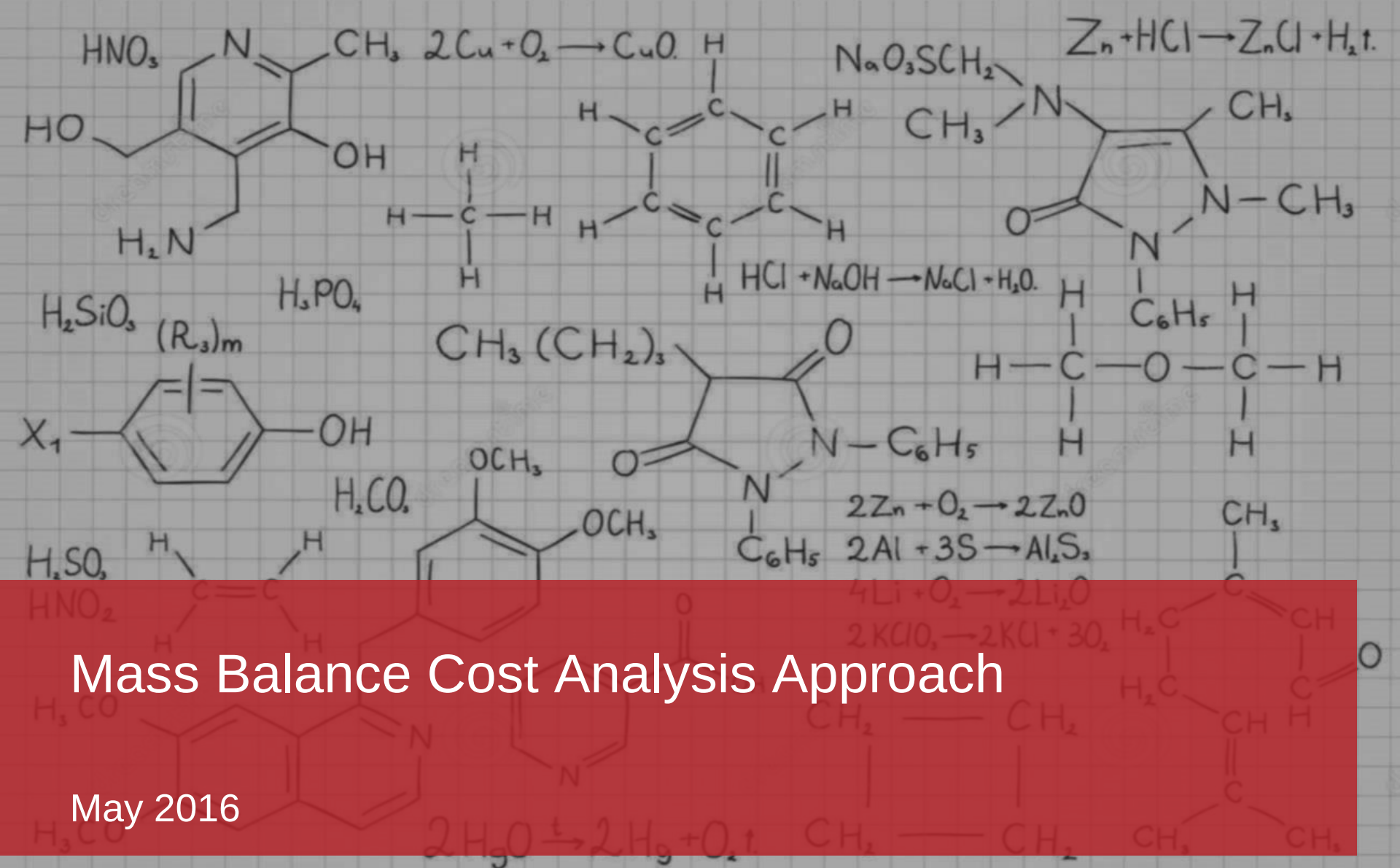


Mass Balance Cost Analysis Approach

May 2016

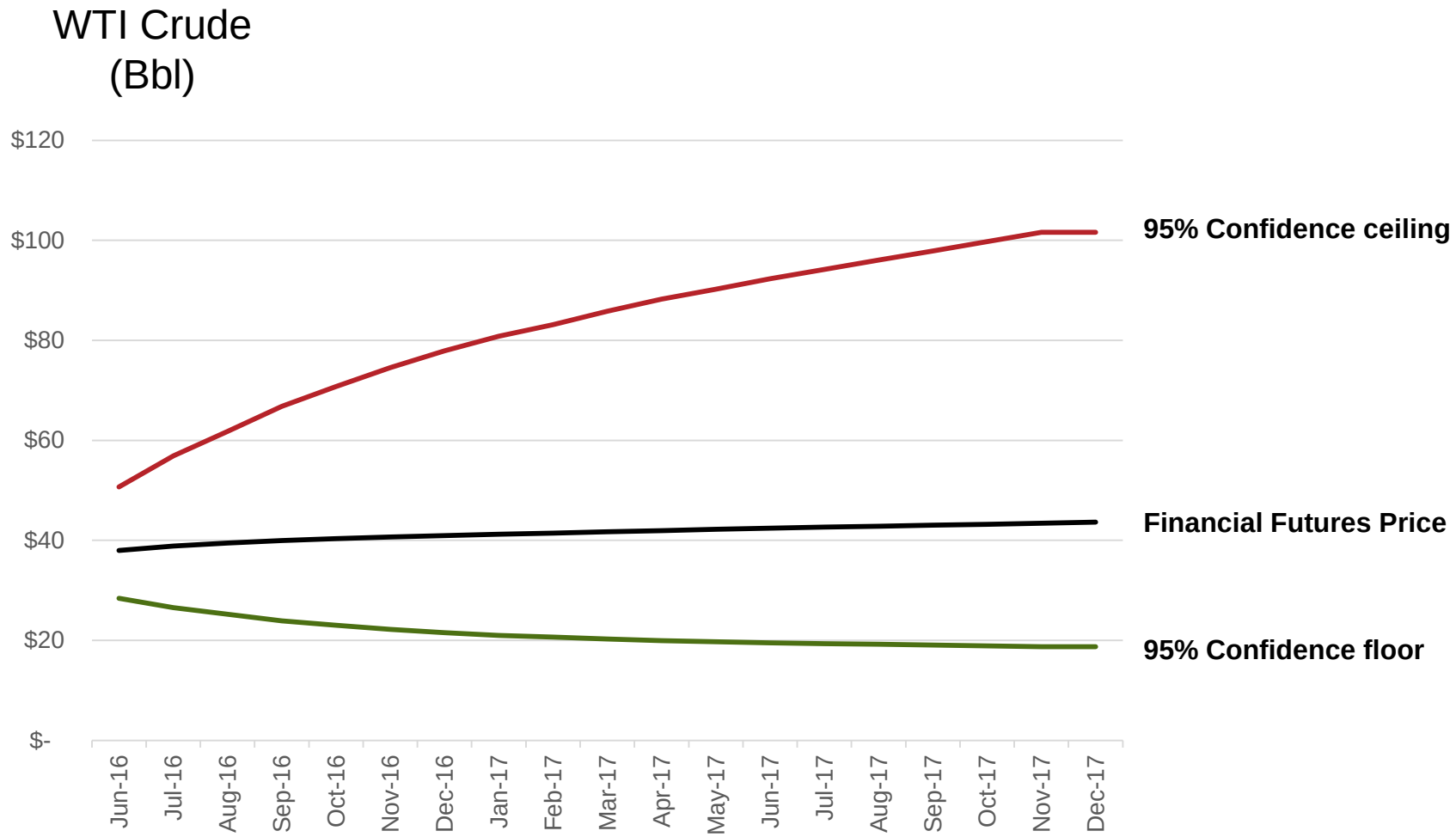
Cost & Capital

Executive Summary

- ***Current Market Outlook–*** Crude reached its lowest point in 13 years during February, and futures markets remain low, which indicates a long term impact on most petrochemicals.
- ***Contract Pricing Impact–*** Existing contracts and cost models were likely not structured for such extreme drops in commodity prices.
- ***Mass Balance Approach–*** Cost & Capital utilizes the theory of mass balance to develop cost models for a variety of resins and chemical intermediates.
- ***Pricing Pressure & Value Chain Analysis–*** Pricing pressure analyses help highlight value chain choke points, regional advantages, and variations in producers' processes.
- ***Price Decreases–*** Buying organizations should monitor their suppliers' external communications and cost drivers, as suppliers are unlikely to proactively present price decreases.
- ***Cost & Capital Background–*** Cost & Capital works with its clients to develop cost models, supplier intelligence reports, contract reviews, commodity forecasts and negotiation packs.

Current Market and Outlook

Crude reached its lowest point in 13 years during February, and futures markets remain low, which indicates a long term impact on most petrochemicals.



Source: CME Group, EIA

Industrial Chemicals and Plastics Data

Most chemicals and plastics have been in production since the 1940's with chemical reaction, energy and other details available to the public domain.

Group	Invented	Commercial Production
Polystyrene	1839	1930
PVC	1872	1920
Polycarbonate	1898	1953
Polyethylene	1898	1933
LDPE	1933	1933
Nylon 6,6	1935	1938
HDPE	1935	1953
Epoxy	1936	1946
Polyurethane	1937	1952
PET	1941	1951
ABS	1943	1948
Polypropylene	1954	1957
PBT	1932	1970

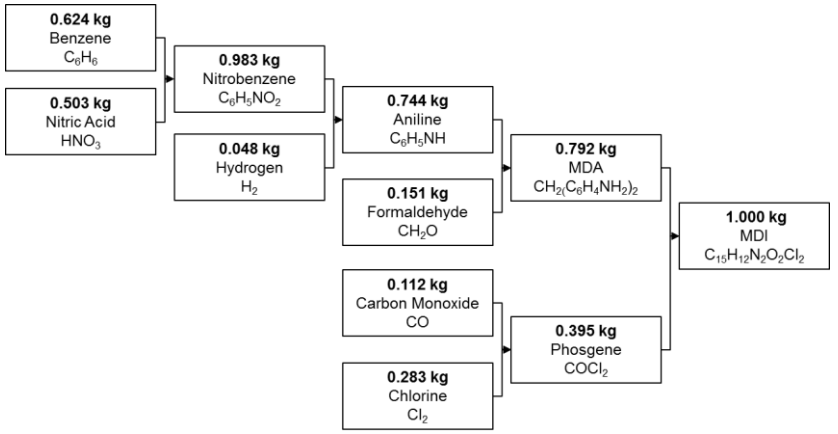
Mass Balance Equations

Using mass balance, the exact amount of feedstock can be accurately calculated.

Mass Balanced Chemical Reactions

Benzene C_6H_6	Nitric Acid HNO_3	→	Nitrobenzene $C_6H_5NO_2$	Water H_2O
Nitrobenzene $C_6H_5NO_2$	3 Hydrogen H_2	→	Aniline C_6H_5NH	2 Water H_2O
2 Aniline C_6H_5NH	Formaldehyde CH_2O	→	MDA $CH_2(C_6H_4NH_2)_2$	2 Water H_2O
Carbon Monoxide CO	Chlorine Cl_2	→	Phosgene $COCl_2$	
MDA $CH_2(C_6H_4NH_2)_2$	Phosgene $COCl_2$	→	Dicarbonyl Chloride $C_{15}H_{12}N_2O_2Cl_2$	2 Water H_2O
Dicarbonyl Chloride $C_{15}H_{12}N_2O_2Cl_2$		→	MDI $C_{15}H_{12}N_2O_2Cl_2$	2 Hydrochloric Acid HCl

Required Mass for Each Feedstock



Chemical reaction models provide a fact-based approach to ensure chemical manufacturers' index formulas match their actual costs.

Cost Model Approach

Mass balance, producers' processing technology, product value chain, and capacity constraints are reviewed to develop pricing models and outlooks.

- Cost & Capital utilizes a mass-balance approach to develop price models
- Pricing Pressure Analyses help highlight value chain choke points, regional advantages, and variations in producers' processes
- Capacity and commodity price outlooks help management

Price Model – Formulas and levers

Pricing models cannot reflect short term supply and demand effects.

Product	Basis	Units	Formula	Variance	Variance Impact
Caprolactam	Brent	MT (Brent Price in Barrel)	$___ + (___ x Brent)	Caprolactam capacity can alter pricing -$__ to +__ per lb	Medium
Butadiene	Brent	MT (Brent Price in Barrel)	$___ + (___ x Brent)	Butadiene can have very large swings as demand for tires is the main driver	High
Propylene	Brent	MT (Brent Price in Barrel)	$___ + (___ x Brent)	Propylene tracks very closely to crude—new "on-purpose" reactors can create propylene from propane and lower costs when natural gas is at a discount to crude	Low
PA 6	Caprolactam	lbs	Caprolactam + $___	PA 6 tracks closely to the underlying caprolactam price	Low
PA 66 – C3	Propylene	lbs	(Propylene * __) + $__	PA 66 always prices to the higher of the C3 or C4 route	Low
PA 66 – C4	Butadiene	lbs	(Butadiene * __) + $__		

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Note: 1 MT = 2204.62 lbs

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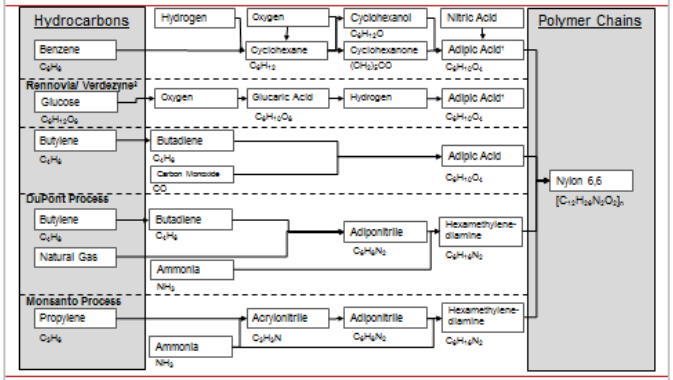
Nylon 6,6 Pricing Pressure Chart



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1. Combination of Cyclohexanol and Cyclohexanone is the most common method to produce Adipic Acid
2. Verdezyne is bio process based on fermentation of paraffin, sugar or plant based oils to produce Adipic Acid

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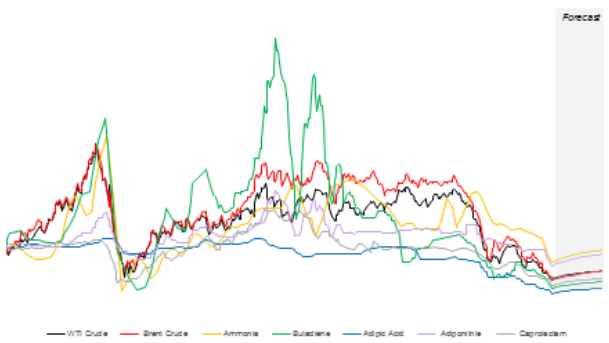
Commodity Development

With some capacity driven exceptions, pricing generally moves with crude.



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Source: Cost & Capital Analysis, EIA, CME Group, Polsh, Fertecon, Farm Futures, Argus, ICIS, PJ Daily, SunSirs, Platts, SK Securities

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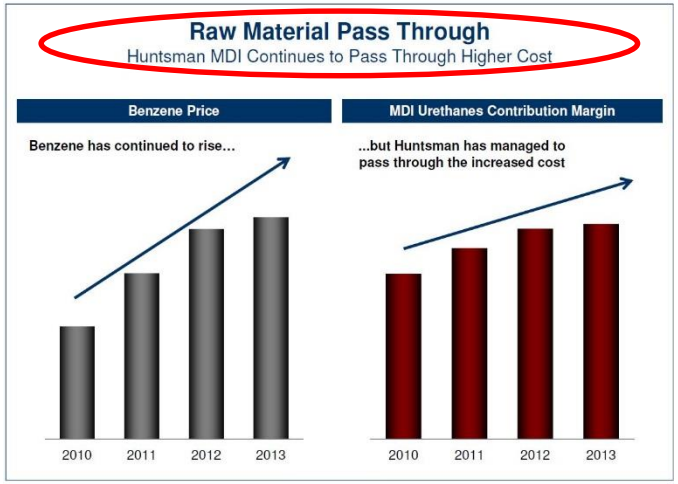
Producer Communication

Buying organizations should monitor their suppliers' external communications and cost drivers, as suppliers are unlikely to proactively present price decreases.

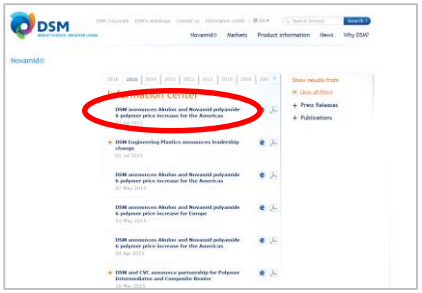
- Producers tend to brag to their investors that they can effectively pass through high raw material pricing
- Producers will also announce price increases via press releases, but remain quiet as commodity prices decline
- Additionally, producers illustrate how they will maintain margins during low demand and/or low raw material price situations

1



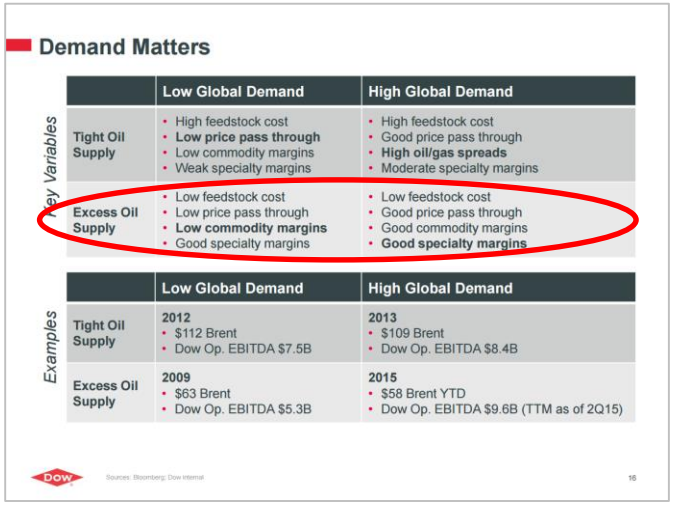
2

July 2015 Price Increase due to input prices



No press releases in 2016 as input pricing declines

3



Sample Experience

Cost & Capital works with its clients to develop cost models, supplier intelligence reports, contract reviews, commodity forecasts and negotiation packs.

Industries
Automotive
Consumer Goods
Electronics
Industrial Goods
Transportation
White Goods

Inputs & Intermediates
Adipic Acid
Adiponitrile
Ammonia
Benzene
Butadiene
Caprolactam
Ethylene
Polyols
Propylene

Resins & Chemicals
ABS
BDO
HDPE
HFO
MDI
Nylon 6
Nylon 6,6
PBT
PP
TDI

Cost & Capital Partners Introduction

- **Cost & Capital Partners focuses on the two most critical levers for shareholder value today - Cost Efficiency and Capital Efficiency**
  - Cash should be treated as the valuable resource it is
  - Spend management preserves cash
  - Capital efficiency frees cash trapped in traditional operations
- **We deliver results – not just recommendations, each and every time**
  - We stand behind our recommendations and prefer to be involved in implementation
  - We conduct negotiations on behalf of our clients
  - We are passionate about our work and the results
  - We work with our clients to implement the changes required to improve the business

Previous project work

Cost & Capital

For more information contact:

Tom Bokowy, Partner
(208) 610-0032
Cost & Capital Partners LLC
tbokowy@costandcapital.com