Web-based Collaboration for Iowa DOT Bridge Construction

James S. Nelson  
Iowa Department of Transportation  
800 Lincoln Way  
Ames, IA 50010  
James.S.Nelson@dot.iowa.gov

Aaron C. Zutz  
Department of Civil, Construction, and Environmental Engineering  
Iowa State University  
394 Town Engineering  
Ames, IA 50011  
aczutz@iastate.edu

Charles T. Jahren  
Department of Civil, Construction, and Environmental Engineering  
Iowa State University  
394 Town Engineering  
Ames, IA 50011  
cjahren@iastate.edu

EXTENDED ABSTRACT

Bridge construction projects are becoming increasingly complex as the demand for context sensitive solutions, aesthetic designs, and accelerated bridge construction becomes more prevalent. In addition, the Iowa Department of Transportation (Iowa DOT) is entering a phase of design and construction of large border bridges, such as the I-80 (Let 2008 for $56 Million) and US 34 bridges over the Missouri River and I-74 over the Mississippi River.

Compared to typical construction projects, these bridges generate more contractor Requests for Information, Value Engineering Proposals, Requests for Changes, and shop drawings. Management of these submittals is a significant challenge for Resident Construction Engineers and other department of transportation (DOT) staff. Additionally, some submittals require cross-departmental review and review from project consultants as well. Implementation of a web-based collaboration solution is intended to speed construction submittal review time, reduce incidence of delay claims, and free up DOT staff from project management administrative tasks.

Researchers from Iowa State University working with the Iowa DOT conducted a multi-pronged approach to identify a web-based collaboration solution for Iowa DOT bridge projects. An investigation was launched to determine the functional needs of the Iowa DOT. Commercially available software programs were also evaluated to find what functionality is currently available. By comparing the needs of the DOT to what is currently available, a recommendation was made for a solution to be used on a pilot project by the Iowa DOT. The results of this research should give the Iowa DOT a tool to assist in the successful completion of future complex bridges.

Key words: bridge—collaboration—construction—web-based
PROBLEM STATEMENT

Bridge construction projects are becoming increasingly complex as the demand for context sensitive solutions, aesthetic designs, and accelerated bridge construction becomes more prevalent. In addition, the Iowa Department of Transportation (Iowa DOT) is entering a phase of design and construction of large border bridges, such as the I-80 (Let 2008 for $56 Million) and US 34 bridges over the Missouri River and I-74 over the Mississippi River.

Compared to typical construction projects, these bridges generate more contractor Requests for Information (RFI), Value Engineering (VE) Proposals, Requests for Changes (RFC), and shop drawings. Management of these submittals is a significant challenge for Resident Construction Engineers (RCE) and other department of transportation (DOT) staff. In addition, some submittals require cross-departmental review and review from project consultants as well. Commercially available software exists for managing submittals and project collaboration teams; in-house solutions may also be possible. Implementation is intended to speed construction submittal review time, reduce incidence of delay claims, and free up DOT staff from project management administrative tasks.

RESEARCH OBJECTIVES

Researchers from Iowa State University working with the Iowa DOT conducted a multi-pronged approach to identify a web-based collaboration solution for Iowa DOT bridge projects. An investigation was first launched to determine the functional needs of the Iowa DOT. Researchers sought to determine the current needs and practices of the Iowa DOT and other potential users of the collaboration solution. Researchers also needed to investigate what would promote or hinder the success of the proposed solution.

Concurrently, commercial software programs were evaluated to find what functionality was available. Researchers then worked to determine if commercially available solutions met the Iowa DOT’s functionality requirements. In many cases, commercially available solutions have capabilities beyond the functionality requirements identified by Iowa DOT. Such excess functionality might be valuable but overlooked by potential users because they are unfamiliar with the capabilities of commercial solutions. Therefore, researchers also investigated these capabilities and considered them for possible additions to the list of functional requirements.

A comparison of required functionality and available functionality would be used to make a recommendation to the Iowa DOT for an electronic collaboration solution to be used on pilot projects. Successful utilization of the selected solution should serve as a validation for the research and also provide lessons learned for future wide-scale implementation. Ultimately, this research will help provide the knowledge necessary for the Iowa DOT to successfully implement a long-term solution to assist all project participants in the management of Iowa DOT bridge projects.

RESEARCH METHODOLOGY

To investigate the functionality required by the Iowa DOT for a web-based collaboration solution, interviews were conducted with users that would be affected by the proposed system. Interviews were conducted with Iowa DOT employees, consultants, contractors, and suppliers. Additionally, due to the inexperience of potential users, interviews were conducted with construction professionals from other construction sectors. Finally, a survey was developed and carried out to learn the processes of other state DOTs with respect to their collaborative practices.
Interviews were conducted in a relatively ad hoc format. A questionnaire was developed based on 
research done by others, initial contacts with Iowa DOT personnel, and information on commercial 
solutions. The questionnaire utilized primarily open-ended questions as to not limit the response of the 
interviewees and gain the most information. Researchers also probed deeper after asking some questions 
to obtain additional useful information.

The comparison of commercially available software programs was done by viewing demonstrations for a 
variety of solutions in order to ascertain information to fill out a set of questions for each solution. All of 
these responses were then combined into a matrix to facilitate the comparison of the programs.

To develop a set of questions to evaluate commercially available solutions, an initial round of 
demonstrations was conducted to determine a baseline for what was commercially available. Researchers 
then used the results of these initial demonstrations, interviews, internet research, and the criteria of other 
researchers to develop the set of questions. These questions were primarily closed ended to facilitate a 
direct comparison between solutions. Using a broad range of tactics, researchers identified over 30 web-
based collaboration solutions. This list was deemed to be too large for an in-depth analysis of each 
solution, so researchers short listed a dozen solutions that best met the Iowa DOT’s requirements prior to 
conducting the in depth examinations.

**KEY FINDINGS**

Based on the interviews conducted, it was determined that the Iowa DOT needed a web-based 
collaboration solution to manage four main areas: contract documents, shop drawing submittals, RFIs, 
and meeting minutes. A primary concern for the use of a web-based collaboration solution was the user 
friendliness of the solution. The ability for all participants to easily access the information would be 
paramount to the success of the solution. To accomplish this, a solution that did not distract the user with 
unneeded functionality was considered to be desirable. Additionally, features such as email alerts along 
with “Dashboard” and “Ball in court” features to alert users of new information or items requiring their 
attention would be helpful. Also, it was necessary to find a solution that could preserve the DOT’s current 
workflow to help ease the transition. Finally, data security and the security of the solution were identified 
as critical to a solution’s success.

Based on the required functionality, a number of solution attributes were determined to be critical for 
pilot project. First, it was determined that the solution used for the pilot project should be used “Software 
as a Solution.” By having a vendor host the software, the solution could be much more easily and rapidly 
deployed. The software also needed to have the functionality to meet the DOT’s four main areas. 
Additionally, to allow easy access for project participants, the solution needed to be accessible with only 
an Internet browser. Research showed that there were a number of commercially available solutions that 
meet the Iowa DOT’s requirements. Due to the quantity of solutions meeting the Iowa DOT’s 
requirements, researchers didn’t recommend a specific program for the Iowa DOT but recommended a 
category of solutions meeting these requirements. Ultimately researchers worked with the Iowa DOT to 
issue a Request for Proposals (RFP) in order to most objectively select the solution to be pilot tested.

**CONCLUSIONS**

Iowa DOT is facing an increasing volume and level of complexity of bridge construction; these 
circumstances necessitate assistance in the management of these projects. Commercially available web-
based collaboration solutions have the functionality required to meet the DOT’s needs. A web-based 
collaboration solution has the potential to improve project success for all parties involved in the project by
promoting accountability, increasing transparency, and decreasing the review time of documents. By pilot testing a web-based collaboration solution, the Iowa DOT will be able to learn valuable lessons that can be applied to future projects. This should help the Iowa DOT become better prepared to manage future complex bridge projects. Finally, the results of this project could assist other government agencies, including cities and counties in the State of Iowa move toward web-based collaboration on their construction projects.

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