate complex solutions. Knowledge of the customer and developing a customer need (industry demand) are central to the process. The TDD framework suggests that technology is a catalyst to enable collaboration, which improves business performance (Najafi-Tavani et al. 2018). The TDD framework highlights the need for a process of continuous involvement between innovation and industry demand.

The ability of companies to innovate both internally and in coalition with other companies is growing because digital technologies change so fast that it is unlikely that any one company will be competent to act in the many opportunity areas. Collaboration and the implementation of integrated, cross-company systems are at the heart of value co-creation. The TDD framework infers that as collaborative, innovative abilities advance, cooperating companies build their value propositions for the market. Co-creation opportunities are shared between all contributors in the value chain. Truly innovative ideas originate from constant brainstorming by members of the collaboration who are continually encouraged to think in unusual ways about how to fuse technologies to create a new purpose for the fusion outcome. This is perhaps the most important of the distinctive competencies in the TDD framework. Fusing innovative products and services no longer depends only on the tangible and intangible resources of one company to achieve the business objectives but uses powerful shared resources available globally.

According to the TDD framework, such distinctive competency development is a precursor to competitive advantage. Competitive advantage involves far more than only developing innovative customer solutions that create demand. Companies must possess business processes that keep pace with technology developments. Competitive advantage as a business output becomes a complex combination of the ability to supply products and services within very short time frames because technology continually advances. This necessitates the ability to be strategically flexible by all supply chain stakeholders to make collective decisions quickly to maintain their access to unique business opportunities. The ability to generate profit follows. In the TDD framework, positive financial results are the result of the adoption of technology to collaborate over the value chain to develop distinctive competencies for competitive advantage at the most opportune time to market. Positive financial results enable companies to invest in future resources to further improve in developing collaborative competencies to remain competitive and sustainable. The means by which individual companies in the coalition then use and leverage the joint digital opportunity allows each to enjoy both the collaborative impact of the development and the option to adapt elements of the collaborative work to their own independent business models.

A danger for such a collaborative environment, however, lies in partners not keeping up their internal systems' functional technology advancement, thus falling behind other partners' technological competencies. This inhibits the rapid sharing of information needed for TDD to occur.

Managerial implications

The rapid development of technology and digital transformation is a driver of change in society, economies and companies. This is leading to the redevelopment of business processes and new business models. Managers

should, first and foremost, note that in the contemporary business environment, typified by disruptive change, technology impacts future strategy in a way that requires aligned development of supporting business processes. In this study, this was definitely the case for technology-driven Company X. However, because of IoT connectedness, it can be assumed that TDD permeates through most industries.

For technology-driven companies, technological transformation is paramount to both success and survival. Staying abreast of technology is therefore essential to remain competitive and relevant in the market. Collaboration and co-creation are prerequisites of first-mover advantages derived from the implementation or fusion of new technologies. Companies need to develop technology-based systems that allow interaction between the company, the customer and industry to share knowledge and execute strategic business processes, as observed by Bala, Massey and Montoya (2017).

The advancement of business processes in tandem to support technology advancement requires strategic managerial control over the implementation of constantly evolving technology-based analytic tools that have a system-wide connection with all stakeholders (Lăzăroiu 2018; Smith & Kubala 2018). The 'system' may be that of a global company connecting across multiple business types and geographic regions, such as Company X, or one that incorporates fluid, instant integration of different alliance partners' individual systems all contributing information to a decision that produces competitive advantage.

Technologies are transforming the association between company, customer and industry. Certain technologies lead to improved processes, knowledge transfer, collaboration and creative development of products and services offering value to the customer and the industry. It is doubtful whether these products and services would be conceptualised if a traditional view of responding to the customer or even industry demand was followed.

Areas for future research

This study has shown that the greater discourse of digital transformation and digital business models has gained interest in practice, but the concept of digital transformation of business demand is lacking in the literature and requires further research. There is an apparent lack of understanding regarding how digital transformation impacts and transforms business strategy. In addition, the interdependencies between digital transformation and business strategy should be explored further, as there seems to be insufficient understanding in this area.

Research limitations

Given the process that was implemented in this study and the enormity of technological change underway, several limitations should be considered, which can be used for further research opportunities. The body of knowledge on the

value of technology adoption in creating sustainable business is growing, but there is little research into the strategy to drive end-to-end seamless collaboration both within and between companies to ensure information pertinent to creating TDD is shared and applied before an opportunity is lost. This study made use of a single case study, which can be seen as a limitation. More studies will need to be conducted with companies focusing on TDD to build a broader understanding of the strategic building and tweaking of systems required to ensure competitive advantage.

Conclusion

With the advent of 4IR, rapid technological advancements have grabbed the attention of companies and academia alike, and there is real potential for the digital transformation of business processes. This study has found that technology is fundamentally changing the way business is conducted, significantly impacting business models, business strategy and business processes. Rapid technological development has given rise to dynamic marketplace changes, by which companies use new technologies to develop innovative product offerings that integrate digital technologies to develop dynamic business models, processes and structures. This view is the nexus between technology and the market. However, as this study has shown, technology has the potential to transform the way we think about and go about business. The only certainty at present is that the way we view, practice, study and teach business is most likely to change drastically in the next couple of years.

Acknowledgements

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

P.S., G.G. and P.T. all made a significant contribution in writing this research.

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

The data that support the findings of this study are available from the corresponding author, P.T., upon reasonable request.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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