



SOFTWARE RISK MANAGEMENT PLAN

ANTHROCLOUD

Software Modernization for Cloud-based Pediatric Anthropometry

December 4, 2019

Version 2

Change History

Version	Date	Author	Changes
1.0	July 28, 2019	Dusty Wright	Initial Document
2.0	December 4, 2019	Dusty Wright	Document revision: <ul style="list-style-type: none">- Table 1 updated- Table 2 updated- Table 3 updated- Table 4 updated

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1 Introduction

1.1 Purpose

The purpose of this document is to specify a simple risk management plan for the AnthroCloud software solution. Stakeholders and developers are the intended audience for this document. This document lays out activities for risk management.

1.2 Scope

Risk management activities seek to manage risk before and during software development. The AnthroCloud software solution is a modern cloud-based WHO Child Growth Standard compliant anthropometric calculator designed to provide a more flexible, maintainable, and portable solution to meet the changing needs of users. The scope of this project is limited to WHO Child Growth Standards, z-score calculations, percentile calculations, growth curves, and plotted scores.

The objectives of the project are as follows:

1. Choose an application platform to improve the ability of the calculator to change to new specifications or operating environments.
2. Design software that decouples the application into components to reduce the effort necessary to change the calculator.
3. Provide a common interface to better exchange data between calculator components.
4. Build a test suite to reduce the effort necessary to verify calculator changes.

1.3 References

Azure for Students-Azure FAQ | Microsoft Azure. (2019). Retrieved June 12, 2019, from <https://azure.microsoft.com/en-us/free/free-account-students-faq/>

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2 Risk Management Plan

The Risk Management plan is created to anticipate issues that may arise before and during creation of the AnthroCloud software solution. This plan lays out the necessary activities to manage risks during this project.

2.1 Risk Source

Risk sources are identified to focus efforts on specific areas that could negatively impact the project. A list of sources is compiled; however, additional sources may be discovered and added later. Project status and progress reports are an additional source. Specific sources impacting the development of the AnthroCloud software solution are as follows: uncertain requirement, unprecedented efforts, infeasible design, unavailable technology, and unrealistic schedule estimates or allocation (CMMI, 2010). This product relies on two external software components which equate to third party software component capability as an additional source of risk.

2.2 Risk Category

Risk categories fall into one area shaped by the work-breakdown deliverables. The software product milestones consist of setup, database, web application, web service, and test. The software, components, and process to create the deliverables effectively create the risk category for AnthroCloud software solution.

2.3 Risk Parameters

Risk parameters are established to measure potentially unwanted changes to the project caused by risks. Parameters are indicators for action that require a risk mitigation plan to take effect. The risk parameters are defined as follows:

Risk likelihood and probability refer to the risk of occurrence.

Risk impact and severity refer to the consequent of the risk occurring.

Threshold for unacceptable risk is exceeded and met with the highest risk response.

2.4 Risk Management Strategy

The risk management process includes risk identification, risk analysis, risk response, and risk control. Identified risks are placed in a risk list or register. Analyzed risks are categorized and prioritized for mitigation. An effective risk response is created from risk categories. Risk control mitigates unacceptable risks. A strategy for identifying, analyzing, and mitigating risks is detailed below.

3 Identify Risks

Potential issues negatively impacting this project will be documented as a risk. The risk identification effort shall be conducted weekly. Risks shall be recorded in the list or register below. The name of the risk will be recorded. The description of the risk shall be included. In addition, each identified risk will include three elements:

Cause – Source of the risk or trigger

Condition – Effects that may change the outcome of a project

Consequence – Impact of the event or condition to the outcome of a project

Table 1 Risk Identification

Name	Description	Cause	Condition	Consequence
Few Anthropometric Calculator Libraries	Insufficient software libraries support human measurement.	There is no universal open source library to calculate anthropometrics.	No software library can be found to support accurate anthropometric measurement.	A custom library would be created to calculate z-score and percentiles.
Limited Free Line Plot Controls	Insufficient open source user control libraries supporting line plots.	WHO Anthro uses NPlot to graph and plot Growth Charts.	No free web-based user interface control can be found to replace desktop-based NPlot to support line plot graphing.	Create a custom graph or purchase a license to graph growth curves and plot scores.
Discrepancies with WHO Anthro	Comparing any calculator to WHO Anthro will yield a discrepancy.	WHO Anthro software adjusts length input data internally by $\pm 0.7\text{cm}$ depending on age in compliance with standard measurement procedures (WHO, 2011, p. 8). For example, a sick child cannot stand and is measured lying down adding 0.7cm.	AnthroCloud Calculations show a discrepancy with the WHO Anthro software	AnthroCloud would perform adjustment by changing the supplied inputs without user knowledge.
Azure for Students Service limitations	Azure products are free according to their period of availability and service limitations.	Azure for Students includes \$100 in Azure credits for 12 months plus select free services (subject to change) without a credit card.	Azure subscription could incur charge outside of free services.	Purchase Azure credit or upgrade to a pay-as-you-go subscription.
Limited Sample Data	Lack of verifiable sample data may affect validation.	There is no single source for hand calculated verifiable sample data and WHO Anthro only has 3 patients.	AnthroCloud can only verify calculations against 3 WHO Anthro patients.	Insufficient sample data was obtained to validate the calculator.

4 Analyze Risks

Identified risks are evaluated, categorized, and prioritized. Risks are two dimensional based on severity and probability. Severity represents the risk's impact on effort. Probability represents the likelihood of the risk occurring in the future. The severity has five dimensions from least to most including: No impact, Minor, Medium, Major, Extensive. The probably has five dimensions from least to most

including: Highly unlikely, Unlikely, Possible, Likely, and Very likely. Risks are prioritized. In this project, the higher probability and severity the higher the priority.

Risk prioritization was calculated from risk exposure as a product of probability multiplied by severity. Risks one through five are calculated below and prioritized in Table 2 Risk analysis.

$$R1 = 3 \times 2 = 6$$

$$R2 = 3 \times 2 = 6$$

$$R3 = 3 \times 1 = 3$$

$$R4 = 2 \times 2 = 4$$

$$R5 = 2 \times 1 = 2$$

Table 2 Risk Analysis

Priority	Risk	Severity	Probability	Mitigation
1	Discrepancies with WHO Anthro	Medium. This impacts verification of calculations.	Unlikely. The behavior can be replicated. The risk is reduced due to better understanding of calculation & user interface configuration.	AnthroCloud assumes clinician inputs are compliant with standard measurement procedure (recumbent and standing), whereas WHO Anthro adjusts inputs. Two-years and under shall be measured recumbently using Length-for-Age; otherwise, Height-for-Age and standing will be used. Unadjusted inputs are a more accurate. Measurement user interface element shall be removed or read-only.
2	Few Anthropometric Calculator Libraries	Medium. Without an accurate calculator, development time increases for coding, research, verification, and validation. Also, development time decreases for other tasks.	Unlikely. Reduced after testing accuracy.	Erik Knudsen's anthstat-statistics (GitHub) computes WHO Child Growth Standards compliant z-scores and percentiles for children and adolescents. The library was tested and is accurate for the measurement indicators reducing likelihood of risk.
3	Limited Free Line Plot Controls	Medium. This impacts the display of child growth charts.	Highly Unlikely. Library found.	Use a user interface control library with a line plot chart control like Google Charts.
4	Limited Sample Data	Minor. This impacts verification testing.	Unlikely.	WHO Documentation contains some test data. Anthstat-statistics solution contains some automated tests. WHO Training Course contains test data. CDC Growth Chart Training contains test data. Some State agencies provide online training.

5	Azure for Students Service limitations	Minor. This could impact architecture.	Highly Unlikely. Remaining balance is positive.	Mitigation - Review Azure for Students FAQ product restrictions ("Azure for Students", 2019). Review pricing calculator for subscription prices ("Pricing Calculator", 2019).
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The risk matrix is color-coded for risk control indication. The combined severity and probability are categorized as unacceptable (red), controlled (yellow), and acceptable (green).

Green – Low probability, low severity is acceptable

Yellow – Medium probability, medium severity risks should be controlled

Red – High probability, high severity risks are unacceptable

Table 3 Risk Matrix

Severity	Extensive					
	Major					
	Medium	R3	R1, R2			
	Minor	R5	R4			
	No Impact					
		Highly unlikely	Unlikely	Possible	Likely	Very likely
Probability						

The ALARP concept holds that risks falling into the green and yellow risk areas are acceptable if the risk stays at that level, but low risk items reside in the risk register and need to be reviewed on a regular basis (CGE, 2017). Currently, no risk identified measures unacceptable necessitating further quantitative analysis or measure. A visual approximation of current exposure on matrix the converges near R1, R2, R3, R5, and R4, within monitoring but controlled as low as reasonably practicable.

The timeline for each risk impact on the project is identified below:

R1 = Testing begins 11/18 through 12/2. A discrepancy is anticipated as the AnthStat-statistics library does not impose an addition for height and length measures.

R2 = Calculator begins 10/7 through 10/18. The BMI-for-age measure is accurate for a female weighing 9kg and measuring 73 cm in length.

R3 = Chart control begins 11/4 through 11/8. Google Charts draws a line and plots a point.

R4 = Testing begins 11/18 through 12/2. Sample data is available.

R5 = Setup is 8/26 through 9/6. This will be the first risk addressed.

5 Risk Response

A risk response will be planned for each identified risk. Positive risks are accepted by default on this project as an opportunity to exploit, enhance, or share are unlikely. Negative Risks are ranked in one of the four risk response categories: avoid, mitigate, transfer, accept. A contingency should be considered, if possible.

The criteria are described as follows:

Mitigate – High likelihood, low impact activities suggest mitigation using risk control to reduce risk.

Avoid – High likelihood, high impact activities suggest avoiding of the activities altogether.

Transfer – Low likelihood, high impact activities suggest a transference of activity to a third party.

Accept – If the mitigation effort exceeds the effort to complete the activity, then a suggested response is to accept the risk and continually monitor the risk.

Table 4 Risk Response

Risk Title & Description	Date Identified	Likelihood (H/M/L)	Impact (H/M/L)	Risk Response
Discrepancies with WHO Anthro	6/10/19	L	M	AnthroCloud assumes clinician inputs are compliant with standard measurement procedure (recumbent and standing), whereas WHO Anthro adjusts inputs. Unadjusted inputs are a more accurate. Measurement user interface element shall be removed or read-only. This is accepted.
Few Anthropometric Calculator Libraries	6/10/19	L	M	Erik Knudsen's anthstat-statistics (GitHub) computes WHO Growth Standard-compliant z-scores and percentiles for children and adolescents. The library was tested and is accurate for the 9 indicators reducing likelihood of risk. Risk accepted.
Limited Free Line Plot Controls	6/10/19	L	M	Use a user interface control library with a line chart and plot chart capability. ChartJS and Telerik were evaluated. Free open-source Google Charts was selected, accepted.
Limited Sample Data	6/10/19	L	L	WHO Documentation contains some test data. Anthstat-statistics solution contains some automated tests. WHO Training Course contains test data. CDC Growth Chart Training contains test data. Some State agencies provide online training. Test data does exist for this domain,

				accepted. Accuracy with anthstat-statistics exceeded expectations. Numerous patient scenarios are unnecessary. Risk accepted.
Azure for Students Service limitations	6/10/19	L	L	Review Azure for Students FAQ product restrictions. Review pricing calculator for subscription prices. This can be mitigated by creating a Web App, Web Service, and Database in Azure. As of 11/29, \$60 of \$100 student credit remaining. Risk accepted.

6 Monitoring and Control Risks

Risk monitoring and controlling consists of new risks, risk tracking, risk reclassification, and risk reporting.

New risks, if any, will be identified in weekly Agile planning retrospectives. Planning will be necessary for new risks.

Existing risks are tracked in the AnthroCloud risk register. The following conditions would amend tracking of existing risks.

- An existing risk requires reassessment for change in accuracy.
- A risk condition has been triggered.
- A risk's severity and probably have increased.
- A risk's scope requires a longer-term plan.

Risk are reclassified when their criticality does not decrease with time. The possibility of a risk occurring should decrease over time and the risk should eventually be closed. If an action plan is not effective at reduce the risk over time the risk will be reclassified.

The risk register is effectively the risk report for the project. It is maintained weekly.

A risk audit assesses and evaluates project risks, risk sources, risk categories, new potential risks, and possible changing risks that require attention beyond weekly risk monitoring. Four project milestones at 9/9, 9/30, 10/28, and 11/18 presented an opportunity for an audit.