VERSION 2.0

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SUMMER INDUSTRY PROJECT

RESEARCH AND ANALYSIS OF THE IMPACT OF CLOUD COMPUTING ON THE HIGH-TECH INDUSTRY

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CONTENTS

SUMMER INDUSTRY PROJECT

PROJECT COMMUNICATION DOCUMENTS

The purpose of the project will focus on enabling current companies who have not yet been exposed to cloud technologies and show them the positives and negatives of implementing such technologies. We will be accessing.

We will provide me a more holistic view to the companies in Canada and give me an in-depth knowledge of the cloud-based software that have taken the world by storm.

It will help me secure a future in the technology consulting field that I am planning to enter in the near future. Interacting with prospective companies in my field of interest will also help me in networking with like-minded individuals that can help me secure a job in the future.

PROJECT COMMUNICATION TABLE

Document	Recipients	Responsibilities
Introductory Project Report	Perry Atwal	This report comprises of an overview of the project we will execute.
Marketing Document	Perry Atwal	Focusing on the marketing aspect, this document will focus on research techniques to understand the current demand.
Financial Document	Perry Atwal	Focusing on the financial aspect, this document will emphasize on cost analysis tools of cloud computing based on existing public companies.
Issue management document	Perry Atwal	This document will focus on the potential risks and issues related to the implementation of the project in a real-life scenario
Project schedule	Perry Atwal	This document will provide the schedule and timelines related to the completion of the project.

PROJECT STRUCTURE

The structure of the project will encompass the analysis of existing organizations who are in the technology sector based on their current projects which are available to the public.

After analysis, the next step would be the benefits (if any) if we were to integrate cloud computing to the aforementioned products. Finally, we would need to provide a basic recommendation on how to integrate the cloud-based software into these products

PROJECT GOALS

The goals of this project will be divided into various aspects, focusing on the following angles:

- From the technology awareness angle that would focus on marketing the benefits of using cloud computing
- From the cost to implement the cloud computing technologies into my previous organization (due to unlimited access to their portfolios) and create a NPV estimation of forecasted returns focusing on financial segment of the project.
- Finally, from the strategy plan that would be formulated to successfully implement a mock business implementation plan focusing on the strategic segments of the project.

TASK ASSIGNMENTS

This project will be focusing on the following tasks to reach a valid conclusion. To structure the steps, the following table will be used to divide our work logic into individual tasks

Task Name	Task goals	Task Resources
Marketing	Exploratory Research - Qualitative Research on existing non-cloud using my previous organization Secondary Research - Database Research on school's definition on cloud computing and success of implementation on prior companies	Book: Marketing Essentials, Canadian Edition Paperback – Import by Joel R. Evans (Author), Barry Berman (Author), William J. Wellington (Author) Online: www.kpmg.com/.../The_**Cloud**_Changing_the_Business_Ecosystem.pdf
Financial	Cost Benefit Analysis on the after effects of implementation of cloud computing in the companies. NPV Estimation of non-cloud and cloud based companies in the same sector with similar value propositions	**Online:** www.cab.latech.edu/~CIS450/spring_10/ti/files/presentation3.pptx www.cica.ca/focus-on-practice-areas/information.../item48755.pdf
Strategy	Porter's 5 Forces Analysis to evaluate the attractiveness of cloud computing to the technology market	**Book:** Cloud Computing: Implementation,

Task Name	Task goals	Task Resources
	PEST Analysis to understand the external factors that may contribute to the market growth or decline of cloud computing to evaluate if investing in such changes will be feasible in the long run.	Management, and Security John W. Rittinghouse (Author), James F. Ransome (Author) **Online:** www.pwc.com/us/en/issues/cloud-computing/strategy.jhtml

MARKETING ANALYSIS

EXPORATORY RESEARCH

INTERVIEW AND SURVEY RESULTS

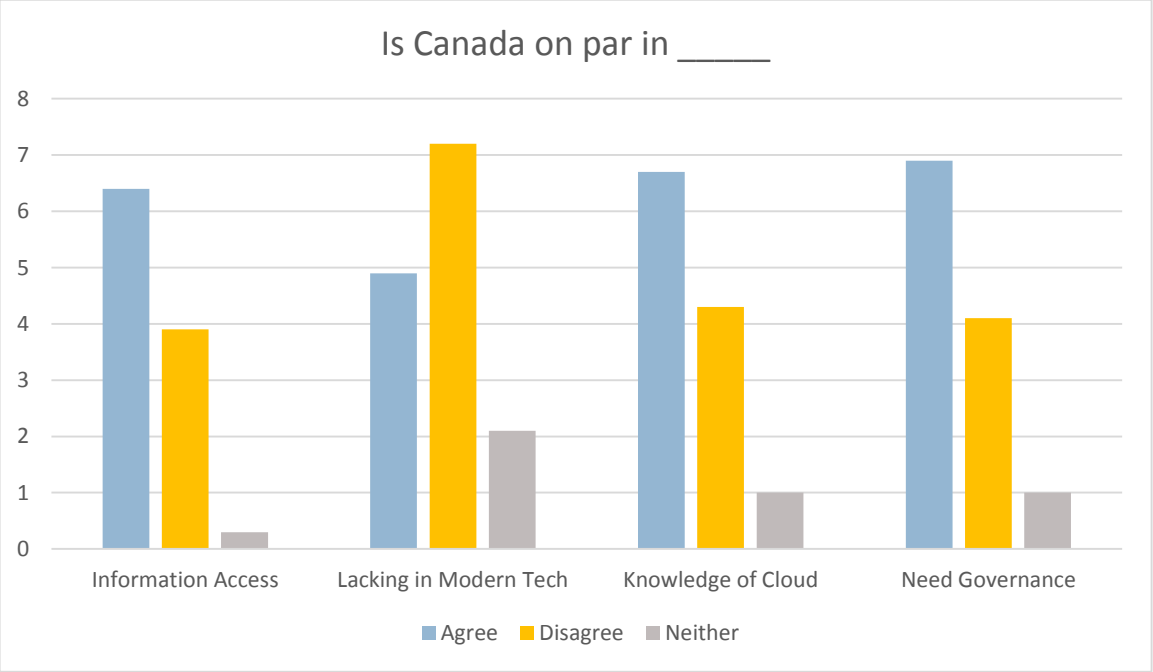
In the duration of June 15th to July 7th I was able to execute two operations from a marketing perspective that will help me form a valid conclusion on the marketing aspect of Cloud Computing in the Canadian Market:

- Group Discussions on Cloud Computing on Yahoo Forums
- Interview with Shridhar Venkatraman (CEO,ESQ Business Services)
- Survey Findings on Canadian Buyer-Seller relationships over Cloud

RESULTS ACQUIRED

Based on our current findings, we can safely assume that if used right, cloud computing can let us share data among different systems. Removal of a common electronic medium for data sharing has a lot of advantages and based on our analysis of some of the existing organizations such as the Canadian Healthcare and the Financial Analysis industries.

We also dug up some interesting survey findings that focuses on the current state of Cloud Computing in Canada and what the industry experts expect this business model is going in the future. Following are the aggregated results of the survey:



For a more detailed information on the Survey Results, Please refer to Appendix

The above shown chart shows some key findings in the Canadian Cloud Industry and as such, the results from this study suggest that:

- Most participants believed in the potential of Cloud computing to improve the Canadian infrastructure.
- One of the benefits that cloud computing can offer is that it allows allow for data interchange between disparate systems.
- A high number of respondents believe that the cloud needs to be much more secure before implementing it into existing systems.
- 40%of the respondents believe that Canada is significantly lagging behind in Cloud Computing knowledge as compared to their existing counterparts.

Governing a cloud computing service is a task in itself but based on our findings, it is the most crucial aspect of this industry's success. It would help the service providers and the consumers to move from the buyer-seller market type to partnered relationships. This would undoubtedly lead to a mutual recognition of responsibility in Canada.

FINANCIAL ANALYSIS

ECONOMICS OF CLOUD COMPUTING

BRIEF OVERVIEW

Using economies of scale core IT infrastructures can be incorporated into large data servers through cloud technologies. In a nutshell, the economies of cloud computing can be broadly classified into the following categories:

- Direct Cost Saving: Occurs for changes both within an organization as well as within the large data centers. Some examples are:
    - Supply-Side Savings: Lowers cost per server due to superior buying power and expertise
    - Demand-side aggregation: Smoothens overall variability since we can have multiple users across a wider region
    - Multi-user efficiency: Lowers server cost per tenant.

- Productivity Improvements: Scaling based on customer needs can be implemented via the cloud infrastructure. Additionally, access to files and data by employees when they are working remotely is an added benefit.

PRE-REQUISITE ASSUMPTIONS

The numbers provided below are an estimation on the estimate of what the organization's actual numbers would be and thus, are not comprehensive even though they would seem correctly indicative.

We will also assume that a lot of the operations on the customer site backed by legacy will be on-premise and we are just putting the website on the cloud.

COST VALUE ESTIMATION OF IMPLEMENTING A CLOUD INTERFACE

THE APPROACH

Using the online software of the Amazon Cost Calculator, we have estimated our requirements of the configurations that should be sufficient to our needs and compared the Cost-Value estimation between Amazon and Dell based configurations under different scenarios.

Upon comparison of the hardware specifications provided, 1 Dell Server hosts 4CPU, 4 core environments, or 4 core servers and so, we will consider taking up a 4-to-1 ratio that 1 Dell server will be worth 4 Amazon Servers.

Source: Forrester, also using Dell and Amazon Price Calculators

As you can see, over the course of 3 years with an assumed 24-hour efficiency usage there is a huge skew in a real-time scenario and our generate data. The Dell costs come out half of the Amazon IaaS costs. But, one server is not a realistic comparison. If we increase the number of servers the following graph is generated:

This seems more realistic and the calculations we have made is based on the fact that even if we have 5 Amazon instances in comparison to 5 Dell servers, only one AMI(Amazon Instance) is running at full capacity and the rest 4 are in an idle state and only running when needed during the 3-hour peak period. The conclusion we can draw from this Cost Value estimation of a Cloud Service implementation is that it takes a very close management of the cloud infrastructure to actually get the bang for the buck we expect when trying to implement such a complex system.

STRATEGY IMPLEMENTION

PORTER'S APPROACH TO CLOUD INFRASTRUCTURE ADOPTION

INTRODUCTION

Based on excerpts from technology trend documents, there has been a gradual yet important development of IT outsourcing services being linked with cloud computing services.

According to our research findings from a study conducted by Computer Economics (2013), "IT outsourcing budget continues to increase from 6.1% from 2009 to 8.9% in 2012 as a percentage of total budget of the IT industry".

The main reasons for outsourcing of an operation by any organization is the following:

- Cost Reduction
- Operational Flexibility
- Service Level Improvement
- Management Overhead Reduction
- Rapid deployment of new capabilities

Source: Computer Economics (2013)

THE FIVE FORCES

In a nutshell, the following diagram gives us a brief explanation on what are the Porter's Five Forces:

The following analysis will be carried out with the understanding of the value and improved profit margins created by the IT outsourcing industry.

Buyer Bargaining Power

- Examples: Customer size and geographical concentrations.
- Increased IT Literacy → Increased bargaining power → Demand cloud computing.
- Increased Power → Reduced Profitability

Supplier Bargaining Power

- Examples: Subcontractors, hardware, software.
- Demand > Supply → Increased Supplier Power
- Increased Supplier Power → Reduced Profitability.

Threat of New Entrants

- Examples: Legal obstacles, entry of new IT outsourcing providers.
- Barriers to entry not lower due to high initial fixed costs.
- But, disruptive technologies like cloud →Decreased profitability.

Threat of Substitutes

- Former products can reduce demand due to customer switch to former alternatives.
- Depends on relevant price-to-performance ratios as well as customer switching costs.
- Cloud implementation → Reduced profitability.

Competitor's Rivalry

- Head-to-head competition would dissipate current IT outsourcing value.
- But, cloud computing implementation by rivals may lead to drastic changes to existing IT outsourcing profit margins.
- Profitability depends on who implements cloud technology first.

CONCLUSION

We learnt that the cloud computing technology may be a business strategy but requires some economical and competition factors that need to be considered before making any concrete decisions. From my personal perspective, the existing IT outsourcing industry would have lower profitability margins if they implement cloud computing infrastructure as a service.

PEST ANALYSIS ON DECISION TO ADOPT CLOUD COMPUTING

INTRODUCTION

From an industry's perspective, cloud computing represents low startup capital, lower maximum usage, scalability, easy to manage etc. So, there will be good profit margins for pay-per-use in high-performance computing situations.

From a customer's perspective, Cloud IaaS provides lower capital expenditure, efficient IT dexterity, quick ROI (Return on Investment), lower barriers to entry etc. Therefore, cloud computing indicates promising prospects for collaboration and a new competitive advantage for the current digital market.

THE APPROACH

The following table depicts the respective factors in an unbiased format:

Political Factor	Economic Factor
• Continuous data protection → More legislation due to privacy laws. • Politicians looking to regulate → Cloud is a good alternative • Reduced carbon emissions.	• Flexible payments→ Saas (Software as a Service). • Minimized expenditure on H/W, S/W and maintenance. • 50-75% reduction in time and effort to add new products.
Social Factor	**Technological Factor**
• New collaboration and social networking opportunities. • Cooperation in IT industry • User friendliness • Opportunity for employees to develop new skills → Career progression → higher job satisfaction.	• Customized and efficient operations. • Always accessible, anytime, any device, any connection, any place. • Scalable through dynamic resource provisions. • Minimal launch effort due to easy migration of code.

THE CONCLUSION

Cloud computing have a potential to grow exponentially and help the productivity, efficiency and profitability of small scale enterprises. Some see it as a gamble based on possible assumptions that may lead to misconceptions and others do not see it as part of a larger strategy. Accordingly, increasing number of industries (small and large) are starting to see some real value in using the Cloud.

RISKS AND MITIGATION

RISKS AND ISSUES MANAGEMENT

POTENTIAL EXCEPTIONS AND PROBLEMS

According to the Privacy Commissioner of Canada, the following privacy issues have been identified as the leading overreaching problems the IT industry would face today:

- "Jurisdictional Neutrality" The assumption that changing the location of processing or storage doesn't change the existing dynamic of data stream of processing of storage used is mostly not the case and contracting out cloud infrastructures may result in the privacy of the individual at risk.
- "Consumer not in Control" Case in Point Amazon Kindle, when Amazon decided to remove some publications from the cloud store, the DRM sites were shut down without consent from the customers and hence, they were unable to access the resources they had already paid for.
- "Function Creep" Organizations will take this opportunity to extend the size and scope of their organization to leverage on the information they are gathering.
- "Meaningful Consent Compromised" If cloud computing does become the de facto model then sale of actual copies of the software will cease and move towards a free, advertised related structure. The structure itself is not a problem, but the absence of any alternatives to this structure may result in problems.

According to the industry leading experts, cloud computing creates a distance relationship between individuals and their data. Therefore, the existence of privacy related problems will be a key factor as to whether implementation of cloud computing is valuable to the existing information structure or not.

Following are some risks identified that are related to the privacy of the customer as well as the organization:

- "Information Jurisdiction" As per data protection laws, there may be problems related to sending, storing and processing data across multiple jurisdictions.
- "Creation of new data streams" The cloud creates huge collection of (new) data with every click a customer executes. This data may be used by organizations in ways that may not have previously be consented to by the customers.
- "Security" As of today, most of the cloud service providers tend to forgo the strong security solutions. This may lead to data theft and experts have pointed out that a minimum of data encryption methodologies used in online banks should be used as a standard.

APPROPRIATE CORRECTIVE MEASURES

Canada has a very strong corrective measure already in place called PIPEDA (Personal Information Protection and Electronic Documents Act) which governs how private sector organizations collect, use and disclose personal information in the course of commercial business. Utilizing its evolving sub-sects every 5 years, the Government has been able to keep track privacy and data protection posed by the cloud model.

Self-regulation should also be used to prevent data leakage from cloud models since the cloud providers and the customers have an inherent responsibility to each other to correctly understand what the general pitfalls in utilizing such a model are.

An unofficial census of cloud customers for 2012-2013 provided us with some interesting insights:

90% of the customers skip reading the privacy agreement terms of contract.

Top 3 Cloud storage companies have a monopoly going on in the current market of user data acquisition.

ORACLE

IBM

amazon web services™

Data security has **no set standard** and as such private and public cloud servers have different levels of data encryption.

Customers are looking towards **cheaper alternatives** as compared to existing providers and as such are not paying attention to privacy laws abatements.

Another corrective measure that should also be considered here is the divergence from existing companies as mentioned above towards more localized cloud service providers like RackSpace and RedHat, who are free alternatives to behemoths like Amazon and Microsoft. This would help the fiscal part of the customer demands and these services have been in the Government's control in a much better aspect as compared to its commercial counterparts.

TRACKING RISKS AND ISSUES

The following table lists the risks and issues we have identified above. Each risk will be provided an impact value ranging from 0-9, 9 being the most damaging. The probability of occurrence will be ranging from 0-9, 9 being highest probability of occurrence.

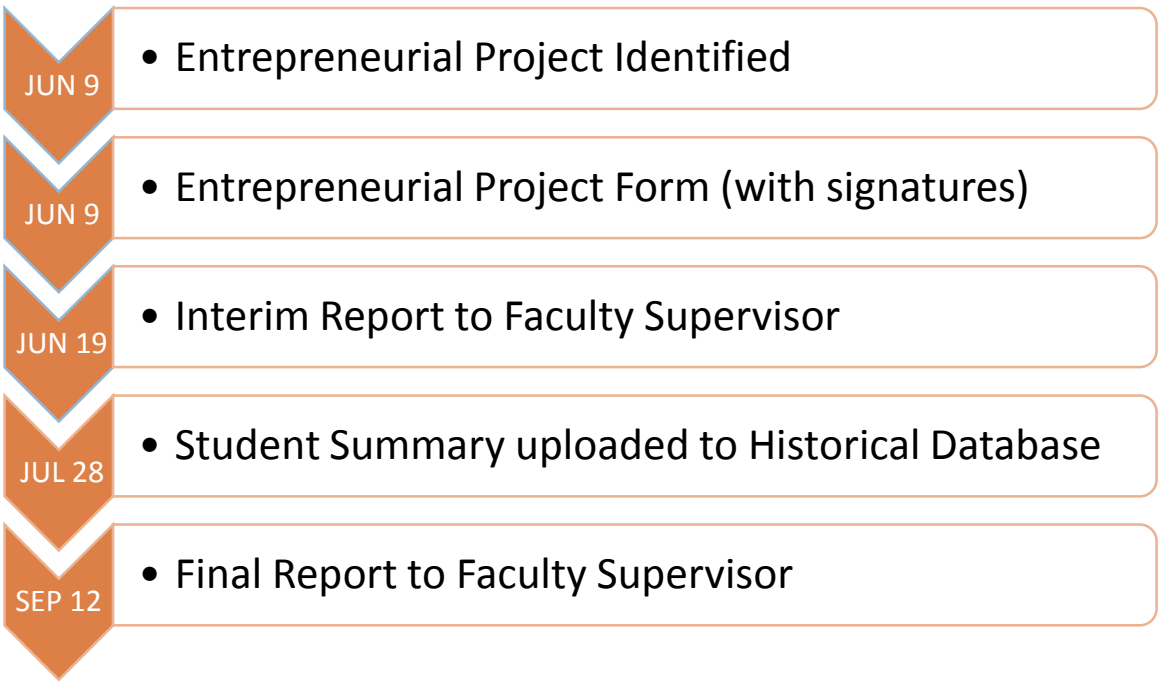
Date recorded	Risk description	Probability	Impact
20th June	Jurisdictional Neutrality	6	8
22nd June	Consumer not in Control	8	4
22nd June	Function Creep	8	8
25th June	Meaningful Consent Compromised	9	5
26th June	Information Jurisdiction	9	3
26th June	Security	7	7
27th June	Creation of new data streams	5	7

Based on the above table, we can conclude that the 3 issues highlighted above should be our primary concern as of this date and should be rectified at the earliest.

These values were estimated based on expert analysis and citations in government reports and analysis tools found on the web and books. They have been properly referenced at the end of the report.

PROJECT TIMELINE

TASK AND DELIVERABLES



The above mentioned flow diagram displays the various milestones in the project that we have to meet in order to complete the project within the estimated deadline.

APPENDIX

APPENDIX 1.1: CUMMULATIVE ECONOMIC BENEFITS (2010-2015)

	France	Germany	Italy	Spain	UK	EMEA
Business development opportunities	24,599	32,642	23,995	16,866	29,555	**127,657**
Business creations	51,377	69,507	43,305	30,939	20,026	**215,153**
Net total cost savings	26,323	37,740	28,463	22,008	26,206	**140,740**
IT Capex savings	28,653	36,378	30,461	23,013	36,176	154,682
IT Opex savings (FTEs/productivity)	13,818	18,139	14,533	10,396	16,943	73,829
IT Opex savings (power and cooling)	11,107	14,345	11,821	8,510	10,566	58,349
Additional cloud services expenditure	-27,255	-31,122	-28,353	-19,910	-37,481	-144,120
Indirect GVA	60,450	81,351	55,007	40,737	42,202	**279,747**
Total economic benefit	**162,749**	**221,239**	**150,770**	**110,550**	**117,989**	**763,297**

Source: CEBR Study of GDP growth on cloud adoption

APPENDIX 1.2: POTENTIAL GDP GROWTH ON CLOUD ADOPTON

Expenditure	Annual GDP impact over 10 years			
	At 75% adoption		At 50% adoption	
	Percent	$ billion[1]	Percent	$ billion[1]
Capital	0.10%	1.44	0.07%	1.01
Operational	0.13%	1.87	0.08%	1.15
Total	**0.23%**	**3.32**	**0.15%**	**2.16**

Source: KPMG Modelling Software

APPENDIX 1.3: TOTAL INVESTMENT IN HARDWARE AND SOFTWARE 2010-2012

ANZSIC industry	Investment in computer hardware ($m)	Investment in computer software ($m)
Agriculture, forestry and fishing	91	78
Mining	303	406
Manufacturing	1,202	992
Electricity, gas and water supply	337	465
Construction	274	205
Wholesale trade	776	637
Retail trade	928	637
Accommodation, cafes and restaurants	97	54
Transport and storage	483	590
Communication services	479	732
Finance and insurance	1,723	1,862
Property and business services	2,113	2,016
Government administration and defence	1,068	1,604
Education	584	455
Health and community services	445	358
Cultural and recreational services	208	216
Personal and other services	202	231
Total	**11,313**	**11,538**

Source: Canadian National Accounts: Information and Communication Technology Satellite Account, 2010-2012

APPENDIX 2.1: SURVEY RESULTS

Table 1. Access to information

Question: Access to information is a basic right for every Canadian citizen.	
Strongly disagree	12.24%
Disagree	8.16%
Neither agree nor disagree	2.04%
Agree	22.45%
Strongly agree	55.11%
	100%

Table 2. Adoption of modern information technologies

Question: Canada is lagging behind other western countries in the adoption of modern information technology.	
Strongly disagree	6.12%
Disagree	40.82%
Neither agree nor disagree	14.29%
Agree	26.53%
Strongly agree	12.24%
	100%

Table 3. Knowledge of cloud computing

Question: How do you describe your knowledge of cloud computing?	
Very Good	46.94%
Above Average	28.57%
Average	10.20%
Below Average	10.20%
Extremely Poor	4.08%
	100%

Table 4. Cloud Computing and business strategies

Question: Cloud computing is one of the most important strategic technology opportunities for business.	
Strongly disagree	8.16%
Disagree	8.16%
Neither agree nor disagree	8.16%
Agree	46.95%
Strongly agree	28.57%
	100%

Table 5. Clear governance development

Question: To get the most benefit from their cloud initiatives, Canadian organizations must develop a clear governance strategy..	
Strongly disagree	8.16%
Disagree	4.08%
Neither agree nor disagree	10.20%
Agree	42.86%
Strongly agree	34.70%
	100%

Table 6. Cloud Computing and health information sharing

Question: Cloud computing has the potential to facilitate health information sharing nationwide.	
Strongly disagree	8.16%
Disagree	4.08%
Neither agree nor disagree	6.12%
Agree	44.90%
Strongly agree	36.74%
	100%

Table 7. Impact of privacy and security concerns on Cloud Computing adoption

Question: Cloud computing has the potential to make EHR systems more effective and more secure.	
Strongly disagree	10.20%
Disagree	12.24%
Neither agree nor disagree	30.61%
Agree	28.57%
Strongly agree	18.38%
	100%

Table 8. Impact of privacy and security concerns on Cloud Computing adoption

Question: In your opinion, what is the biggest barrier to Cloud Computing adoption in Canada?	
Security concerns	44.90%
Privacy concerns	24.49%
Portability concerns	8.16%
Lack of adequate governance	16.33%
No idea	6.12%
	100%

Table 9. Adoption rate of Cloud Computing in Canada

Question: Cloud computing adoption has been slow in Canada.	
Strongly disagree	4.08%
Disagree	6.12%
Neither agree nor disagree	24.49%
Agree	44.90%
Strongly agree	20.41%
	100%

Table 10. Cloud deployment model

Question: What is the cloud deployment model used in your organization?	
Public	18.37%
Private	16.33%
Community	4.08%
Hybrid	30.61%
None	30.61%
	100%

Table 11. Role of the governments in the adoption of Cloud Computing in Canada

Question: Governments (Federal, Provincial, and Territorial) should play a significant role in the diffusion of cloud in Canada.	
Strongly disagree	12.24%
Disagree	6.12%
Neither agree nor disagree	16.33%
Agree	48.98%
Strongly agree	16.33%
	100%

Table 12. Outsourcing and performance

Question: Outsourcing has become a way of life for successful companies in the new economy.	
Strongly disagree	6.12%
Disagree	12.24%
Neither agree nor disagree	24.49%
Agree	24.49%
Strongly agree	32.66%
	100%

Source: Survey conducted on Canadian Cloud Council of 49 members in fall 2012

APPENDIX 3.1: AMAZON PRICE CALCULATOR SNAPSHOT

Choose region: AWS GovCloud (US) — Inbound Data Transfer is Free and Outbound Data Transfer is 1 GB free per region per month

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. It is designed to make web-scale computing easier for developers. Amazon Elastic Block Store (EBS) provides persistent storage to Amazon EC2 instances.

Compute: Amazon EC2 Instances:

Description	Instances	Usage	Type	Billing Option	Monthly Cost
DB Server-Credential Storage	1	4 Hours/Day	Linux on t1.micro	On-Demand (No Co	$ 2.93
DB Server-Client Database	1	70 % Utilized/Mor	Linux on m3.large	1 Yr Light Reserved	$ 85.68
Add New Row					

Storage: Amazon EBS Volumes:

Description	Volumes	Volume Type	Storage	IOPS	Snapshot Storage
Offshore Project	3	Provisioned IOPS (SSD)	20 GB	10	300 GB-month of Storage
Add New Row					

Elastic IP:

Number of Additional Elastic IPs:	20	
Elastic IP Non-attached Time:	90	Hours/Month
Number of Elastic IP Remaps:	10	Per Month

Estimate of Your Monthly Bill

Show First Month's Bill (include all one-time fees, if any)

With AWS, You only pay for what you use. Below you will see an estimate of your monthly bill. Expand each line item to see cost breakout of each service. To save this bill and input values, click on 'Save and Share' button. To remove the service from the estimate, jump back to the service and clear the specific service's form.

Save and Share

Amazon EC2 Service (GovCloud-US)		$ 586.10
Compute:	$ 88.61	
EBS Volumes:	$ 9.00	
EBS IOPS:	$ 2.34	
EBS Snapshots:	$ 112.50	
Reserved Instances (One-time Fee):	$ 300.00	
Elastic IPs:	$ 73.65	
AWS Support (Basic)		$ 0.00
Support for all AWS services:	$ 0.00	
Total One-Time Payment:		$ 300.00
Total Monthly Payment:		$ 286.10