Deconstructing a $1 Billion Disaster

How implementing online collaboration and project management (OCPM) technology can revolutionize the architecture, engineering and construction industry's communication, efficiency and overall project completion.

Allison Way
Think Big Partners

Executive Summary

When Lord Norman Foster & Partners designed the Harmon Hotel as a non-gaming boutique, spa center, and upscale resort at CityCenter Las Vegas, the company did not predict that the project would be cut in half…literally. In 2008, when detrimental flaws were discovered during inspection of the building, work on the Harmon Hotel was halted. After surveying many of the building's defects, architects and designers had to backtrack and redesign the hotel, reducing it from forty-nine stories to twenty-eight. Due to the drastic design alterations, time constraints, budget cuts, and lack of communication, construction of the Harmon Hotel was delayed indefinitely and is to be demolished completely by 2012.

Placing blame for the Harmon Hotel incident is near impossible. With so many different individuals and companies involved in the hotel's construction including eight internationally-known architects; the project's general contractor, Perini Building Company; rebar subcontractor, Pacific Coast Steel; and many, many others, the reason behind the demolition of the Harmon Hotel can only be explained by human error and process difficulty.

If there was a way to prevent human error exclusively, construction projects would evolve into headache-free, on-time, and under-budget endeavours. But because of miscommunication habits and basic psychology, human error, mistakes, and poor decisions are not only forecasted in the AEC industry's processes, they are highly anticipated.

Although there is no conclusive way to eradicate human error in the architecture, engineering, and construction (AEC) industry, there is a way to minimize it.

> "Successful completion of a construction project depends on accurate, effective and timely communication, formation, and then exchange of critical information. To make this happen, elements of the AEC industry have started to move away from traditional communication methods…and have started to rely heavily on online collaboration and project management (OCPM) technology."
>
> **Dr. Burçin Becerik1**
> **Harvard University School of Design**[i]

After extensive research, it has been found that the implementation of a project scheduling, project costing, project reporting, and project management technology has a powerful impact on the timeliness, cost, and completion of any construction project. This case study confirms that with the appropriate use of OCPM technology, communication within the AEC industry can be vastly improved and construction can be completed on-time, within budget, and most importantly, nearly error-free.

The Harmon Hotel

History

The Harmon Hotel was to change the Las Vegas skyline forever. The forty-nine story, elliptical masterpiece with a highly reflective exterior was designed by Norman Foster, renowned designer and owner of Lord Norman Foster & Partners. The non-gaming boutique hotel was to be operated by Andrew Sasson's The Light Group at CityCenter Las Vegas, right at the intersection of Las Vegas Boulevard and Harmon Avenue. The 400 hotel rooms and 207 condominium residences located inside of the Harmon Hotel were to become a home-away-from-home for vacationers, a crash pad for celebrities, and a beloved abode for residents. The building: one of the tallest Las Vegas had ever seen.

In 2008, however, work on the Harmon Hotel was stopped. Inspectors had uncovered numerous construction defects including improper installation of critical steel reinforcements (also known as rebar) after fifteen stories of the Harmon had already been erected. After investigation, it was found that Harmon's third-party inspection firm, Monrovia, California-based Conserve Consultants, falsified sixty-two daily reports between March and July of 2008. Other Harmon construction workers reportedly moved rebar without approval from the project's structural engineer, Halcrow Yolles, which immediately broke the AEC chain of command[ii].

This rebar installation error played a domino effect on the entire building process, requiring element upon element to be redesigned, modified and reconstructed. The final consensus among designers, architects, engineers and general contractors was to reduce the Harmon Hotel from forty-nine stories to twenty-eight and completely remove the condominium portion.[iii]

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>
> **Tony Illia**
> **Las Vegas Review Journal**

Figure 1: *Changes made to the Harmon Hotel, Las Vegas Sun, 2009. Illustration by Steve Marcus and Chris Morris.*

Consequences

Completion: Due to the delay and drastic alterations to its design, the Harmon Hotel was postponed past the other CityCenter projects and was scheduled to be finished in late 2010. To date, the Harmon Hotel has been delayed indefinitely. Litigation is pending due to the hotel's found defects, but MGM Resorts International, the owner of CityCenter, has targeted a complete demolition of the hotel by 2012[iv]. Tony Illia, Las Vegas Business Press journalist, wrote in his 2010 article, Harmon Hotel stuck in limbo, that "…[The Harmon Hotel] sits dormant with a wrap sign for CityCenter's 'Viva Elvis' show plastered across its façade. Harmon may be the world's most expensive billboard".

Financial: To say that miscommunication, human error, and poor change management was a costly consequence to the Harmon Hotel is an understatement. MGM Resorts, the owner of CityCenter, tried saving themselves $600 million in construction costs and $200 million in expenses when cutting the Harmon Hotel in half. But in the end, MGM withheld its payments of $490 million in construction bills. A total of $500 million dollars was lost among Perini and Pacific Coast Steel alone. The Harmon Hotel was to be an $8.5 billion development, the priciest private project in U.S. history.

> Within the first nine months of construction, the Harmon Hotel project lost nearly $1 billion.
>
> **Engineering News Record**

Employment: The Harmon Hotel did not just face serious financial disaster, but also cost hundreds of people their jobs. The hotel was to be the home of a Mr. Chow restaurant, a Frederic Fakkai Hair Salon, a full spa center, and a 24/7 butler services[v]. What's more, every person involved in the construction process — from architects to construction workers, from supervisors to electricians — lost a source of income because of the Harmon Hotel incident.

The Overlying Problem

When a construction project requires a diverse assortment of individuals, communication and collaboration immediately become top priority. When successful

completion of a construction project depends on the accuracy and efficiency of critical information among team members, it is important to implement some type of tool that will allow for greater communication. When communication in a construction project is lost, the proposition can quickly deteriorate.

Peter Love, a construction management specialist from Curtin University School of Built Environment (Australia), has thoroughly researched and identified key solutions to solving the problems faced by the AEC industry. Love's solutions could be the missing link between a multi-billion dollar construction disaster and a successfully completed project. According to Love, it is a conglomeration of communication, psychology and human error that accounts for most of the inefficiencies in the AEC industry.

Love's consensus confirms why the Harmon Hotel incident happened. Love bases his solutions around a government report which states that if the performance of the construction industry is improved by ten percent, an extra 2.5 percent could be added to the GDP. This change could have significant impact upon employment figures[vi].

According to Love, there are countless other problems that the AEC industry faces. One of the biggest problems is the separation between the design and construction processes. In addition, Love believes that the amount of errors found downstream on site and the amount of mistakes that are made when architects feel fatigued account for many construction challenges.

Collectively, the AEC industry needs to return to its fundamentals in order to understand the errors that it makes during the construction process. Upon understanding, industry leaders must develop solutions to address the problems that they face in a more efficient and effective manner.

Finding the Right Solution

Successful completion of a construction project depends on accurate, effective, and timely communication, formation, and exchange of critical information among all project team members[vii]. In order to complete a successful construction process, many AEC companies have moved away from traditional communication methods and have been driven to utilize online collaboration and project management (OCPM) technology.

About OCPM Technology

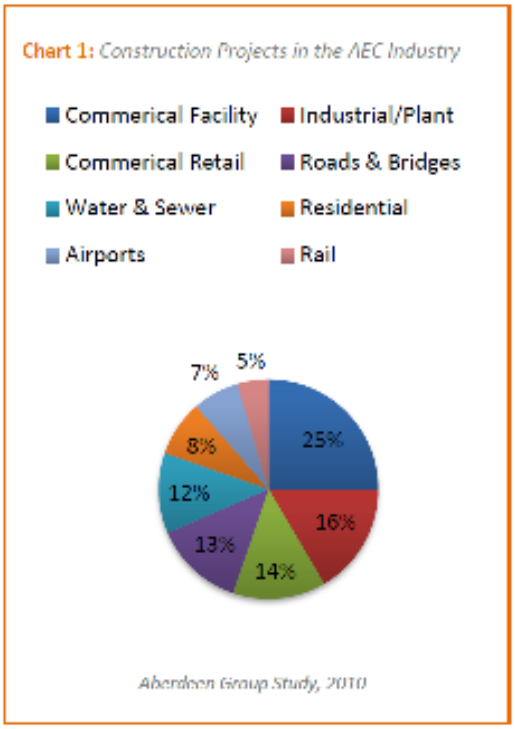
The most effective OCPM technologies function as dashboards that systematically organize all project information during an entire construction life cycle. OCPM technology is a revolutionary software as a service (SaaS) that has the ability to correlate and update plans, specifications, BIM models, RFIs, ASIs, submittals, as-built drawings, planholders lists, email correspondence, videos, photos, and any additional requested information. In addition, OCPM technology creates a collaborative environment for every individual that is involved in the construction process while simultaneously archiving information for electronic closeout.

The ultimate reason to invest in an OCPM technology is to facilitate transparent and continuous communication among an entire project team (owners, general contractors, subcontractors, architects, engineers, consultants, suppliers, and the internal staff). In addition, OCPM technology aims to:

- Facilitate construction workflow (RFIs, change orders, submittals, drawings, and specs);
- Create standards, procedures, and policies;
- Create a historical archive of information;
- Enable information availability and control;
- Improve project control and change management;
- Provide a competitive advantage for the AEC industry;
- Improve efficiency (time and budget).

Quick Facts[viii]

- The average cost of a construction project is $7.3 million.
- Average use of OCPM technology is 8.2 months per project.
- Of 30,000 projects surveyed by the Harvard Graduate School of Design, 21% utilized the OCPM technology during the planning stage and 49% utilized the technology in the construction or close-out stage.
- Most AEC companies are able to deliver project milestones in an average of 12 days. AEC companies with OCPM technology can deliver with more precision in an average of 7 days.
- The following charts provide some more quick facts..



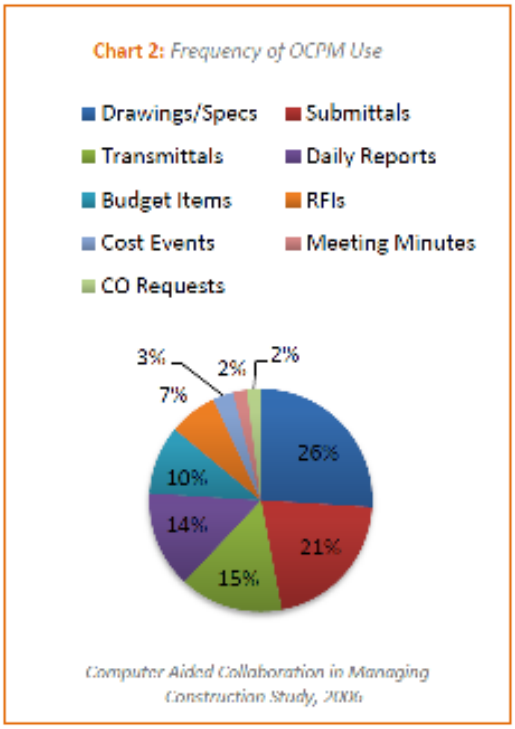
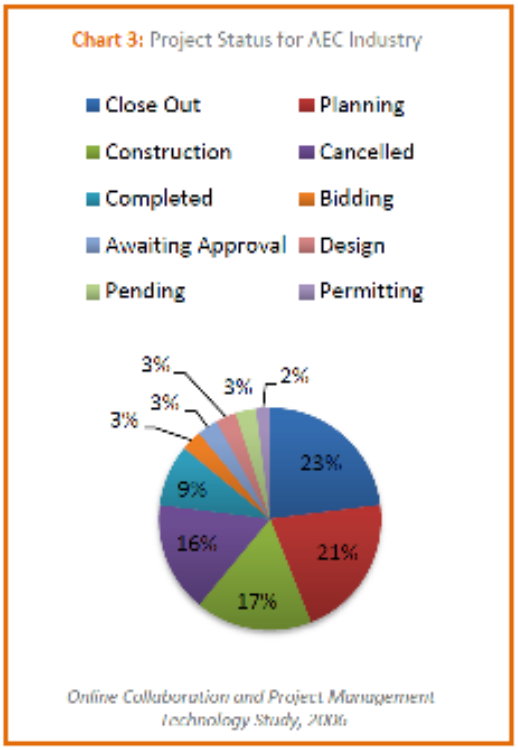


Chart 1 outlines the variety of construction projects in which the AEC industry is involved.

Chart 2 defines the type of entry that is most frequently used in the OCPM technology based on 46,000 projects.

Chart 3 shows project statuses within the AEC industry based on 30,000 projects.



Benefits of OCPM Technology

The implementation of OCPM technology in a construction project has tangible benefits, quasi-tangible benefits, and intangible benefits.

Tangible benefits: benefits that can be measured in terms of money.

Quasi-tangible benefits: benefits that focus on improving the efficiency of an existing organization.

Quasi-tangible benefits are quantifiable but difficult to measure.

Intangible benefits: benefits that focus on improving the effectiveness and performance of an organization. Intangible benefits are not quantifiable and cannot be measured.

Specific benefits from the use of OCPM technology are listed below. These benefits are restricted to the AEC industry.

- Improved Information Management
  - Accurate and timely information to give valid/concrete decisions
  - Improved data availability
  - Faster reporting and feedback
  - Better inventory management
  - Complete audit trail
  - Fewer information bottlenecks

- Improved Version Control and Change Management
  - Better project/program control

- Timely capture of design/construction decisions
- Quicker response to project status and budget
- Improved quality of the output
- Better forecasting and control
- Improved process automation (RFIs/change orders/auto-updated master budget)

 Improved Communication

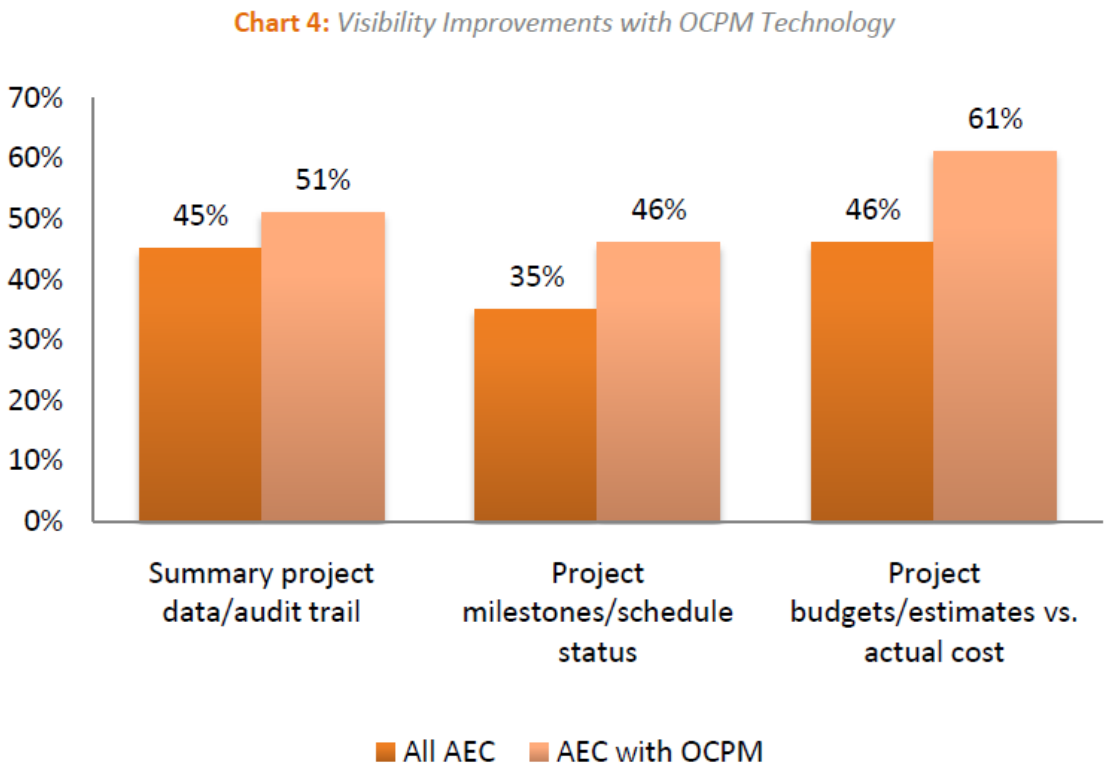
- Enhanced working with virtual teams
- Improved project relationships with strategic partners
- Better resource allocation; more effective assembly of project teams
- Improved public relations
- Improved idea sharing among team members/within organization
- Effective identification and assessment of new suppliers

 Errors

- Reduced rework/data re-entry
- Reduced errors/omissions
- Minimized project/business risks

 Improved Efficiency

- Reduced personnel costs due to improved efficiency
- Faster launch to market
- Reduced delivery lead times
- Enabled advance purchase of materials



Aberdeen Group Study, 2010

OCPM Technology and the Harmon Hotel

The incomplete construction of the Harmon Hotel is just one of the incidents in which OCPM technology could have been implemented effectively to achieve a better project outcome. If OCPM technology had been utilized in the correct way during the construction of the Harmon Hotel, the project could have been deemed more efficient and could have been more successful. By utilizing the OCPM technology that is available today, the design, inspection, and construction stages of the Harmon Hotel could have run more smoothly. The completion of the Harmon Hotel could have benefitted Las Vegas even further through improvements in the city's economy and employment opportunities.

The following paragraphs break down the services that OCPM technology provides and how the Harmon Hotel could have effectively utilized the system in order to create a finished, on-time, budget-minded, forty-nine story project.

Information Availability, Visibility and Control

OCPM technologies centralize all project information allowing for greater visibility by all individuals involved in the construction project. It has been documented that project information, management, and reporting is improved by 40% when using OCPM technology[ix]. With improved knowledge management, individuals have the ability to revisit the data on the project, which eliminates the loss of any useful information created in the design and construction processes. With increased information availability and control, the Harmon Hotel project would have maintained a complete audit trail, which would eliminate the risk of lost data. An accurate audit trail could have been useful when reviewing the inspections of the rebar placement in 2008. Higher visibility and transparency also provides record of accountability for

every individual involved. **Chart 4** (above) outlines the improvements made in information transparency, availability and overall visibility when an OCPM technology is involved.

Project Control and Change Management

When there are various projects in one portfolio, change management becomes extremely laborious. Simultaneously, change management is one of the most important sectors in the AEC industry. According to the Aberdeen Group, changes introduced after the start of a project is the top single main cause for poor performance[x]. In order to solve this, OCPM technology allows for a record of all activities on a construction site. This helps to monitor and control every project and change in a timely manner. Allowing this visibility is a key to minimizing the impact of potential problems. OCPM technology can improve change management and control from 35% to 57%[xi]. Because the Harmon Hotel was a multi-year and multi-million dollar project, there was no question that changes would be made throughout its construction. If the changes had been better documented and maintained, however, the project may have been successfully completed.

Efficiency

OCPM technology improves collaboration, review, and turnaround time. By improving better version control, information workflow, and document routing, efficiency within the AEC industry can be greatly improved. According to the Aberdeen Group, projects that use OCPM technology finish early or on-time 83% of the time, and on budget 89% of the time.

The Harmon Hotel was a large, multi-million dollar project. A one-or two-percent increase in efficiency could have had an extreme impact on the project outcome. Even a five-percent advantage can translate to millions of dollars on a project like the Harmon Hotel.

Communication and Coordination

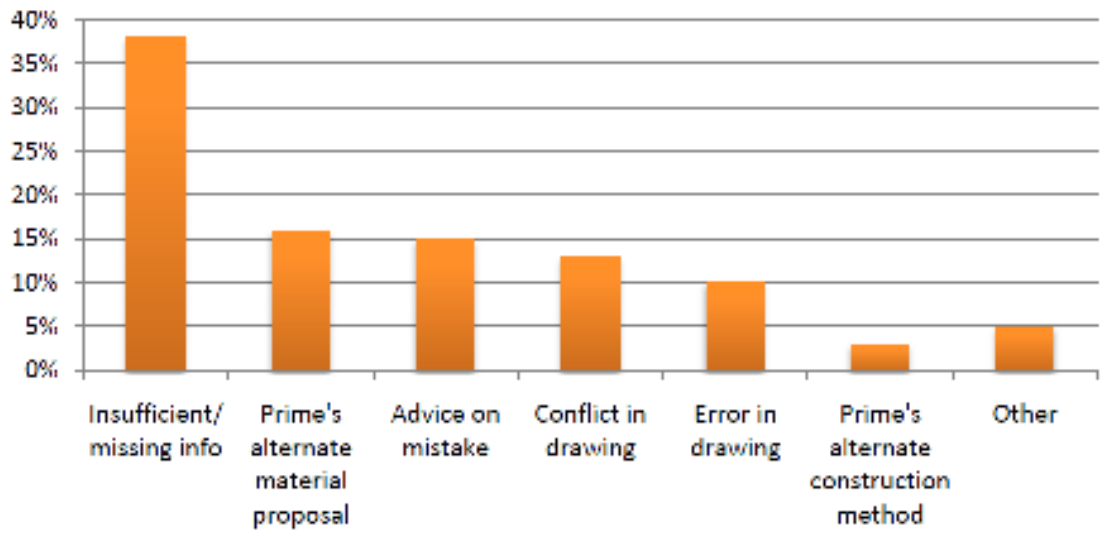
One of OCPM's most beneficial features is its ability to improve communication, collaboration and coordination within the AEC industry, and more specifically, within the various teams involved in one construction project. OCPM technology allows for everybody involved to be on the same page; from general contractors to subcontractors, from architects to owners.

According to Aberdeen's *Delivering Project Profitability: On Time and Under Budget* benchmark report, the culture of collaboration correlates directly with project profitability. In fact, the use of OCPM technology increases collaboration from 33% to 41%. This includes the collaboration of people as well as information (i.e. contracts, design documents, plans and specifications). With the correct use of OCPM technology, the Harmon Hotel could have improved its communication on designs and specifications in order to prevent its changes from negatively impacting the project schedules, profitability, and completion.

Error and Omission Control

Requests for information (RFIs) are not uncommon in the AEC industry. As shown in **Chart 5**, the reasoning for an RFI is most often due to mistakes, conflicts, and errors during the design and construction phases.

Chart 5: *Reasons for RFIs on a Project*



Online Collaboration and Project Management Technology, 2006

Trends in the AEC Industry

Instances like the construction of the Harmon Hotel have spurred the growth of OCPM use among architects, general contractors and subcontractors alike. Leading-edge companies have begun to administer OCPM technology in all of their construction projects. These companies have helped to put OCPM technology on the map and have been the launch point for new trends in the AEC industry including:

 OCPM as a contract requirement: As a competitive advantage, OCPM solutions have become contract requirements in the bidding phase of many construction projects.

 Applications integration: Integrating an OCPM solution in financial, contracting, purchasing, managing, and planning applications as well as importing all other information to other applications has become a trend in the industry.

 Optimization: A policy of having all official communication go through the OCPM solution on a project is growing within the AEC industry.

 Communication standards: OCPM technology helps to facilitate communication on a project and has set the standard for collaboration in the industry.

 Benchmarking and reconfiguring: Using OCPM technology for reconfiguring, reusing and benchmarking information for future projects becomes beneficial AEC companies.

 Mobility: Portable devices with a connection to the OCPM solution has become a trend in the industry.

Conclusion

OCPM solutions combine the document management and collaboration tools that the AEC industry needs in order to be more efficient, accurate, effective, and productive. The incident that ensued in 2008 during the construction of the Harmon Hotel could have been avoided with the proper implementation of OCPM technology. AEC

companies such as Perini, Pacific Coast Steel and Lord Norman Foster & Partners who were involved in the CityCenter Harmon Hotel project, could have been less impacted by the project's changes and would have been better able to deliver the project in a timely manner, with lessened major budget cuts and sacrifices. The trends currently taking place in the AEC industry act as proof that the movement toward a more organized, efficient, communication-driven business starts with a cutting-edge solution—that solution is OCPM technology.

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The Author

MySmartPlans.

Creating Chaos-Free Construction

MySmartPlans is a project centric dashboard that automatically organizes all construction project information from design phase to closeout. This online collaboration and project management (OCPM) technology allows for improved visibility, transparency, organization, and collaboration. By effectively organizing all

plans, specs, RFIs, ASIs, submittals, as-built drawings, planholders lists, email correspondence, videos and photos, and client-requested information onto a single project-centric dashboard, MySmartPlans keeps all users on the same page all while staying green and going paperless. With a strong project information management (PIM) team MySmartPlans provides clients and users with access to real people in real time in order to facilitate ease of use and overall collaboration.

About Project Perfect

Project Perfect is a project management software and consulting organisation based in Sydney Australia. Their focus is to provide organisations with the project infrastructure they need to successfully manage projects.

Project Perfect sell "Project Administrator" software, which is a tool to assist organisations better manage project risks, issues, budgets, scope, documentation planning and scheduling. They also created a technique for gathering requirements called "Method H"™, and sell software to support the technique. They also sell a complete web based methodology for software package selection. For more information on Project tools or Project Management visit www.projectperfect.com.au

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