Digital Transformation for Sustainability: A Qualitative Analysis

Wail El hilali[1], Abdellah El Manouar[1], & Mohammed Abdou Janati Idrissi[1]

[1] Mohammed V University in Rabat, Morocco

Correspondence: Wail El hilali, Mohammed V University in Rabat, Morocco.

Abstract

In the digital era, finding a new way to conduct business becomes mandatory. The risk of disruption, the bloody competition, the change in customer behaviours and the scarcity of resources, these are few of many drivers that force companies to change their business models and adapt to the new market reality. Digital transformation emerged as a recent concept that help companies to best leverage digital capabilities such as Big data, Internet of things, Cloud Computing and Artificial Intelligence. The purpose of this paper was to conduct a qualitative analysis on three big size companies in order to enrich the literature on this concept and to discuss whether or not companies could reach sustainability during their transformation journeys. The three in-depth case studies showed that customers, data, competition and innovation are four dimensions of digital transformation that have an impact on the companies' sustainability actions. We proposed at the end of the article a future research model, composed of 5 hypotheses, to be validated by a future empirical study.

Keywords: sustainability, digital transformation, digital capabilities, qualitative analysis

1. Introduction

Digital transformation is a buzzword that is used a lot nowadays by both practitioners and academics. It can be comprehended as a foundational change in how an organization delivers value to its customers (Boulton, 2019). Transforming digitally a business is synonym to implementing radical changes at the business model level, enabling companies to capture new kind of value (El Hilali & El Manouar, 2018).

Digital transformation becomes mandatory to survive in this volatile world. Companies are nowadays at the mercy of any disruptive technology that could change an entire industry. The expected outputs of a digital transformation are : providing better customer experience, gaining competitive advantage and exploiting digital capabilities, such as big data and cloud computing, to deliver and capture new kind of value adapted to the digital era (Ivančić, Vukšić, & Spremić, 2019).

Publications on digital transformation date back to years ago, but have only recently raised greater scientific interest (Kohli & Johnson, 2011; Zhu, Dong, Xu, & Kraemer, 2006). Many papers on this subject were products of collaboration between professional experts from consulting companies and research centres. MIT and Capgemini consulting published, for example, a report on the subject in which they proposed a framework that helps companies to succeed in their digital journey. Three building blocks were proposed to work on during a digital transformation, which are Customer experience, Operational process and Business model (Westerman, Calméjane, Bonnet, Ferraris, & McAfee, 2011). MIT also collaborated with Deloitte to publish a research report on digital transformation, in which, they conclude that strategy, not technology, drives firms to succeed in transforming their businesses.

On the other hand, companies are still trying to find the "secret sauce" to reach sustainability, an equilibrium between their economic ambitious, their social impacts on communities and their carbon footprints on environment. Drivers and motivators to pursue sustainability differ from a company to another. Reputation, brand image, cost savings, innovation, employees' ethics and stakeholders' pressure are the major reasons that drive companies to adopt a sustainable mindset according to a McKinsey Global Survey (Bonini, Görner, & Alissa Jones, 2010).

Diverse researches were published, discussing how to reach sustainability from different frames. As there are numerous studies which explore the roads to reach sustainability (Abu-Tayeh & Myrach, 2016; Eccles & Krzus, 2010; Gray & Stites, 2013; Joyce & Paquin, 2016; Nidumolu, Prahalad, & Rangaswami, 2009; Rothenberg, 2007), yet very few papers discussed the link between sustainability and digital transformation. The two

concepts require fundamental changes at the business model level. Thus, exploring the relationship between the two concepts could be a promising road to explore. Our research aims to enrich the literature on both the digital transformation and sustainability concepts by addressing the identified gap and achieving the two following research objectives:

- To conduct a holistic and comprehensive investigation of all aspects of digital transformation and their impacts on the three pillars of sustainability, which are economy, society and environment.

- To propose empirically grounded directions for developing a framework to guide firms to reach sustainability in their digital transformation journey.

To achieve these objectives, a qualitative research was conducted on three companies, from three different industries, operating in Morocco.   The results showed that customers, data, innovation and competition are major axes that these companies have worked on during their digital transformation. The three Companies succeeded to increase their financial numbers and their social footprints while reducing their negative externalities on environment.

This article is structured as follows. After the introduction, we describe our methodology. We present after our three case studies. Next, we discuss our findings and we argue how companies could reach sustainability by working on four dimensions identified during our in-depth interviews. Finally, we offer concluding remarks and identify future research directions for an empirical study.

2. Methodology

We adopted a qualitative approach by conducting three case studies to look for any potential relationship between digital transformation and sustainability. The case study represents a widely employed qualitative method to carry out research in management disciplines. It is often used as the explorative part of a quantitative survey (Damgaard, 2001). It is the preferred strategy when "how" or "why" questions are being posed and when the focus is on a contemporary phenomenon in some real-life context (Yin, 2003).

Case studies have in fact the merit of enabling theory building and development more than quantitative research approaches in the field of management (Tsang, 2014). They are also capable to explain complex connections between phenomena and their context (Dubois & Gadde, 2002). Furthermore, case studies offer the possibility of collecting and analysing different form of data, allowing a more in depth understanding of the analysed subject (McCutcheon & Meredith, 1993).

- Case selection

This research was conducted on three big size companies from three different industries, operating in Morocco. The three companies are mature enough and experienced doing work the old-fashioned way before digitally transforming their businesses. The country context is an emergent economy where digital capabilities are not fully exploited.

For confidentiality and privacy reasons, alias names will be used in this article. The first company, named Firm 1, is a telecom operator with more than 8000 employees. Digital transformation is a huge focus for the telecom industry due to the gradual decline in revenue from traditional services and the change in customers habits. Thus, the industry needs to transform by improving efficiency and capturing new value (Maidment, 2016). The second case company, named Firm 2, operates in the mining/fertilizing industry and employs more than 20000 employees. The mining industry is a volatile and challenging market that needs a digital shift. Mining companies are embracing digital tools and capabilities, such as cloud-enabled mobility, big data-powered analytics and IoT in order to shift their strategies, to adopt new business models and to change their operating models (Long, 2019). Case 3, which will be named Firm 3, is a classic bank. Banks around the world have already realized how investing in digital technologies could attract new customers and increase both their loyalty and satisfaction (Cortet, Rijks, & Nijland, 2016).Table 1 presents an overview on the three chosen companies:

Table 1. The companies' overview

	Firm 1	Firm 2	Firm 3
Industry	Telecommunications	Mining/ fertilizers	Banking
Number of employees	8000	20000	7700
Revenue in 2018	$ 3.4 billion	$ 5 billion	$ 1.7 billion
Net income in 2018	$ 724 million	$ 386 million	$ 370 million
Year of foundation	1998	1920	1961
Year of starting DT	2017	2016	2016
Formal role of Chief digital officer	No	Yes	No

3. Findings

During our analysis, we noticed that the three companies have adopted three different roads to transform digitally their businesses. Firm 1 has focused on the customer experience. They sought the help of a well-known consulting group in order to identify the changes they need to implement. The work was overseen by the strategic watch management. Firm 2 saw the digital transformation a way to leverage technology to improve operational processes. They created a digital lab as a joint venture with IBM in order to provide the firm with various services in their digital transformation journey. Firm 3 also focused on customer experience. They created a "digital business unit", working as a startup, in order to experiment and develop innovative solutions.

The multiple case study approach has helped us to identify four dimensions of digital transformation that have an impact on the companies' sustainability actions. These dimensions are: customer, data, competition and innovation.

3.1 Customers

3.1.1 Firm 1

Firm 1 has seen the digital transformation as an opportunity to shift from a product-centric to a customer-centric company. Improving customer experience was the ultimate goal to reach. Customers are stopped being considered as a market to segment but as a dynamic network instead. This dynamic network could shine or harm the brand image as any negative experience could go viral through social networks (Rogers, 2016).

In order to improve the customer experience, the telco bet on many actions. First, Firm 1 invested in a selfcare solution in order to give the possibility to customers to enable/disable new services without need of going to any salespoint. The selfcare solution is accessible through both a mobile application and an online website. Firm 1 also limited cash payment and deployed multiple self-service payment terminals (in addition to online payments channels) to reduce the waiting time.

To take it to a higher level, the company decided to invest in an adjust business, which is the online banking. Firm1 is convinced that the most important asset that a telco could own is its customers data. Succeeding in managing sensitive customers data (related to call detail records) could be a competitive advantage to use in order to convince customers to have a bank account with the telco. Firm 1 also invested heavily in mobile payment, allowing consumers to pay conveniently through a phone.

Firm 1 also started thinking of customers as content creators. Through their social media official pages, the telecom operator is constantly in touch with its customers to brainstorm ideas about new offers and new services to market.

Last but not least, the operator is also following the trend by thinking platforms in its transformation journey. In fact, Firm 1 is thinking to launch a C2C solution through which customers could share unconsumed data buckets and airtime credits. This platform will allow customers who have accumulated and unused airtime credits or data buckets to be lent for money. This will give birth to a win-win situation and created a shared value (Porter & Kramer, 2019) where both customers and the Telco are capturing value.

3.1.2 Firm 2

The mining company saw digital transformation as a way to blur the traditional way customers are considered in the mining/fertilisers industry. Customers and farmers are willing to profit from the advance of technology in order to better anticipate disasters, vagaries of the weather, and to follow and display market data in real-time basis (sales, prices, volumes…).

In order to do that, and to think out of the box, the mining firm decided to launch a challenge to local startups in order to improve the customer experience. The challenge concerned three axes which are: Supply chain to

improve performance, redefinition of the customer relationship, and the boost of talent management.

Furthermore, and to help the African farmers to improve their daily activities, Firm 2 has given them a digital access to valuable information about the weather, farming inputs and commodities. The company has put also in the hand of farmers an e-market solution that enables them to market their product and services.

3.1.3 Firm 3

Firm 3, the traditional bank, saw the digital transformation as an imperative way to avoid disruption. Digital disruption is occurring at every level in the banking industry. incumbent banks have become increasingly vulnerable with the raise of FinTech startups nowadays (Accenture, 2019).

In this context, Firm 3 worked very hard to reshape its customer experience. Today, all transactions (opening an account, applying for credit ...) are done online through a selfcare solution.

Our bank bet also on mobile banking apps to follow the customer behaviour shift. According to (GASCOIGNE, 2018), customers' activity on banking apps has rocketed by 354 per cent in the past five years. The bank also invested in a mobile payment solution that allow sending money from mobile to mobile free of charge, in seconds and safely. The solution allows also to perform different payment operations and to follow up current transactions on the electronic wallet. Firm 3 saw this solution as a new brick in the bank digital offer in order to make the basic banking options accessible to as many of their customers as possible.

For firm 3, the digital transformation was mandatory in order to reduce churn and increase loyalty. With low switching costs and low barriers to entry concerning FinTech startups, banks in general saw themselves at the mercy of any disruptive technology that can disturb the entire industry. Focusing on customers was the ultimate way to stay competitive according to the questioned manager. This focus is reflected through optimizing the customer experience and enhancing customer services from thinking cross-channel and multichannel to omnichannel.

3.2 Data

3.2.1 Firm 1

The telecom operator is convinced that data is a key element to increase both its financial numbers and its social footprints and to reduce its negative environmental externalities.

The company invested heavily on a Hadoop and MapReduce based solution, through which, terabytes of traffic data are parsed in a daily basis to extract valuable information. Big data analytics offered the telecom operator a real opportunity to capture a more comprehensive view of their operations and customers. Near real time data analysis is conducted in order to derive phone usage patterns and to detect suspicious call behaviours. Reconciling data between multiple platforms and databases has been advanced and has become a task of few hours thanks to big data capabilities.

The operator is also using internet of things (IoT) for improving operational efficiency. As a remote cell tower site includes auxiliary equipment besides the main telecommunication equipment, Firm 1 is using sensors to monitor power generators, air conditioning and other passive infrastructures. Predicting their failure in advance is an essential ingredient of remote management for Firm 1. Sensors are also used by the Telco to monitor its carbon foot print.

Furthermore, Firm1 is convinced that social networks are goldmines to exploit as there are a lot of key insights to extract from the internet. This is why the operator invested in a sentiment analysis solution based also on Hadoop to leverage content from forums, blogs, and other social media resources to develop a sense of what people need and expect, and how they're reacting to the firm's commercial offers.

The Telco saw it also an opportunity to adopt a shared value mind set (Porter & Kramer, 2019). Using big data capabilities, Firm 1 succeeded in listing the most important educational content that students access and decided to make it free of charge. By doing that, not only the telco is shining its brand image, but it is making future loyal customers as well.

3.2.2 Firm 2

Data is used by Firm 2 to fuel and feed machine learning algorithms that is helping the company to achieve strategic business insights. First, the company has put in place a big data solution that predicts the heavy demand of fertilisers in Africa. The solution is combining historical data with satellite imagery and weather forecast in order to anticipate, foresee and get well-prepared for any future growth in consumption. "Thanks to this solution, we are able to anticipate any changes in the market to serve our customers in the best possible manner" indicate

the managers of Firm 2.

On the other hand, Defects can occur in machines during their operations, causing delays, additional cost for the company and other negative effects. This is why, Firm 2, shifted from classic condition-based maintenance to predictive maintenance.

Predictive maintenance, which is one of the main digital enablers of industry 4.0 (Ntalaperas, Vergeti, Apostolou, & Boursinos, 2019), has been implemented using the collected data from sensors used by firm 2. The goal of predictive maintenance is to predict at the time "t", using the data up to that time, whether the equipment will fail in the near future (Alwis, 2017). Firm 2 is using static and historical data, combined with real time events as inputs for regression models to predict remaining useful lifetime. By doing that, the company not only has reduced their maintenance costs, but it has also reduced its carbon footprint and its negative externalities regarding the environment.

3.2.3 Firm 3

Firm 3 also seized the opportunity of digital transformation to invest in artificial intelligence (AI) and machine learning, changing by that the banking experience for the better. Fraud prevention has been enhanced by our bank, fully exploiting by that, the huge possibilities that data offer. Spending patterns, location, and customer behaviour, all these elements are analysed, on a real-time basis, in order to detect potential anomalies and suspicious behaviours. Thanks to big data and machine learning algorithms, Firm 3 can catch and detect attempted fraud in real-time instead of waiting for it to happen and taking steps to rectify the situation.

Loan processing become also more efficient thanks to AI and machine learning algorithms. In fact, Firm 3 used the vast amount of its customer historical data to train its machines to learn from mistakes and improve itself continually. Firm 3 is now able to determine which customer is more credit-worthy and which applicant is high default risk. The result is a faster, more accurate system that answer customers' needs.

Same as Firm 1, Our bank is using a sentiment analysis solution to read through social media posts about the company from customers. The solution is able to identify if the overall sentiment is positive, negative or neutral. By understanding how customers are commenting on the bank, Firm 3 can understand how to improve their customer acquisition and customer experiences.

3.3 Competition

3.3.1 Firm 1

The telecom operator is aware that customers in the digital era are becoming more sensitive to sustainability issues (Joshi & Rahman, 2015). Firm 1 is leveraging big data and analytics in order to stay in tune with the market regarding competition and its rivals' social moves for the community. The company succeeded in building a competitive intelligent information repository, fuelled by data gathered from forums, blogs, social media texts. As the questioned manager affirmed "the idea is not to copy our competitors but to think of smarter ways to reach the audience we are all targeting ". An example of this is the reaction of the telco to a competitive offer that targeted students. In fact, a competitor has launched a very attractive offer that proposes computers at 100$ in condition to get a 4G subscription. The offer went viral and was a huge success. Firm 1 learned that students are potential customers and there is a real opportunity to implement a razor and blades business model. Our operator decided after to inspire from its competitor's experience and to market bundled low-cost tablets and 4G subscriptions at very attractive prices. By doing that, not only the telco has captured a new value, but it has participated in promoting education in Morocco.

3.3.2 Firm 2

For long years, Firm 2 has been the kingdom monopoly regarding mining and phosphate derivatives such as fertilisers. Since the company is considered as one of the key players in the international market, its digital transformation comes at first hand to increase its operational efficiency as the rivalry insides the industry is so fierce.

To distinguish itself from the competition, Firm 2 put the farmers at the centre of its digital strategy. The company decided to put its data and analytics at the farmers disposal. By doing that, Firm 2 is creating a shared value (Porter & Kramer, 2019). The farmers will beneficiate from the advanced technology that Firm 2 invested in, whereas the company is shining its brand image as a firm that gives priority to the prosperity and the wellbeing of low-income families.

3.3.3 Firm 3

Firm 3 has understood that to outdo the competition, the company need to distinguish itself and to think out of

the box. One of the main decisions taken was to adopt an integrated reporting in which the company decided to put its social and environmental actions in its annual report (De Villiers, Unerman, & Rinaldi, 2014). According to the questioned manager, the goal was to show to all the stakeholders that the bank's social and environmental actions fit with the overall digital strategy the company crafted.

The report of 2018 for example highlighted how the bank has increased the capacity of its data centres to support the digital transition. The company seized this opportunity and invested also in the optimization of these data centres, especially the cooling system by using smart sensors, in order to offset its growing environmental impact. Including this information in the integrated report was important for the bank to show to the stakeholders how concerned the company is regarding sustainable development issues.

3.4 Innovation

3.4.1 Firm 1

As a part of its digital transformation process, Firm 1 has also launched an open innovation program called "Telecom challenge". The objective of the company is to identify Moroccan, African and international innovative startups to co-develop with them digital innovative solutions that solve strategic and operational issues for the company.

Open innovation is a recent paradigm which assumes that firms can and should use external ideas as well as internal ideas, and internal as well as external paths to market, in order to innovate (Bogers, Chesbrough, & Moedas, 2018). The managers inside firm 1 recognized that research is no more sufficient to maintain the competitive advantage, conversely new and specific know-how and skills are required. Firm 1 seized the opportunity of digital transformation in order to redefine the process of research and development inside the company. They believe that this is the way to distinguish themselves from the competition and the start of a blue ocean strategy that will help the company to increase more its financial numbers.

3.4.2 Firm 2

Firm 2 saw its digital transformation journey an opportunity to change the traditional way, things were done. The mangers inside the company knew that, to remain competitive in the fertilizing industry, they need to be kept updated regarding cutting-edge technologies and latest innovative approaches. Thus, Firm 2 decided to work hand in hand with the academic word by collaborating with research labs. According to the questioned manager, Firm 2 has more than 270 research programs with Moroccan universities and worldwide. These partnerships are also intended to boost the national knowledge ecosystem.

The company also opened an atypical and very selective school to help the firm to hire the most talented young people in Morocco. The idea was to give a second chance to people with IT skills in AI, data and programming fields that failed in their academic journey, to be hired by the company. The school is "completely free of charge, open and accessible to anyone between the ages of 18 and 30. No need for an IT degree, or of having undergone extensive IT training. The only criteria for admission is "CREATIVITY", said a senior manager of Firm 2. Investing in such a program gave birth to a shared value and increased the social footprint of the company regarding society.

3.4.3 Firm 3

Our bank followed also Firm 1. Knowing that the future of the banking ecosystem will look much different than today and will extend well beyond financial services, Firm 3 decided to launch an innovative program called "Fintech challenge". The idea is to identify promising national and African startups and make them partners of the bank. More specifically, the company tries to offer the start-ups a mutually beneficial partnership based on the co-construction and deployment of innovative solutions, in response to authentic business issues.   By doing that, Firm 3 ensures the use of cutting-edge knowledge and helps, on the same time, the new startups to integrate themselves in the market.

Table 2 summarizes our findings regarding the impacts of actions during a digital transformation on sustainability. The acronyms EC, S and E stand, respectively, for Economy, Society and Environment.

Table 2. The impacts of the digital transformation on sustainability

	Customers			DATA			Competition			Innovation		
	EC	S	E	EC	S	E	EC	S	E	EC	S	E
Firm 1	*	*		*	*	*		*		*	*	
Firm 2	*	*		*		*	*	*		*	*	
Firm 3	*			*	*			*		*	*	

4. Discussion

The four main drivers of the digital transformation identified from our research are customer, data, competition and innovation. The identification of these dimensions supports related works arguing that digital transformation is much more than using cutting-edge digital technologies (Kane, Palmer, Phillips, Kiron, & Buckley, 2015; Kohnke, 2017). The main output of a digital transformation is a suitable business model that helps companies to capture a new value adapted to the digital era (El Hilali & El Manouar, 2019).

During their digital transformation journey, the three companies have followed different ways to transform their businesses. Multiple actions were done and impacted the three pillars of sustainability, which are Economy, Society and Environment.

First, rediscovering the customer experience has helped the three companies to increase their customers loyalty. Designing and providing more adequate solutions such as mobile and selfcare applications increased customers satisfaction and reduced significantly their churn. The three companies put the customers at the centre of their businesses, creating by that a true customer-centric culture. In case of Firm 1 and Firm 2, the value was created and captured for both sides through a knowledge sharing platform and a market place. These two actions have increased the social footprint of the companies.

Second, the three companies have succeeded in taking maximum advantage of data, the fuel of the digital era. In fact, not only the three companies have increased their financial numbers by improving their operational effectiveness and lowering their costs, but they also succeeded in decreasing their negative externalities. The three firms used data collected from sensors to monitor their equipments in order reduce their carbon footprints. In addition to that, Firm 1 and Firm 3 are using cutting-edge technologies to parse unstructured data and to conduct sentiment analysis in order to understand better what customers expect from them.

Third, and to distinguish themselves from the competition, the three firms invested in actions related to sustainability. Firm 1 was pushed by the competition to propose adequate offers at low prices to students. Firm 2 shared its knowledge with farmers to improve their wellbeing. Firm 3 adopted an integrated reporting in order to shine its brand image. Our findings are in line with previous studies which confirmed that competition is a key driver that push companies to invest in sustainability (Berns et al., 2009; Bonini, Gorner, & Jones, 2010).

Last but not least, the three companies saw innovation as a way to impact positively both their revenues and their social footprints. By partnering with the academic world and being business incubators for new and promising startups, the three companies are trying to leverage new technology and knowledge in order to stay ahead of competition. An added value is also captured by the society as the academic world and the new startups beneficiate from funding and necessary support.

To sum up, according to our qualitative analysis, the three companies conducted, in three different ways, a digital transformation. the actions done can be grouped around four primary axes: customer, data, competition and innovation. Working on these actions has increased the financial numbers of the three firms, their social footprints and lowered their environmental negative externalities. Thus, we propose a research model, based on five hypotheses, for a future empirical study that will prove empirically our findings:

Hypothesis 1: Customers in the digital Era have a positive influence on companies' commitments to sustainability

Hypothesis 2: Competition in the digital era has positive influence on companies' commitment to sustainability

Hypothesis 3: Data in the digital era enhance the relationship between companies and customers

Hypothesis 4: Data in the digital era enhance the companies' commitment to sustainability

Hypothesis 5: Innovation in the digital era is a key driver of companies' commitment to sustainability
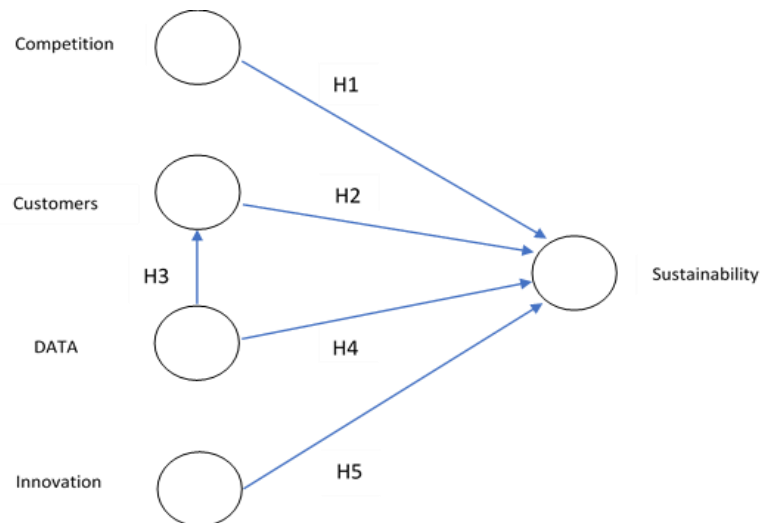
Figure 1. The proposed research model

5. Conclusion

This paper represents a qualitative and an exploratory research on the relationship between digital transformation and sustainability. Three big size companies inside Morocco were chosen as case studies to analyse their digital transformation journeys and to investigate about, whether or not, these transformations have enhanced the commitment of these firms to sustainability. Our findings show that the three companies, have worked, in different manners, on four axes during their transformations, which are: customers, data, innovation and competition. These actions have enhanced their financial numbers and their social footprints, and helped them to reduce their environmental negative externalities.

As a future research direction, a new research model was proposed to be validated using an empirical research and a regression model. This future empirical study will prove empirically our findings.

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