Economic Implications

We were asked to select a calculator that would help to estimate the cost of cloud services that exist on the web. My calculator of choice was Microsoft Azure's TCO Calculator. It was intuitive to use and very user friendly for someone like me who was using the calculator for the first time. From BallotOnline's IT Budget and Infrastructure Summary, I plugged

Current server specifications (year 0):

400 application servers (2 CPUs, 4 cores, 32GB RAM, Linux OS)
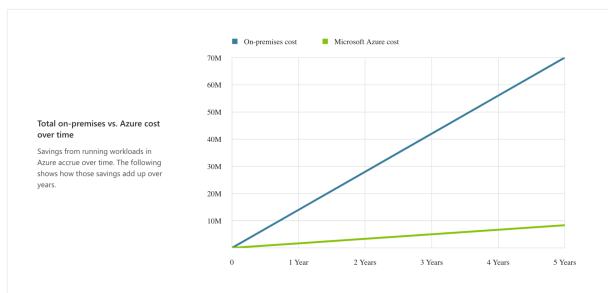400 database servers (4 CPUs, 8 cores, 64GB RAM, Linux OS, MySQL DB)

this information into the calculator. The assignment called for us to estimate TCO for a comparable configuration(5 years) in the cloud to estimate the potential savings. I received the information that is displayed in the images below. According to Azure's TCO Calculator the TCO for on premises computing
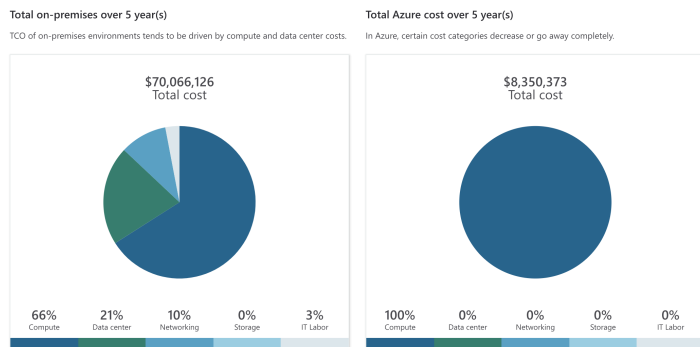
environments for one year is $32,803,538. Whereas, the total Aure cost for one year is $1,670,075. For a comparable configuration, I manipulated the TCO calculator to reflect the data for 5 years. The Azure TCO Calculator reported that over the next years BallotOnline would save as much as $61,715,753 by transitioning their IT

Over 5 year(s) with Microsoft Azure, your estimated cost savings could be as much as $61,715,753

Total on-premises vs. Azure cost over time

Savings from running workloads in Azure accrue over time. The following shows how those savings add up over years.

infrastructure from on premises to the Azure infrastructure. This savings are significant and fall below BallotOnline's IT Budget.

In the image below you can see the TCO comparison. If Ballot Online were to maintain an on premises
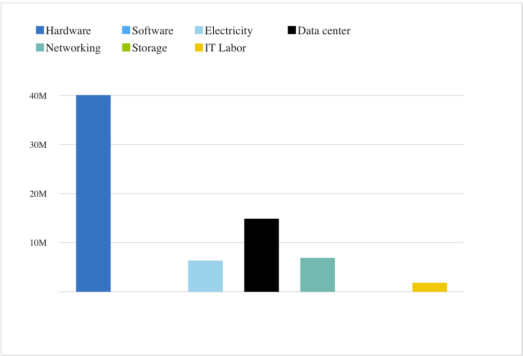

Total on-premises over 5 year(s)

TCO of on-premises environments tends to be driven by compute and data center costs.

$70,066,126
Total cost

| 66% Compute | 21% Data center | 10% Networking | 0% Storage | 3% IT Labor |

Total Azure cost over 5 year(s)

In Azure, certain cost categories decrease or go away completely.

$8,350,373
Total cost

| 100% Compute | 0% Data center | 0% Networking | 0% Storage | 0% IT Labor |

infrastructure, they would still fall below the 5-year IT budget ($112,500,000—5 percent of year 5 project revenue of $225 million reported). However, the total Azure

cost over 5 years would be significantly lower, and would certainly enable a 1 percent (or even higher) reduction in the IT budget. The overall estimated total cost savings would allow BallotOnline to reallocate those savings into other departments within the organization. Below I have included the remainder of the TCO report that also reflect the estimated savings for BallotOne for the next five years. From the information that is displayed below, BallotOnline would see significant savings if they transitioned their infrastructure from on premises to Azure.
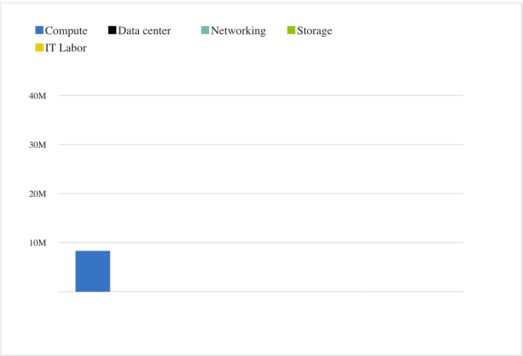
Total on-premises cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

$70,066,126
Cost over 5 year(s)

Total Azure cost breakdown

In Azure, several of the cost categories from the on-premises environment are consolidated and decrease with the efficiency that comes with the cloud.

$8,350,373
Cost over 5 year(s)

On-premises cost breakdown summary	
Category	Cost
Compute	$46,430,480.00
Hardware	$40,064,000.00
Software	$0.00
Electricity	$6,366,480.00
Database	$0.00
Data Center	$14,884,120.10
Networking	$6,911,049.00
Storage	$476.80
IT Labor	$1,840,000.00
Total	$70,066,126.00

Azure cost breakdown summary	
Category	Cost
Compute	$8,343,024.00
Data Center	$0.00
Networking	$0.60
Storage	$7,348.22
IT Labor	$0.00
Total	$8,350,373.00

Estimated on-premises cost (5 year(s))		Estimated Azure cost (5 year(s))	

⌃ Compute cost

Hardware cost

Cost per 2 proc 4 core, 14 GB RAM physical server for Linux	$6,964.00
Number of servers required	400
Cost per 4 proc 8 core, 112 GB RAM physical server for Linux	$21,558.00
Number of servers required	800
Total cost for physical server(s)	$20,032,000.00
Cost of maintaining physical server(s) - 20% of cost of physical server(s)	$4,006,400.00
Total cost of maintaining server(s) over five year(s)	$20,032,000.00
Total hardware cost over five year(s)	**$40,064,000.00**

Software cost

Total software license cost	$0.00
Total software cost over five year(s)	**$0.00**

Electricity cost

Price of electricity per kWh	$0.1334
Power rating of 4 core, 14 GB RAM server	324 Watts
Total electricity cost consumed by 400 server(s) - 4 core, 14 GB RAM server per month	$12,620.00
Power rating of 8 core, 112 GB RAM server	1,200 Watts
Total electricity cost consumed by 800 server(s) - 8 core, 112 GB RAM server per month	$93,488.00
Total electricity cost over five year(s)	**$6,366,480.00**

MySQL Database cost

Total number of license(s) required	800
MySQL Community Edition License cost per instance	$0.00
Total license cost	$0.00
Total MySQL Database licensing cost over five year(s)	**$0.00**

Total cost over five year(s)	**$46,430,480.00**

Azure compute cost

App Service cost

B3 Basic App Service (4 core, 7 GB RAM)	$0.067 /hr
	SKU# AAD-20058
Full time App Service instances	400
Average utilization	80 %
Auto scaling	No
Total App Service cost per month	$70,080.00
Total App Service cost over five year(s)	**$4,204,800.00**

Azure Database for MySQL cost

Azure Database for MySQL - MemoryOptimized G5, 2 vCore(s)	$0.2362 /hr
	SKU# AAA-90572
Instance Count	400
Cost Per Month	$68,970.40
Total Azure Database for MySQL cost over five year(s)	**$4,138,224.00**

Total Azure compute cost over five year(s)	**$8,343,024.00**

Data center cost

Compute cost

Number of rack units per rack	42
Rack units required per 4 core, 14 GB RAM server	2
Number of 4 core, 14 GB RAM server	400
Total number of rack units required	800
Rack units required per 8 core, 112 GB RAM server	4
Number of 8 core, 112 GB RAM server	800
Total number of rack units required	3,200
Total number of rack units required for all server(s)	4,000
Data center construction cost per rack unit amortized over 20 years	$744.02
Data center compute cost	$2,976,080.00
Total Data center compute cost over five year(s)	**$14,880,400.00**

Storage cost

Total number of rack units required for all storage	1
Number of rack units for DAS or SAN	1
Rack mounting/installation cost	$744.02
Total Data center storage cost over five year(s)	**$3,720.10**

Total Data center cost over five year(s)	**$14,884,120.10**

Azure data center cost

Total Azure data center cost over five year(s)	$0.00

Total Azure data center cost over five year(s)	**$0.00**

Networking cost

Total hardware + software cost over five year(s)	$40,064,000.00
Network hardware and software cost assumed to be 15% of hardware and software cost over five year(s)	$6,009,600.00
Network maintenance cost assumed to be 15% of network hardware and software cost over five year(s)	$901,440.00
Service provider cost/GB per month	$0.15
Amount of bandwidth needed (GB) per month	1
Total service provider cost per month	$0.15
Total networking cost over five year(s)	**$6,911,049.00**

Azure networking cost

Total outgoing bandwidth needed per month	1 GB
Total outgoing bandwidth cost per month	$0.01
Total Azure networking cost over five year(s)	**$0.60**

Storage cost

Hardware

Local Disk/SAN-HDD	
Cost per GB	$0.20
Storage (RAID 10 configuration) volume in GB (GRS enabled Storage volume doubled to provide geo-redundant capability)	1,056
Total storage procurement cost	**$211.20**

Backup

Total backup and archive volume in GB	2,048
	HP LTO-7 BB873A
Backup volume per tape in TB	6
Number of Tape drives required	1
Cost per Tape Drive	$160.00
Backup and Archive cost over five year(s)	**$160.00**

Storage Maintenance

Storage maintenance cost (10% of storage procurement cost) over five year(s)	$105.60
Total storage maintenance cost over five year(s)	**$105.60**

Total storage cost over five year(s)	**$476.80**

Azure storage cost

Page Blob storage

Usable storage volume in GB	512
Storage cost per GB/month	$0.06
Annual storage cost per usable volume	$368.64
Total Page Blob GRS storage maintenance cost over five year(s)	**$1,843.20**

Backup

Total backup and archive volume in GB	2,048
Storage cost per GB	$0.0448
	SKU# AAA-70201
Backup and Archive maintenance cost over five year(s)	**$5,505.02**

Total Azure storage cost over five year(s)	**$7,348.22**

IT labor cost

Number of IT admin hour(s) needed per year	16,000
Hourly rate for IT administrator	$23.00
Total IT labor cost over five year(s)	**$1,840,000.00**

Azure IT labor cost

Number of IT admin hour(s) needed per year	0
Hourly rate for IT administrator	$23.00
Total Azure IT labor cost over five year(s)	**$0.00**

Total on-premises cost over five year(s)	**$70,066,126.00**	**Total Azure cost over five year(s)**	**$8,350,373.00**