**Computing Project Proposal**

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**Project Title:** The current and future implications of big data analysis on the farming industry in North America

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**Name of GDI:** Sharon, Taly

**Ethical Checklist Completed:** Yes

**Name of SSM:**

**The Programme**: MSc in Software Engineering

**Domain:**

* CKIT-504-1B: Databases
* CKIT-507-1: Software Engineering
* CKIT 511: Security Engineering

**Proposal approved by:** (To be filled in by the DA)

**Date of the approval:** (To be filled in by the DA)

**Approval confirmed in MiTSA by the Lead Faculty (Dissertation)**: (To be completed by the Lead Faculty)

**Sponsor's Details: N/A**

**Sponsor's Background:**

**Sponsor's Agreement:**

**The Project Aims and Objectives:**

It is a fact that the world's population is on the rise, and an unfortunate turn of events is the fact that the world’s resources will soon not be enough to feed the entire world. According to projections by experts, the population of the world will hit over nine billion by 2050 and to sustain that population will require food production to increase by sixty percent (Zhijun 2011, p. 296). Big data is a term that has penetrated the technological world in the recent years. It refers to the collection of relevant data from a vast number of sources and translating it into actionable information so as to insightfully solve problems at large scale and speed thereby improving business processes (Zhijun 2011, p. 296). To ensure that the populations in the future survive, there is a need to incorporate Big Data analytics into farming. Using adequate information, agriculture will enter a new age where it maximizes food production.

The world today is in the information age where human activity relies on data collection and analysis to run successfully. The new era of information is due to the immense competition in the business world forcing businesses to try and take never-ending precautions to ensure that they do not slip up. Thus, with technology levelling the playing field, there was a need for organizations to come up with a competitive edge. That advantage became information because the adequacy of information brought immense benefits. For instance, decision-making processes are smooth because the management will be able to make informed decisions. It is possible for companies to identify their problems and deal with them. Because information brought this much changes in the business world, in farming, the changes will be a sight. Brian Marshall is one of the few people who have seen the benefit of this idea and created a digital farm (Galt 2013, p. 343).

The project aims to figure out and utilize the best method of improving data collection and analysing it to decrease costs and increase productivity in the farming industry. Existing solutions are not viable for small farms and will take even well financed farms months to execute the results.

The ideal solution would be to provide tweaks to the day to day activity of all farming aspects. The proposed solution will benefit the farming community in Atlantic Canada as the algorithms, data processing techniques and research can be used to benefit any field where increasing productivity is a matter of big numbers.   
Big Data is changing the landscape of the world whether we like it or not. Change is not something that people take kindly; thus, an essential move will be finding the right way of incorporating the change. The fact that farms will become the centre of food production means that it is the only hope for the future. Without agriculture in the picture, the future generations may have to depend on synthesized foods which are unhealthy because of their lack of the natural nutrients that our bodies depend on.

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| **Step** | **Short Description** |
| Hypothesis | Effective use of big data analysis in the farming industry can change it, piece by piece by tweaking the way the industry works, mainly small and low budgeted farms.  Simple application Farmer companion/assistant that collects and analyses data related to farming for specific farm conditions can increase productivity and decrease cost. Making information generated by data analysis available as a simple step by step report will get small and low budgeted farms participating in the big data game |
| Research Methods | * Literature Research * Model building * Prototyping * Survey and Questionnaires – this method will allow to gather data regarding the farmers current actions and results |
| Artefact | Farmer Companion applications: A simple, documented, easy to use API and web application to generate step by step reports based on existing data and farm’s budget to improve productivity. |
| Evaluation | Working prototype application evaluated by selected group of farmer users.  Personal interviews with some of the farmers to learn more about their process and validate the proposed solution.  The reports and steps will be evaluated by farmers (and people of the academia) to determine the results of the produced guide. |

**Project Outline:**

Farmer Companion is something the farming industry is craving for. The need for a client facing platform, to propose simple steps to increase productivity in “layman terms” is something that is still unavailable for small farms.

The proposed Farmer Companion will provide a platform (responsive, mobile compatible web application) where farmers will be able to upload their data such as location, climate, industry type, harvest seasons etc, and the output will be a list of easy to follow steps to increase productivity and decrease costs. Allowing small farms to stay in business, decreasing their costs and increasing productivity (and there for – gains).

The project will include the following stages:

* Literature research and Data collection
* Algorithm modelling
* Application Development
* Evaluation

While the algorithm will be tested and configured for the agriculture conditions of Atlantic Canada’ farms, the Farmer Companion will be available for everyone. With small adjustments, the algorithm could work in rain forests as well as deserts.

The e product (Website and Mobile app) will be the same for all areas.

Farmer Companion will benefit the farmers, small businesses, and in the perspective, it will help decreasing world hunger.

The initial stage of the project will use a Google Form questionnaire to be distributed to at least 100 farms in Atlantic Canada. This questionnaire will be designed to understand how farmers use technology, how they farm and what would be the easiest and most cost-effective way to collect data from their farms.

After that, a “human” data analysis will take place which will help with building the algorithm for analysing farming data.

This algorithm will have a “goal” (a target state, which will be derived from the questionnaire) and a “starting point” which will constantly change, dependent upon the data that was fed to the software.

Analysis of the supplied data will produce a report consisting of simple steps (displayed via the web application) that can be taken in order to increase productivity and decrease cost. Simple examples are “water harvests during the night” if water bill is too high, or “reduce/increase land size” assuming the ideal rate between land-size/harvest/expenses has not been reached.

**Literature Survey / Resources’ List:**

Aiello, LC 2011, 'The Origins of Agriculture: New Data, New Ideas', Current Anthropology, pp. S161-S162.

Canisius, F, Turral, H, & Molden, D 2007, 'Fourier analysis of historical NOAA time series data to estimate bimodal agriculture', International Journal of Remote Sensing, 28, 24, pp. 5503-5522.

Fuller, D, Willcox, G, & Allaby, R 2011, 'Cultivation and domestication had multiple origins: arguments against the core area hypothesis for the origins of agriculture in the Near East', World Archaeology, 43, 4, pp. 628-652.

Galt, RE 2013, 'The Moral Economy Is a Double-edged Sword: Explaining Farmers' Earnings and Self-exploitation in Community-Supported Agriculture', Economic Geography, 89, 4, pp. 341-365.

Zhijun, Z 2011, 'New Archaeobotanic Data for the Study of the Origins of Agriculture in China', Current Anthropology, pp. S295-S306.

**Scholarly Contributions of the Project**

The project will propose a solution for farming field to provide tools to small and low budgeted farmers to slightly decrease benefits by big companies taking advantage of technology. The original aspect is to perform complex and dynamic analysis from different sources and be able to produce a step by step guide for improvement. Ideally, the proposed solution will provide a competitive advantage for small farmers.

The project will be analysing the problems farmers face on a daily bases, their crops and production and will offer better alternatives to some of their actions, or additional steps to take in order to maximize efficiency.

**Description of the Deliverables:**

The project work will involve gathering a lot of data on the current process of agriculture in the Maritimes, their costs, profits, and their actions.

Key deliverables for the project will include:

* Literature overview and analysis
* Design and implementation of the algorithms
* Design of the web application
* A small-scale prototype web application to enable the full process starting at additional data collection and aggregation, and ending with an actions analysis and “recommended steps”

**Evaluation Criteria:**The Farmer Companion could be evaluated by people of both the IT industry and farmers across the Maritimes. A successful solution (if possible) will be farmers recognizing the validity of the reports that were generated and implementing them.

The project in total will be evaluated against Project specification and design.

**Resource Plan:**Google Docs will be a key resource in my subject is it provides a simple easy way to collect data from distant locations.

Visual Studio (Community-free Edition) will be used as an IDE, as I prefer to create the artefact using .Net Core. As for database, I’ll be using MongoDB under MLAB (Free resource of up to 500MB).

The costs will be kept at minimum, as I didn’t find a sponsor. Potential sponsors, if needed are John Deere, Irving Oil, JDI, and Baxter.

**Project Plan and Timing**

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| Task | Assigned To | Start | End | Days |
| Proposal Approval | Elad |  | 1/9/2018 |  |
| Choosing a DA | Elad |  | -- |  |
| Data Collection | Elad |  | -- |  |
| Project Specification and Design | Elad |  |  |  |
| Implementation | Elad |  |  |  |
| QA | DA |  |  |  |
| Evaluation | Elad |  |  |  |
| Write Up | Elad |  |  |  |

**Risk Assessment:**

The main risk this dissertation contains is inconsistent/lack of data. This will cause the entire hypothesis to be invalid. I managed this risk by choosing a very specific area in North America (Atlantic Canada) which a very easy to predict weather, and hostable farmers, I verified that the farmers are willing to participate and are aware of their obligations.

Secondary risks include the information/reports displayed by the UI being not user friendly thereby discouraging farmers to use it. UI should be developed in such a way that these information are easy to understand and organized for end users.

**Quality Assurance:**

Data collected should be verified with multiple sources to more accurately design the algorithm. The APIs should be unit tested to avoid any failures and UI needs to be reviewed by the end users to ensure it meets their needs and is comfortable to use. The project development progress will be reviewed by the DA.