Digital Technologies are Disrupting Business Models

Digital Technologies are Here to Stay

- Mobile
- Hyper Connectivity
- Internet of Things
- Big Data
- Social
- Cloud
- In-Memory Computing
- Machine Learning

Digital business models are disruptive. The rules have changed.

**Under Armour** is entering healthcare space with “Connected Fitness” apparel, accessories and apps.

**Novartis** set prices for heart drug Entresto based on health outcome; payment is linked to reduction in patients who are admitted to hospital for heart failure.

**Red Bull** is not just a beverage company. It is a content media company spanning web, social, film, print, music and TV creating brand experiences of joy, excitement and adventure.

**Uber** is not just another taxi company, it is redefining transportation and logistics services by expanding its services beyond taxi rides to merchandise and food delivery.
Technology trends enabling digital transformation

The Internet of Things (IoT)
Connecting the end-to-end consumer value chain for new levels of customer proximity and new retail offerings

Artificial intelligence and machine learning
Optimized business processes and more impactful personalized and contextual consumer experiences

Virtual and augmented reality
Adds real-time digital information to shopping environment to drive next-generation consumer experiences
New sources of data – IoT, but also others

1. Sales & Inventory data capture from enterprise systems
2. Loyalty or Bonus Card data for Household identification
3. Customers' Web-presence data from retailer's site and/or syndicated sources.
4. Customers' Social Graph and profile information
5. Mobile and app based data (both retailer's own app and from syndicated sources)
6. Customers' subconscious, habit based or subliminally influenced choices (RFID, eye-tracking etc.)
7. Relative product locations in the store layout and on shop shelves within an aisle.
8. Environmental data such as weather conditions
9. Store location used for third party order fulfillment
The Internet of Things is by no means new!

**Videocart**
- Screens on carts reacted to store IR emitters
- Ads were mostly reminder ads and did not offer a financial incentive for shoppers → effect on incremental sales difficult to measure
- Shoppers did not like the screen location
  - Blocked a view of the cart
  - Took up a large part of the cart’s seat (used for valuables, fragile items, or a small child)
- Batteries ran down → shoppers were pushing a nonfunctioning cart
- Costs and installation of cart displays and store IR emitters
- Patent filed for in 1988, 46,000 carts in 1992, Videocart Inc. bankrupt 1993

**Self-checkout**
- Patent for “an automatic point-of-sale machine” granted 1992
- First system installed in 1992


THE CONNECTED FOOD SHOPPING EXPERIENCE

DIGITAL DISPLAYS
- Product Information
- Cross/Up Selling
- Digital Marketing
- Endless Aisle
- Associate Assistance

MOBILE CAMERA
- Image Recognition
- Augmented Reality
- Social Sharing
- Bar Code/QR Scanning
- Gamification

MOBILE CHECKOUT
- Mobile Payment
- Mobile Checkout
- Mobile Ordering
- Mobile Coupons
- Loyalty Rewards

VIRTUAL ASSISTANTS
- Chatbots
- Artificial Intelligence
- Auto-Reordering
- Product Recommendations

WEARABLES
- Health Management
- Diet Management
- Fitness Management
- Notifications
- Geolocation

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ONLINE
- eCommerce/Ordering
- Account Management
- Subscription Management
- Digital Merchandising
- Digital Marketing
- Order History

MESSAGING
- Social Networking
- Messaging
- Chatbots

VIDEO
- Food & Cooking Shows
- Interactive Video (YouTube)
- Video Messaging
- Video Marketing
- Product Placement

SOCIAL
- Social Sharing
- Social Engagement
- Social Discovery
- Social Commerce
- Digital Marketing

MOBILE
- Shopping List Management
- Mobile Ordering
- Inventory Finder
- Wayfinding
- Product Discovery
- Subscription Management

DURING

BEFORE

AFTER
The Transformation of the Refrigeration Product Value Chain

**Level 1: Efficient, connected manufacturing**
- Supplier(s)
  - Design and manufacturing operations
- Assembly and parts analysis
- Factory
  - Design and manufacturing operations
  - Fridges performance and operations
- ERP
  - Availability, substitutes, cost, and payment

**Level 2: A customer-contributor-informed value chain**
- Smart Fridge operational signals
- Supplier analysis and improvements
- Reorder Request
- Delivery and related service providers

**Level 3: Automatic grocery replacement**
- Smart Fridge tracking of the consumption of goods
- Auto-reorder request
- Back-end system process integration (order or payment)
- Logistics signaling, tracking, and delivery
- Replenish status

**Level 3: Energy conservation**
- Power consumption monitoring
- Consumption optimization
- Fridge performance and operations
- Power consumption monitor and adjust
- Predictive maintenance signal
- Technician repair

**Level 3: 3D parts printing and service**
- Predictive maintenance
- Repair order management
- Technician dispatch
- Local parts production (3D)

**Smart Fridge**
- Consume and replenish
- Spare part request
- Distributed manufacturing
Connected Products

- Distribute and optimize smart products
- Connect, monitor, and control products in the field
- Track, trace, and respond to changing conditions
Connected Fleet

- Collect, map, store, and analyze moving assets data in real time
- Optimize supply chain and logistics processes
- Gain full visibility of component, spare part, and product stocks, and movements

SAP Vehicle Insights • SAP Networked Logistics Hub
• SAP Global Track and Trace*
Connected People

- Improve safety through real-time connectivity to environmental and safety practices
- Leverage a connected health network focused on patient outcomes with lower healthcare costs
- Make home life more comfortable, efficient, and secure with connected energy and security systems
Data & Understanding: Analytics, Artificial Intelligence, Machine Learning, ...

Importance To Retailing Success: (% Rating 'Very Important')

- Customer Analytics: Retail Winners 48%, Others 41% (77%)
- Retail Forecasting: Retail Winners 59%, Others 41% (74%)
- Unified pricing, promotion and assortment modeling: Retail Winners 41%, Others 36% (72%)
- Lifecycle price optimization: Retail Winners 36%, Others 36% (72%)
- Social media presence: Retail Winners 41%, Others 59% (59%)
- Localized assortments: Retail Winners 43%, Others 56% (56%)
- An optimized, end-to-end merchandising lifecycle: Retail Winners 48%, Others 56% (43%)

Source: RSR Research, February 2017

Merchandising Technologies: Perceived Value

- In-season demand forecasting for price, promotional or assortment planning: Retail Winners 45%, Others 69% (45%)
- Assortment optimization: Retail Winners 52%, Others 67% (52%)
- Integrated assortment and space planning: Retail Winners 41%, Others 67% (41%)
- Integrated planning, allocation, and replenishment systems: Retail Winners 52%, Others 67% (52%)
- Initial demand forecast as a basis for next year's plan: Retail Winners 28%, Others 56% (28%)
- Space optimization: Retail Winners 38%, Others 56% (38%)
- Attribute-based merchandising planning systems: Retail Winners 22%, Others 44% (22%)
- Planogram optimization: Retail Winners 35%, Others 26% (35%)
- Augmented Reality and/or Virtual Reality: Retail Winners 16%, Others 26% (16%)

Source: RSR Research, February 2017
Digital transformation priorities

Priority 1: Customer centricity
Putting the customers’ point of view at the center of every decision

Priority 2: Service to the segment of one
Leverage customer insights to provide targeted personalized offerings

Priority 3: Digital consumer supply chain
Connect the real-time supply chain for greater efficiency and new levels of responsiveness

Priority 4: Smart retail technology
Differentiate your shopping experiences and drive new revenue opportunities

Priority 5: Monetizing new customer offers
Leverage understanding of customer needs for new revenue-generating offers

Reimagine Shopper Engagement
Reimagine Retail Processes
Reimagine Work
Reimagine Business Models
Reimagine Shopper Engagement

Customer Centricity

- Predict demand – not sales – with machine learning
- Influence customer navigation and decisions:
  - Advertisements personalized based on camera detections or location services
  - Reordered mobile shopping lists
  - Smart shopping carts
- Social and digital feedback mechanisms are replacing traditional marketing surveys. Closed-loop processes incorporating real-time customer feedback, reviews, and quality ratings will directly influence sourcing, assortments, and pricing

Service to the Segment of One

- Personalization is expected – but respect legal and cultural norms of privacy
- Proactive fulfillment & subscriptions/one-click service
- The Long Tail is expanding, driven by online retailers and make-to-order

Smart Retail Technology

- Digital households: expand your definition of “customer” to include smart refrigerators & Amazon Dash
- Cloud-based product information systems in omnichannel frameworks: exchange & enrich data and spot trends quickly
Reimagine **Retail Processes**

Service to the Segment of One

- Marketing:
  - Personalized
  - Location-based
  - Context-dependent

Smart Retail Technology

- Compliance of all store-related activities such as planogram execution
- Customer heat maps
- Smart shelves

Digital Consumer Supply Chain

- End-to-end tracking to improve on-shelf availability and replenishment
- Demand-driven operations in planning and replenishment
- Digitally engaged vendors allow faster reactions
Reimagine Work

Customer Centricity
- Real-time shopper and consumer insights from all channels
- Improve customer interaction through gamification

Service to the Segment of One
- Use real-time insights from social media to personalize store associates’ interaction with customers

Smart Retail Technology
- Improve employee productivity
  - Turn scheduled tasks into on-demand activities – e.g., camera systems detect perishables’ fresh status before employees
  - Target store associates towards high-value customers…
  - … or hand clienteling activities directly over to systems
- Digitize HR processes to replace manual paperwork through mobile apps and self-service functions
- Workforce planning and scheduling based on store traffic forecasts
Reimagine **Business Models**

**Monetizing new consumer offers**

- Move beyond selling products – to delivering on outcomes
  - Subscription services offering more than ingredients: HelloFresh.com
  - Predictive one-click shopping

- Build new digital businesses
  - Leverage massive customer data, cross-referenced to external sources
    - Social media data
    - Fitness tracker data
  - Create digital communities to build brand loyalty and generate even more data

- Digitize products and services
  - Ubiquitous connectivity
  - Smart personalization
What does this imply for forecasting?

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Reimagine Shopper Engagement
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Reimagine Work
Reimagine Business Models
Retailers are getting more and more sophisticated in forecasting

- **Retailer A**
  - F&R customer
  - Use Bayesian neural networks to modify F&R forecasts and for workforce planning

- **Retailer B**
  - F&R customer
  - Is experimenting with Poisson regression, regression trees and similar tools

- **Retailer C**
  - F&R customer
  - Request predictive densities

- **Retailer D**
  - Has an entire Data Science team

- **Retailer E**
  - 30+ people in forecasting & replenishment
  - Statisticians, data scientists, computer scientists, …

- **Walmart**
  - Gave a keynote at the 2017 International Symposium on Forecasting (ISF)
  - Dynamic Linear Models (DLM) and ensemble forecasts

- **Amazon**
  - Gave a featured talk at the 2017 ISF
  - Leverage Innovation State Space Models (ISSMs) and Deep Learning
  - Publish academically

**Consequences for forecasting:**
- Retailers need to invest in forecasting and data science competence, or be left behind
- Suppliers & wholesalers need to be able to hold their own in discussions with retailers
- Software providers will see higher expectations and need to meet them – in all functions
- Note that there are two aspects to this:
  - Understanding modern statistics, data science and machine learning
  - Understanding the retail business – domain knowledge

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http://datascience.stackexchange.com/a/2406/2853
Times are changing, and nobody knows where they will end up

- Grocery is moving online, but speed differs between countries
- Everyone is experimenting
  - Home delivery by truck vs. by drone vs. click-and-collect in stores vs. click-and-collect in automated “dark distribution” centers vs. digital natives entering the market vs.…
  - “Across all of these models there is no evidence that any are fulfilling ongoing digital transactions profitably.” (Nielsen)
- Consequences for forecasting:
  - Take everything I’ll say with a grain of salt
  - Flexibility is key
    ▫ Collect all the data you can
    ▫ It may be useful in five years

Is This the Death Rattle of Mail-Order Meal Kits?

As the novelty of meal kits wears off, companies like Blue Apron and Hello Fresh are seemingly faced with a choice: pivot or die

Kochhaus ist pleite

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The (mobile) web and social media amplify feedback loops

- Higher variance
- Shorter lifecycles
- Incredibly fast dynamics

Consequences for forecasting:
- Forecasts may (!) need to be more adaptive
- However, beware of picking up and extrapolating spurious signals!
On the output side, new data need to be forecasted

- Channel proliferation, Omnichannel
- Shorter lifecycles
- Proliferating variants
- Responses to personalized offers
- Responses to recommendations
- My own refrigerator stock, and when I need to refill it
- Footfalls
- Demand for services

Consequences for forecasting:
- We need to understand the drivers for each time series
- The difference between numerical prediction and categorical classification is blurring
- We need new tools in our forecasting toolbox
Data to be forecasted have lower and lower volumes on more and more granular levels

- So-called “count data”

This is a consequence of:
- DB capabilities – 20 years ago, we simply couldn’t store data on daily level
- Product & variant proliferation – yoghurt demand now spreads over 20 instead of 5 flavors
- Channel proliferation, Omnichannel
- Personalization (requires “what-if” forecasts on customer/household level), Long Tail effects, make-to-order
- Connected homes, smart refrigerators
- And: increased expectations, partly driven by hype

Consequences for forecasting:
- The standard normal distribution assumption becomes more and more questionable
- Forecast accuracy measures become misleading (Kolassa, 2016)

Kolassa, S. Evaluating Predictive Count Data Distributions in Retail Sales Forecasting. *International Journal of Forecasting*, 2016, 32, 788-803
Inputs proliferate…

- More and more different promotions
- Personalization dimensions
- Social media, fitness tracker and other external personal data
- Weather, social media and other external non-personal data

- Consequences for forecasting:
  - These inputs can in theory be used to improve forecasts
  - However: beware of overfitting!
  - Regularization becomes more important

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Kolassa, S. Sometimes It’s Better to be Simple Than Correct. Foresight, 2016, 40, 20-26
... and can be fed back into instantaneous decision tools

- Personalized offers and pricing based on:
  - Location (e.g., a competitor’s store)
  - Context (e.g., your cart’s contents)
  - Situation (e.g., an overstock on fish)
  - Emphasis (e.g., a supplier is paying to have his products recommended more prominently)

- Consequences for forecasting:
  - Can we leverage these at all in forecasting? How?
  - Do we need to forecast which customers enter the store, and what they put in their cart?
Data quality may improve – or not

- Does data quality improve faster through ML, IoT, connected stores etc. – or does proliferating data rot faster than we can clean it?
- Consequences for forecasting:
  - Data quality will remain a key issue
  - Developments in retail may both improve and degrade it

Taylor, E. Supermarket self-checkouts and retail theft: The curious case of the SWIPERS. Criminology & Criminal Justice, 2016, 16, 552-567
Conclusions

- Yes, we are living in interesting times (IoT, ML, …)
- However, there is an enormous amount of hype
- Modern technologies will not solve all our (forecasting) problems
- Data quality in particular will remain a problem
- We will need to push back on hype-driven unrealistic forecast accuracy expectations
- For this – and to understand the strengths and limitations of new forecasting methods – we will continue to need forecasting expertise

Reminder

- Retailers are getting more and more sophisticated in forecasting
- Times are changing, and nobody knows where they will end up
- The (mobile) web and social media amplify feedback loops
- On the output side, new data need to be forecasted
- Data to be forecasted have lower and lower volumes on more and more granular levels
- Inputs proliferate…
- … and can be fed back into instantaneous decision tools
- Data quality may improve – or not
Thank you.

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