2010 SCoPM Performance Excellence Award Application Cover Sheet

Team Name	**WIGINS (Wearable Inspection Grading Information Network System)**
Date Team Operating from	**2001 - Current**
Organization Name	**NCDOT**
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The following information is an overview of the project and, if selected for recognition, will be used for publicity. This part of the application is note scored; however, the narrative is used as background information for the application. By submitting this application, the organization agrees to publication of award winning applications.

Team Purpose:

In accordance with a federal mandate, the North Carolina Department of Transportation (NCDOT) Bridge Management Unit must inspect more than 21,000 bridges, culverts, pipes, and over head signs every two years. Historically, the inspections were handled via a paper-based process, which proved to be inefficient and inaccurate. The process of inspection reporting varied from team to team making it hard to accurately and efficiently analyze data inputs. In the old system reports had to pass manually through the hands of at least five different people making the approval process painfully slow and introduced the possibility of reports getting lost in the paperwork shuffle. The process also created the possibility that bridges in disrepair or potentially hazardous to motorists might not be repaired in a timely manner.

With approximately 150 new bridges being added each year, NCDOT saw the need to improve the current process of bridge inspections. To increase the efficiency, accuracy and consistency of the process, and to make bridge reports available more quickly, NCDOT set a goal to implement a tablet PC-based mobile inspection system, WIGINS (Wearable Inspection Grading Information Network System).

Impact of Team's Improvement(s):

WIGINS enables our bridge inspection teams and NCDOT Bridge Management personnel to increase efficiency, saving time and money. But most importantly, the WIGINS application has helped NCDOT address bridges that need repairs more promptly. The ability to repair a bridge before a major problem occurs is invaluable. Keeping motorists safe on North Carolina roads and bridges is NCDOT's first priority and this innovative use of technology allows it to do just that; more efficiently and effectively than ever before.

Category 1 - Customer Focus

1.1. List the key customers of the team

1.1.a. NCDOT Field Bridge Inspectors

1.1.b. NCDOT Bridge Management

1.2. Explain **why** you determined that these were key customers

1.2.a. The NCDOT Field Inspectors were determined to be key customers because they are the front line users of the WIGINS product.

1.2.b. NCDOT Bridge Management was determined to be a key customer because they analyze and file all the information that WIGINS provides on a bridge's status.

1.3. Explain **how** the team listened to and collected information from the key customers

1.3.a. WIGINS application developers spent hundreds of hours in the field with the bridge inspectors to understand how inspections were conducted. The team also asked the inspectors what they would like to see implemented on the new system.

1.3.b. The WIGINS team worked with senior management at Bridge Management to identify the data points needed to satisfy Federal NBIS requirements. They also engaged in discussions to identify the shortcomings of the current system.

1.4. Explain **how** the team turned information collected from the customers into requirements

1.4.a. The team used the field observations and discussion with bridge inspectors to develop the tablet PCs interface. Inspectors worked directly with the developers to aid in the design of the screens. From the inspectors' information they developed an interface that allowed the inspectors to enter measurements and observations, upload digital photos, and draw sketches. Based on inspector input, the application interface was designed to make it easy to capture the required data points with minimal scrolling and flipping form screen-to-screen. The WIGINS programmers also developed many personalization options on the Tablet PCs to make them more user friendly. They also made it possible for inspectors to synchronize information with each other when working on the same structure. The mobile style tablet PC was used because of the legwork involved in inspections, while a desktop version can still be used at Bridge Management.

1.4.b. The information gathered by the team from Bridge Management was used to first itemize the numerous data points that had to be captured during inspections. Bridge Management expressed concern pertaining to the sluggish process of information transfers. In response the team then created a system in which information can be sent from the field to the main Oracle server through synchronization, eliminating the need to physically mail reports.

1.5. Explain **how** the team determined both customer satisfaction and dissatisfaction

For both customers the WIGINS team has a literal open door policy and has facilities near many of these customers. Any complaints or compliments that the customers have are discussed and addressed in a timely manner through one on one meetings and discussions. Surveys are also taken annually to gauge satisfaction/dissatisfaction levels.

1.5.a. NCDOT programmers assigned to train bridge inspectors on the WIGINS system had to realize that there is a range of computer literacy levels amongst the customers.

They conducted personal interviews and spent time in the field with individual inspectors to determine what aspects of the WIGINS system they were satisfied or dissatisfied with.
1.5.b. Like the NCDOT programmers assigned to bridge inspector training, the trainers assigned to the customers in Bridge Management interviewed and shadowed the users to access their likes and dislikes with the system.

Category 2 - Process Management

2.1. List the process(es) applicable to the team purpose and performance expectations

2.1.a. The key processes which the team was seeking to improve were data collection and reporting. The team needed to make these processes more efficient and uniform throughout to reduce the amount of time it took to inspect each bridge.
2.1.b. The key processes with regards to Bridge Management were the filing of bridge inspection data, and the analysis of the structural reports. The expectations of the team was to create a system that was free from paper filing and was completely electronic, and have all input standardized to streamline the analysis process.

2.2. Describe the steps taken to achieve the purpose of the team

2.2.a. The team worked in the field along side the bridge inspectors to analyze the data collection process. There are numerous measurements and observations recorded during a typical inspection and each inspection team had different ways of documenting data. The team set a goal to create a program that was universal, meaning it could be used on any and all bridges, and still allowed for mobility and efficiency. The WIGINS team automated the recording process by providing a single point of data entry that could be taken anywhere. The team then improved the interface with the help of the bridge inspectors in order to give the program a sense of familiarity. By taking all the previous steps the team was able to create electronic files and eliminate the need for paper files.
2.2.b.The complex analysis process includes as many as 23 different types of inspections, and the previous method provided data that was documented differently by each team. Units of measurement and shorthand notes varied from team to team, and inspector to inspector. The team set a goal to create a system that could be synchronized and provided uniform data. Along with providing a single point of data entry, the WIGINS team utilized an Oracle database for the storage of statewide data. This along with ASA Mobilink server (Sybase) databases on the Tablet PCS and a standard format, all input data was made uniform and synchronized. The team also added a personalized feature which translated each inspector's personal shorthand into a universal data entry providing a benefit to both customers. By solving the problem of inconsistent data and creating nearly instant input the team solved the issues regarding the speed of analysis.

2.3. Explain how the steps taken to achieve the purpose of the team affected efficiency, effectiveness, quality, and/or customer satisfaction attributes

2.3.a. After completing the visual inspection of the bridge and completing their report, bridge inspectors had to print paper copies and physically mail them. Through WIGINS, once the report is completed and stored digitally, it can be sent directly to bridge management through synchronization. This allows NCDOT to inspect its growing inspectable inventory with no increase in man power and a reduction in the use of consultants. The team also used ActiveReports technology in the WIGINS application to

produce real-time previews of the data entries so that inspectors can correct their errors while they are still at an inspection site, rather than having to make another trip to revisit it weeks or months later. By reducing the amount of travel WIGINS has been able to save NCDOT time and money associated with driving. The WIGINS tablet also eliminates the need for inspectors to carry the prior paper inspections with them to the jobsite because all previous inspection data is available on their tablets.
2.3.b. WIGINS gave Bridge Management the ability to quickly send back new inspection assignments, rejected reports, software updates, or any other necessary information sent by other NCDOT departments back to the field inspection teams. Previously an inspection report had to be printed, signed, and then mailed to the Bridge Maintenance Unit for approval. After this, they were sent through Analysis for another approval and sign-off, and then through three more stages of approval. After all of this, assuming a report isn't lost, if an error is found the whole process had to be repeated. Now data is synced directly between PCs, and a process that used to take weeks is reduced to hours. By creating digital storage of reports WIGINS has also allowed multiple people in various locations to view a report at the same time, thus improving efficiency. All of these factors have allowed analysts to react faster to the bridges that need repairs.

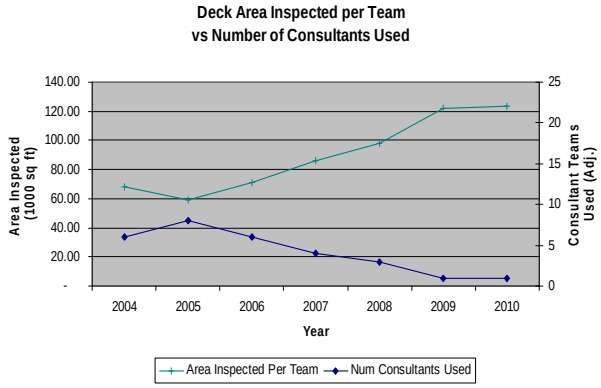
2.4. Explain how the team gathered data, analyzed it, and the tools used to make decisions
2.4.a. Explain how you gathered the data and how you analyzed it.
2.4.a.a.The WIGINS team has always worked directly with the bridge inspectors. Programmers from the team observe the inspection process and talk directly with inspectors to gather data. They allowed the inspectors to become familiar with their work while they did the same with the inspectors. Once new software is developed, trial and error is used and the results are reviewed with the inspectors.
2.4.b.b. Similarly, the programmers work directly with Bridge Management to gather data. WIGINS uses the same analysis techniques only with the idea of receiving and analyzing bridge data, rather than the input of the data.

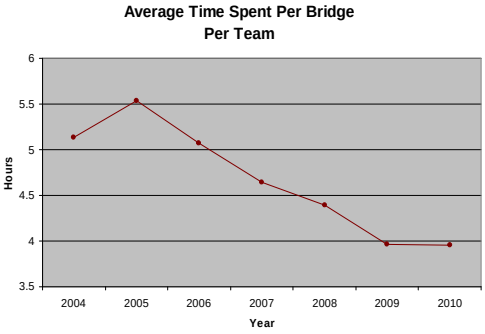
2.4.b. Identify the tools you used from this list: Pareto Chart, Flowchart, Cause and Effect Analysis, Check Sheet, Control Chart, Histogram, and Scatter Diagram
2.4.b. WIGINS team members used flowcharts to document the workflow of the bridge data from inventory, through the inspection and analysis process, and then to completion. Cause and Effect Type Analysis was also used when implanting new features into the system.

Category 3 – Results (this section is worth 450 of 1000 point total)Provide one page of graphical results
3.1. Provide current levels and trends for customer satisfaction **and** dissatisfaction
3.3.a. To obtain customer satisfaction/dissatisfaction levels the team conducted a survey of both NCDOT Bridge Inspectors and Management. As expected, when the amount of data is entered into WIGINS increases, the system becomes more useful and user friendly. There were 35% of users who were dissatisfied with the system in 2005; however in 2010 we were able to achieve our goal of 100% customer satisfaction. There was approximately a 95% return on these customer satisfaction surveys.

3.2. Provide current levels and trends in key measures or indicators for the process(es) listed in Category 2 above

3.2.a. The graph on the left shows the surface area (left vertical axis) inspected by each team versus the number of consultants (right vertical axis) NCDOT needed to use per year to complete all the required inspections. The graph on the right shows the average time it has taken for an inspection team to inspect a bridge over the last 7 years.





3.3. Provide current levels and trends in key measures or indicators of effectiveness, efficiency, and/or quality

3.3.a. The graph on the left shows the percentage of data entry errors that have been found in reports each of the last 6 years. The chart on the right shows the average amount of days required to submit an inspection report. The red line represents the benchmark that NCDOT has in place for number of days to submit an Inspection Report.