IPD and BIM: Benefits and Opportunities for Regulatory Agencies

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Integrated Project Delivery (IPD) and Building Information Modeling (BIM) are used in construction to increase communication and team efficiencies while working toward a win-win project delivery outcome. Within the IPD framework there are core and secondary stakeholders. Core stakeholders are the owner, design team, and the constructor. Secondary stakeholders may include insurance companies, bankers, regulatory agencies, utility providers, or anyone else that may have an interest in the project. The goal of the IPD team is to create a zero sum outcome where all are winners or all are losers, the latter being unacceptable. BIM uses 3D models to help in the design and construction of the project as a way to increase understanding of the project. When IPD and BIM are used in conjunction, the expectations for the project to be completed successfully are increased. This paper explores the idea of elevating regulatory agencies to the core stakeholder category. The impacts of this are addressed from the traditional role of the regulatory agency to the increased role by project phase: concept, design, construction, operation and maintenance, and end-of-life. The benefits of this change are numerous but there are several obstacles in the adoption path.

Key Words: Integrated Project Delivery, IPD, Building Information Modeling, BIM, Regulatory Agencies

Introduction

Project management in the construction field has matured over the past fifty years from a stepped approach to an integrated approach. In the stepped approach each phase of the project was performed on an incremental basis and once a phase was complete, the next phase was begun. This format was based on master craftsmen who did everything. Today's format is based on a large number of participants with narrow scopes of knowledge that operate in a sequential format where parochial interests rule (Fleming & Koppelman, 1996). With increased specialization, the need to communicate increases as does the risk associated with performing multiple project functions simultaneously. The importance of project stakeholders and their effect on the project also become more apparent as do the need to manage stakeholders as part of the project. The introduction of integrated project delivery (IPD) was an attempt to address project issues, constraints, and demands. IPD is a "project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction" (AIA California, 2007). While the IPD systems mature, the flow of information is still not fully integrated among all stakeholders connected to a specific project.

Information technology systems used today in construction encompass all disciplines and are used to describe and document the contributions of each member of a project team (Fischer & Kunz, 2004). Even though software applications are not fully compatible in the construction industry, their impacts are widespread and increasingly important. Building Information Modeling (BIM) recently has gained considerable attention as a way to communicate information to multiple stakeholders in a visual format that all can understand. BIM is a term first coined by architect Jerry Laiserin to describe "3D (three dimensional), object-oriented, AEC (architecture, engineering, construction)-specific CAD (computer-aided design)" (Davis 2003) (parenthesis added for clarification). It also integrates the information generated by specialists into a team setting focusing on the project goals thereby limiting, if not removing, parochial interest and turf protection. There are two simple ideas at the core of BIM. The first is database efficiency. The goal for BIM is to allow information to be stored centrally, updated quickly, and accessed by multiple stakeholders. This reduces waste by reducing redundancy of tasks and documentation. The second advantage of BIM is visualization. All BIM programs can represent a building with a three-dimensional model. This visualization affords stakeholders in a given construction project a three dimensional image of the project and its components.

Even though IPD and BIM organize and facilitate multiple flows of information, there are still questions about who should be included as core project stakeholders. The construction industry typically focuses on stakeholders as those immediately connected with the project. Typically this includes the owner, design team, and contractor. Secondary stakeholders include any other party with an interest in the project such as insurers, financiers, and suppliers. These secondary stakeholders may move into prominent positions of influence throughout the project life cycle until their interests have been satisfied at which time they move back to the periphery. More stakeholders in a project equate to more project uncertainty (Karlsen, 2002). One of the issues associated with secondary stakeholders are the sometimes informal lines of communication that exist between the core stakeholders. These relationships are not acknowledged sometimes within the core project team and often end with uncertain results (Jiang, Chen, & Klein, 2002). This raises the question of stakeholder involvement viewed from an expanded scope that looks at the construction of a project in a broader context.

This paper asks the question "are there any stakeholders at the secondary level that should be moved into the core stakeholder group?" If so, what roles would they play in the IPD and BIM frameworks? This paper summarizes the current and possible roles of the public (regulatory) sector in the IPD framework and introduces the argument that this sector is the ultimate stakeholder in the construction process. As such, there are many benefits that would inure to the public sector with an increased level of participation of regulatory agencies in IPD systems.

Background of IPD and BIM

Project management is a concept that sets forth the idea that a project can be managed or controlled in a manner that satisfies all expectations related to that project. The range of expectations can vary from the development, manufacture, and sales of a new product to the construction of a new building. While the management of a project is for a limited duration, the length of the duration will vary relative to the scope of the project. The project also has certain milestones, costs estimates, and profit expectations. In an effort to effectively manage a project, several methods of project management and project delivery have been created, tested, and modified. Traditionally the steps were engineering, procurement, fabrication, and assembly (Fleming & Koppelman, 1996). As projects became more complex and they were put on the "fast track "in an effort to shorten the project duration, the risks associated with the project increased. The sequential nature of the traditional approach evolved into project teams where several disciplines worked in a team environment toward a common goal (Fleming & Koppelman, 1996). As these teams interacted, the need for communication within and among the team members increased. This need helped spur the project delivery system referred to as IPD.

The intent of integrating project teams is to foster a spirit of cooperation among groups that traditionally are functional adversaries (Fleming & Koppelman, 1996). Wysocki refines this cooperation as the need to place the organization's goals first and those of your department or unit second and in concert with those of the organization (2007). The IPD methodology evolved from the owner's desire to have all stakeholders involved in the process sharing an equal voice in the project (Carbaso, 2008). Under this method there are three groups: owner, architect/engineer, and contractor who act as the core stakeholders. IPD is a result of changes to the traditional project delivery model and seeks to organize the project team in a manner that eliminates waste, cuts time, improves productivity, and creates a win-win outcome for the involved parties (Carbaso, 2008).

Today's projects are information intensive due to the complexity of the project, regulatory requirements, stakeholders' needs, and time and budget concerns. Changes in project information may emanate from globalization of markets, changes in economic conditions, shorter project durations, changes to the project scope, and client sophistication (Alshawi & Ingirige, 2003). It is estimated that the project manager spends 75-90% of their time communicating; either giving or receiving project information (Scanlin, 1998). One of the issues with large amounts of project information is the ability to effectively communicate it to other stakeholders. One of the largest obstacles to the timely sharing of information is the lack of software integration in the industry. There are several area-specific software programs that are stand alone but not one industry-wide system to facilitate smooth transfer of information (Alshawi & Ingirige, 2003).

The use of BIM as an information sharing tool used in conjunction with an IPD system is one of the more promising advances in the construction industry lately. BIM seeks to facilitate the exchange of information between all parties to a construction project, with the goals of reduced cost, error, and redundancy (Bell, 2004). The American Institute of Architects (AIA) defines BIM as "a model based technology linked with a database of project information" (AIA, 2006). The 3D modeling component of BIM is being considered for use on several prominent projects including the Freedom Tower in New York City, The Bart's and the London Hospital in London, and a refurbishment of the renowned Sydney Opera House. Some spinoff uses for BIM are being experimented with in industry and include 4D modeling which adds scheduling to the model, 5D modeling which adds scheduling and costs to the model, and conflict detection and planning by sub-contractors. BIM models can also include selected embedded information concerning building geometry, materials, specifications, code requirements, assembly procedures, prices, manufacturers, vendors, and any other related data associated with how the object is actually used (Ibrahim & Krawczyk, 2003). The ideal information management tool would store information on design, construction, as-builts, and operating manuals. This would encourage stakeholders to function in an integrated manner to ensure the successful use and maintenance of a new building (Stumpf, Ganeshan, Chin, & Lui, 1996).

These and other developments have caused confusion regarding the roles of each stakeholder in modern project management. For example, the owner's role has increased complexity due to the rise of corporate clients, long-term building relationships with contractors, and the separation of building owners from the building inhabitants (Newcombe, 2003). The question is often asked, "Who are the stakeholders in the process?" Karlsen identifies stakeholders as "clients, end users, contractors, labor unions, line organization, public authorities, financial institutions, insurance companies, controlling organizations, media, third parties, and competitors" (pg19, 2002). Once the project's stakeholders are indentified and the relationships determined, the appropriate management steps can be instituted to ensure a positive relationship is maintained contributing to the project's success (Karlsen, 2002). Newcombe categorizes stakeholders as primary and secondary depending on their proximity to the project itself in terms of active participation (2003). If the stakeholders are not properly identified, there are several risks to the project: independently developed design solutions; fragmentation of the design, fabrication, and construction which may result in lost data or information hording; and inadequate prioritization of the project (Evbuomwan & Anumba, 1998). Even if the stakeholders are identified, there is the issue of adequately sharing information with them individually and collectively.

The literature is silent on the prospect of increasing integration of the regulatory sector through the IPD and BIM frameworks in an effort to provide increased long term services to the public sector at large. This paper explores the involvement of public sector agencies at each level of the project life cycle. Stumpf et al. identifies the following project life-cycle phases: manage, plan, design, construct, and operate (1996). The life-cycle phases used here are: concept phase, design phase, construction phase, use and maintenance phase, and end-of-life phase. The role of regulatory agencies are addressed by phase in the traditional setting. This is followed by a discussion of possible opportunities for increased regulatory agency participation using IPD and BIM formats. A discussion follows comparing and contrasting the extended benefits of regulatory agency participation.

Current Integration of Regulatory Agencies in the Typical Construction Process

Government at all levels is involved in the construction process long before the conceptualization of a project. At the Federal level, the American with Disabilities Act (ADA) provides guidelines for barrier-free design and the Fair Housing Act (FHA) sets minimum housing standards. To these overarching standards, the State governments can add their requirements but most states delegate this activity to lesser political subdivisions. In states that have counties and cities, the additional standards prescribed by each higher level of government are binding on each lower subdivision. In most cases, each lower level has the option to add additional criteria although these cannot weaken higher level requirements. The result is typically a regional growth plan at the county level and master plans at the county and city levels and possibly growth plans of individual cities or a consortium of cities. The outcome of these plans typically are zoning requirements and building codes put in place to ensure the community develops in a manner consistent with the community's desires. Regulatory agencies also play a role in the typical project phases: concept, design, construction, operation and maintenance, and end-of-life.

Concept Phase

Regulatory agency involvement in the concept phase depends on the type and complexity of the project and the sophistication of the developer. There are initial inquires into the zoning regulations to ensure the project is allowed. Once the initial due diligence, with positive results, is complete, the project developers may not need to contact the regulatory agencies until a building permit is needed. If the due diligence identifies issues with either zoning or the building code, the involvement level of the regulatory agency increases in an effort to address the problems so the project can either move forward or be tabled until a future time. Almost any request for a change in zoning or use needs to go through a public hearing process and final approval by the governing body. This process may move quickly or take several years depending on the complexity of the project and the issues.

Design Phase

Once the zoning and use requirements are in place, the project design can continue reflecting any additional regulatory requirements the project may need to meet. Unless there are areas that require further clarification, the regulatory agencies typically are not involved again until the permit application process. At the end of the design phase, prior to construction, the project is submitted to the appropriate regulatory agency for permitting. At this time, the project documents are sent out to referral agencies by the charge department for comments on the project and additional questions and/or requirements that may be placed on the development. The charge department is typically the one who issues the building permit. Referral agencies are those within the regulatory organization who have an interest in the project. Typical referral agencies are engineering, health, fire, and critical infrastructure providers like water, sewer, and electric utilities. The general contractor or large sub-contractors may individually apply for the permits in the construction phase.

Construction Phase. The regulatory agency involvement increases during the construction phase with the typical involvement being inspections. Common inspections are: setback, footing and foundation, rough framing, rough electrical, rough plumbing, insulation, roofing, drywall, and final for electrical, plumbing and an overall final resulting in a certificate of occupancy (CO). In some cases the contractor applies for a temporary certificate of occupancy (TCO) once the life safety systems are installed, operational, and tested so the tenants can move into the building prior to the CO being issued. Specialized inspections may be required for non-standard equipment or systems.

Operation and Maintenance Phase. Unless there is a requirement to get a permit for a process needed in this phase, the regulatory agency is not typically involved. Some examples of regular inspections may include life safety systems, conveying systems like elevators or escalators, and mechanical exhaust equipment.

End-of-Life Phase. It is almost certain that some type of permit will be required in this phase depending on the next use of the property. Possible examples are demolition of the structure, adaptive reuse, or major renovation for additional similar use.

Possible Opportunities for Involving Regulatory Agencies in IPD and BIM Processes

The introduction of IPD and BIM into the construction industry is proving to be fruitful for the core stakeholders. The concept of creating a win-win situation versus a lose-lose outcome drives the core stakeholders to produce only positive results. Whether by increasing the flow of information or by presenting information in a 3D model, the easier and more effective the transfer and understanding of the information, the greater the positive impact on the project's bottom line. There is one commonality that all the core stakeholders have, the profit motive. This poses an interesting dilemma for an argument espousing the increased involvement of regulatory agencies in a role that places them in or very near the core stakeholder category. Although the regulatory agencies motives are not necessarily financial in nature, they are interested in the health, safety, and welfare of the future users of the project which should be goals shared by of all the core stakeholders. Regardless, the following sections highlight the benefits and opportunities by project phase for making regulatory agencies part of the core IPD team and giving them access to BIM for the project.

Concept Phase

The use of BIM models could enhance and simplify the introduction and adoption of new building materials and methods to the regulatory agency. Even though these materials and systems may be used in other parts of the country or world, their initial acceptance in a jurisdiction requires education, testing, and supporting documentation leading to an understanding of the concept. The earthship home building method is a good example of the potential benefits of BIM. Earthship construction is not addressed by most building codes and so regulatory agencies often hesitate to approve it as a structural building system. Trying to explain how tires would be filled with earth and stacked into a wall system and covered with earthen plaster would be much simpler if the building officials had a 3D model to look at in concert with written test reports and 2D plans.

In instances where a public hearing is required for a variance, the use of 3D models again would help clarify and convey the need in a manner that most people can understand even without an expert level of understanding. The same can be said for building code adoption or changes. The addition of a 3D visual to the written and verbal arguments would increase the knowledge transfer resulting in a higher level of understanding among the members of the governing body.

The design timeline for the project would also be shortened as a result of better feedback and input from regulatory agencies on code deviances. Throughout the concept phase, the IPD team would benefit from using BIM to convey information to regulatory agencies in an effort to shorten the compliance process prior to final design.

Design Phase

The availability of up-to-date information during the permitting process is critical. By eliminating the initial need to physically take documents to the building official, a click of the mouse can send revisions for immediate inclusion in the design. The inclusion of software with some embedded building code requirements already exists in some cases (Ibrahim & Krawczyk, 2003) making the review process that much smoother. At a minimum, the comments and decisions made throughout the concept phase could be referenced. The anticipated outcome is a shorter time line for the regulatory agencies and the owner.

Construction Phase. Absent any major changes to the structure, the regulatory agency's role during construction is mostly that of inspection. The use of 3D BIM both in the office and in the field increases the inspectors' knowledge and ability to compare the plans with on-the-ground practice. In cases where a question arises, an inspector could conference with other stakeholders and building officials over the phone while each participant views the 3D models.

Operation & Maintenance Phase. This phase is important due to possible changes in building ownership and the potential loss of building data over the life-cycle of the building. Even if the IPD team disbands after the initial construction is completed, the benefits of BIM still exist. The information obtained by the regulatory agency for permitting is typically public record and therefore available to anyone. This bulky paper documentation is often stored offsite by the regulatory agency after project completion and may be difficult to retrieve in a timely manner and may be subject to inadvertent destruction or loss. As a core stakeholder, the regulatory agency would have electronic data storage files in addition to the hard documentation. The ability of an emergency response team to access this information in the event of a fire, accident, or attack could substantially reduce risk to responders, building occupants, and the general public. The owner may be able to request insurance rate reductions and the building occupants would feel more secure in their environment. Current occupants would also have access to the full BIM database which could aid with the building commissioning process, equipment and material maintenance, as well as remodeling projects.

End-of-life Phase. Once a building reaches the end of its expected life there are two paths that can be chosen: demolition/deconstruction or adaptive reuse. The availability of building information including the component type would greatly increase the accuracy of identifying recyclable materials to meet possible code requirements or extended producer responsibility requirements. BIM will aid in identifying which elements can be recycled, reused, or land filled. It will also provide quantities and sequencing to facilitate safe deconstruction. Additionally it may help in any documentation process required by the regulatory agency.

If adaptive reuse is the chosen option, it is likely that permits will also be required. Here BIM will help in redesign, component reuse, and reduced time and cost. If a rating system for green building is used, there may be additional benefits from the BIM models in point attainment. In either case, the advantages to the newly formed IPD team are substantial especially if the building has changed ownership, undergone renovations, or been left idle for an extended period of time. The regulatory agency becomes the go-to permanent core stakeholder to shorten the learning curve for this phase.

Actions Required to Include Regulatory Agencies in IPD and BIM Process. There are several major hurdles to overcome prior to the inclusion of regulatory agencies as core stakeholders in IPD teams and for the use of BIM models. First are software and equipment needs. On the industry side, there needs to be a stable and widely accepted interface platform. On the regulatory agency side, there needs to be equipment and training for the involved parties. The next issue is the creation of the database on the government side and procedures and protocols to ensure its integrity and management over time. It does not matter which viewpoint you look at the increased regulatory agency involvement from, the tasks appear to be daunting. The potential amount of owners, design teams, and contractors along with the thousands of political subdivisions of governmental agencies all indicate that wide-spread adoption will be slow and most likely controlled by perceived benefits to the core stakeholders. Adoption of increased regulatory agency participation could be mandated but that process would create one more adversarial relationship that the IPD team would need to overcome to insure a successful project.

Concluding Remarks

The public, via government agencies, is the ultimate stakeholder in construction activities. This is true not only for a specific project, but for all projects. The idea that regulatory agency activity occurs earlier in the process for a project using IPD may be true in the context of large projects due to an increased level of owner sophistication that understands the need to do up-front due diligence work. Regardless of the size of a project, the involvement of a regulatory agency is inevitable except in the few local jurisdictions that have not adopted zoning requirements and building codes. However, state and federal regulation still apply. With that said, the more important aspects of increasing the interaction and level of stakeholder status of regulatory agencies to core level in the IPD and BIM formats are the long term benefits to future building owners, occupants, the community, and the environment. The sharing of information concerning the building design, plans, as-builts, and specifications in a digital format provides a public service in the case of an emergency from a governmental entity that will always exist. Currently this information may be lost when building ownership changes hands or through document management neglect. In an emergency situation, the responding authorities could retrieve information from the local jurisdiction in a downloadable format for immediate field use. This information in the current format is currently limited by file type (typically paper), the accuracy of the information (initial plans without all change orders and modifications unless required by code), and accessibility (in dead storage).

Increased sharing of digital files in the design, permitting, and inspection phase are also beneficial. In instances where new products or construction methods are proposed (although they may be common in other jurisdictions), the increased visualization from BIM could enhance the acceptance process in the governing jurisdiction. As in most cases when something out of the ordinary is proposed, people tend to adopt with caution. The adoption and modification of building codes would also benefit due to increased understanding of needs of all parties in balance with public safety. Additional information and models could also help in the inspection process. In cases where new construction methods are approved, the inspector also needs to be educated in their use and construction prior to signing off on inspection. In some cases this may help with the acceptance of performance-based specifications. It is worth noting that the oversight function and the public trust must be prioritized to ensure there is no conflict of interest, real or perceived, resulting from regulatory agencies elevation to stakeholder.

The building occupants would also benefit in several areas. When high-tech HVAC systems are installed, the information about system design, operational assumptions, as well as location would always be available. In the case of sick building syndrome, a remodel, or demolition; system location, material content, and size are important to trouble shoot and redesign. In the end-of-life phase where demolition is involved, BIM data could be used to determine the recyclability of building components. BIM would enable the building material inventory to remain current which would allow for greater material recycling in the future as recycling technologies advance.

The impact of communication, both verbal and written, on a project is vital to the project's success. The same is true for the communication of information to regulatory agencies which are the public's representatives in communities, states, and at the federal level. The inclusion of regulatory agencies as core stakeholders, even without a profit motive, provides additional benefits to the IPD project team and to the community at large. This inclusion also furthers the IPD goal of creating a win-win outcome for the project.

Future Research

One of the first steps to determine the potential level of support for increased regulatory agency involvement as a core member of an IPD team would be to survey both government agencies and IPD team members. The identification of IPD teams and regulatory agencies to target in this process would most likely start with early adopters of the IPD process found in the existing literature or from industry-related articles. Once identified, the applicable regulatory agencies could be contacted to gauge receptiveness to the proposed increased stakeholder status. Included in this research would be the discussion of the goals of the core stakeholders, specifically profit vs. public interest. The development of a survey would most likely be multifaceted starting with a focus group or open-ended interviews with the initial parties. The results of these informational gathering activities would then form the basis for a widely distributed survey of construction companies and governmental agencies. A list could be randomly drawn from owners, designers, contractors, and other impacted parties as identified in the information-gathering process. Information also needs to be collected about available software, exchange platforms, and associated costs. IPD core stakeholder relations may be industry-specific, thus limiting the software and platform costs if upgrading is needed among the stakeholders. This is not the case for the government agency; they must be able to also integrate with all their constituents, a costly endeavor. Suggestions to a solution for these issues could be incorporated into the survey research instrument or carried out independently. The issue of proprietary knowledge is another area of concern. While plans may be "of record," care must be taken to ensure that construction methods and means are protected when applicable. The solution could be submittal requirement driven from the agency side or contractually driven from the private sector; research on both is needed. The need for a framework or roadmap to identify the initial and best practices would be a desired outcome of any research conducted in this topical area. Such information would help in the dissemination and adoption of the suggested elevation of regulatory agencies to stakeholder status in IPD systems.

References

American Institute of Architects (2006) Preparing for Building Information Modeling, *Practice Management Digest* [WWW document]. URL http://www.aia.org/nwsltr_pm.cfm?pagename=pm_a_20050722_bim

American Institute of Architects California Council (2007). "*A Working Definition: Integrated Project Delivery*". [WWW document]. URL http://www.ipd-ca.net/images/Integrated%20Project%20Delivery%20Definition.pdf

Alshawi, M., & Ingirige, B. (2003). "Web-enabled Project Management: An Emerging Paradigm in Construction". *Automation in Construction*, 12, 349-364.

Bell, C. (September 2004). *The Building Information Model* [WWW document]. URL http://www.bellcr.com/wp-content/BuildingInformationModels.pdf

Carbaso, T., (2008). "Integrated Project Delivery Improves Efficiency, Streamlines Construction" [WWW document]. URL http://www.tradelineinc.com/reports/0A03D1C0%2D2B3B%2DB525%2D85702BCEDF900F61/print

Davis, D. (September, 2003). BIM (Building Information Modeling) Update. *American Institute of Architects,* [WWW document]. URL http://www.aia.org/tap_a_0903bim

Evbuomwan, N. F. O., and Anumba, J. C., (1998). "An Integrated Framework for Concurrent Life-cycle Design and Construction". "*Advances in Engineering Software"*, v29, n 7-9, 587-597.

Fleming, Q. W., and Koppelman, J. M., (1996). "Integrated Project Development Teams: Another Fad…or a Permenant Change". *International Journal of Project Management*, v14, 3, 163-168.

Fischer, M., & Kunz, J., (2004). "The Scope and Role of Information Technology in Construction" [WWW Document]. URL http://cife.stanford.edu/online.publications/TR156.pdf

Ibrahim, M., & Krawczyk, R. (October 24-27, 2003). The Level of Knowledge of CAD Objects within the Building Information Model. *Proceedings of the 2003 Annual Conference of the Association for Computer Aided Design in Architecture*, Indianapolis, IN, 173-177.

Jiang, J. J., Chen, E., and Klein, G., (2002). "The Importance of Building a Foundation for User Involvement in Information System Projects". *Project Management Journal*, v33, 1, 20.

Karlsen, J. T., (2002). "Project Stakeholder Management". *Engineering Management Journal*, v14, 4, December.

Newcombe, R., (2003). "From Client to Project Stakeholders: A Stakeholder Mapping Approach". *Construction Management and Economics*, December 2003, 21, 841-848.

Scanlin, J., (1998). "*The Internet as an Enabler of the Bell Atlantic Project Office*". Project Management Journal, v29,2, 6-8.

Stumpf, A. L., Ganeshan, R., Chin, S., & Lui, L. Y., (1996). "Object-Oriented Model for Integrating Construction Products and Process Information". *Journal of Computing in Civil Engineering*", v10, 3, 204-212.

Wysocki, R. K., (2007). "Effective Project Management", Fourth edition, Wiley Publishing, Inc, Indianapolis, ID, USA.