BUSINESS MODEL FOR BIM BASED SERVICES

Islam Mazen, MSc. Candidate, islam.mazen@mail.utoronto.ca
Tamer El-Diraby, Associate Professor, tamer@ecf.utoronto.ca
Department of Civil Engineering, University of Toronto, Toronto, Canada

ABSTRACT:

Building information modeling (BIM) has emerged as a new construction technology that has a positive impact on improving the construction industry. The adoption of BIM in the construction industry is still slow within the construction firms. Some companies have successfully implemented BIM; however, they believe they can get more value if the process is well coordinated among the stakeholders. Other companies fail to start the process because of the high amount of required investments, training and organizational barriers. This gap between the need for BIM services and the ability of companies to implement them in their business processes created a business opportunity for selling BIM services to the clients. This paper proposes a business model for selling BIM design services to different customer segments that requires assistance in BIM implementation. The business model acts as a roadmap for companies to sell BIM design services.

Keywords: business models, building information modeling, cloud BIM, BIM services, BIM implementation, BIM barriers

1. INTRODUCTION

Building information modeling (BIM) has emerged, lately, into the world of construction as a new design tool that goes beyond the graphical presentation of the building to enhance the general design and construction processes. BIM is a process-based system, and a culture, to exploit the use of virtualization to model all aspects of facilities during the design phases; it allows users to fully and truly construct a building virtually, and in detail, before it is built. BIM models cover physical aspects of the building as well as softer issues (such as costs, schedules, energy consumption, constructability, and supply chain coordination). A survey by Autodesk (2010) software company showed that the application of BIM tools has more than a 60% return on investment (ROI); moreover, many architectural firms reported an ROI of more than 100% .

The implementation of BIM in the construction industry has not matured enough. Although BIM technology has been around for several years, the adaptation by different stakeholders in the construction industry is still slow. This slow adaptation is due to the challenging steps required by construction companies to adopt BIM into their design and construction activities. Construction companies needs to substantially change their traditional methods through applying new processes and investing more money in their technological and organizational structure. Many companies lack the capability of using BIM in their projects and seek help from external consultants to assist them in exploiting BIM added value (Becerik and Rice, 2010). Some other companies already started using BIM in their projects; however, they believe that they are not getting the most value out of BIM, as they mainly use it for its visualization capabilities. These companies believe that there is more value that could be exploited from their building information models (Young Jr. et al., 2009).

The market need for BIM consultancy created a business opportunity for selling BIM services to clients. This rendered a chance of creating a business model (BM) that is based on offering BIM services to the client which fills the gap between BIM implementation challenges and its market demand. A business model is defined as a map of how a company does its business; it identifies the main aspects composing any business such as financial

streams, customer segments, logistics and added value to the customers. Osterwalder and Pignuer (2010) developed a user friendly canvas containing the 9 main building blocks of the business model that acts like a roadmap for conducting businesses. In this paper, we propose a BM for BIMing the clients' traditional designs and providing them with the added values from BIM without those companies worrying about the required infrastructure, organizational change or additional costs. This BM is presented in the framework developed by Osterwalder and Pignuer (2010). The proposed BM will recommend a business approach and framework to sell BIM services to the client through developing the 9 building blocks of the business model.

2. LITERATURE REVIEW

2.1 Building Information Modeling:

The building information model is a computer-based model that contains information about a building; this information is sufficient to make the entire project's life cycle processes more operational and efficient (McAdam, 2010). BIM is not only a static model that contains information about a project's components, but also provides dynamic decision making information and wisdom to the project's stakeholders (Lu and Li, 2011). The BIM model contains different building factors including: building geometry; spatial relationships; geographic information; objects parameters; and attributes of different building components. BIM represents a move toward integrative project delivery where all aspects of construction management are connected together, providing an interoperable project environment.

The proliferation of Building Information Modeling (BIM) and other IT-based systems in the AEC industry is changing the landscape of design and project management services and is encouraging people to move from CAD-based systems to BIM platforms (Dell, BD+C, 2011). BIM does not only represent a 3D visualization of the building, but also identifies the parameters and characteristics of each building element through encapsulating the non-physical parameters (Words and Images, 2009). BIM offers multi-dimensional building models that include construction methods, construction costs, energy profiles, installations schedules, compliance with design codes and even installation or operational instructions. Designers can simulate and examine a variety of building systems and construction methods (such as structural design, HVAC, plumbing, electrical and the project management process), virtually, before real implementation. BIM enables the designer to develop accurate bills of materials, monitor schedules, study mismatches, discover inefficiencies and detect design clashes.

Each element in BIM is a model by itself that represents a variety of parameters and characteristics. The objects within a model are linked together through rules and dependencies that can help understand how the whole model interacts together. BIM created an opportunity of getting use of nD CAD which includes several dimensions for the building model including cost, schedule, energy and construction methods. The more information and parameters the user inputs into BIM, the more dimensions they can have. For example, once the parameters of the building elements are added, the user can add structural analysis as a dimension to the model (including analysis of stability and code compliance); and once the energy profile of each element is imported, the user can study and optimize the energy performance of the facility.

In addition to the tangible added value from BIM, BIM enhances the collaboration and interoperability of the design and management which reduces the conflicts between different stakeholders and, accordingly, reduces the projects' costs. BIM enhances the overall efficiency of the design where the dimensions added for the cost and energy could be used to analyze the projects' cost and energy efficiency. This analysis leads to projects which are more efficient economically and environmentally. BIM enhances the whole design process by offering added value services.

The application of BIM in the construction industry is still being adopted slowly due to many different barriers challenging its adoption. Some companies have successfully added BIM to their business processes; however, they are not fully exploiting its value. A survey showed that 93% of BIM users believe they could gain more value out of BIM if the process was better coordinated and leveraged among different project stakeholders (Liu et al., 2010). In order for BIM to be fully beneficial to the construction industry, it has to be fully adopted and coordinated among different project stakeholders. Some other companies did not approach implementing

BIM as a new tool to their design activities due to many reasons including extra costs, trainings and internal resistance to change (Becerik and Pollalis, 2006) .

The implementation of BIM as a new technology is costly. Firms have to invest more money in the technology (software and hardware); moreover, more money needs to be spent on training, developing expertise and developing the required standards and tools for BIM implementation (Dell, BD+C, 2011). BIM, like any other new technology, follows a learning curve; this means that the applying company will not be able to get the whole benefit out of BIM until the designers and engineers master the tools and are able to fully exploit its value (Words and Images, 2009). Companies sometimes resist this long term change and prefer to stick to traditional methods of design like CAD. This resistance is considered to be a big obstacle to implementing BIM. A survey showed that 62% of the respondents believe that their current design tools have more value than BIM (Young Jr. et al., 2009).

Contactors and owners get the most benefits out of the added value of BIM. A survey showed that contractors get around 72% ROI for their BIM investments compared to owners whom earn around 70% ROI for their BIM investments (Young Jr. et al., 2009). Contractors and owners get the most benefits from BIM; however, it is not fully adopted by many contractors and owners. On the other hand architectural firms were the highest to implement BIM in their projects (Dell, BD+C, 2011). This shows that contractors and owners need assistance when it comes to implementing BIM into their projects (Becerik and Rice, 2010).

2.2 Business Models:

Business models have emerged to the business markets as a powerful tool that assists companies with inventing and organizing their operations and business processes. A business model is simply a map that defines the value, operations and financials of a business. Analysis of business models emerged lately as one of the most powerful tools for an organization to design or reinvent itself. This is mainly due to the increased penetration of information technology in today's business and the spread of trans-national business ventures. A survey done by IBM showed that 70% of CEOs emphasized the importance of integrating technology and business strategies, those CEOs focus 30 % of their innovation efforts on developing their business models(IBM, 2006). The main purpose of developing business models is to formulate a vision and approach for companies to invent their value proposition and their offerings to customers along with needed key resources and pricing structures.

The business model, as a concept, is defined in a variety of ways in the literature. Timmers (1998) defined a business model as the architecture of the provided physical or intellectual product, including the description of all aspects required for business operations in addition to the financial payments or gains from this product or service. In addition to these elements, Weill and Vitale (2002) added that a business model should include the description of the relationships between the firm's customers and partners. Other authors defined the business model as a tool that exploits additional values proposed by the business and how these values can be integrated within the current firm's strategy. Such exploitation happens through managing the content and structure of the business model (Linder and Cantrell, 2000; Rappa, 2000). Osterwalder and Pigneur (2002) defined the business model from another perspective; they regarded it as the missing link between a company's strategy and implementation processes. Thus, they defined the business model as a blueprint of how a company does its business. Mahadevan (2000) proposed that business models are a combination of three main streams: a value stream that defines the proposition offered to customers; the revenue stream that defines the revenue generation scheme; and, finally, the logistical stream that relates to the design of the supply chain to serve the business. Most of the authors related the idea of business models to internet business; while Osterwalder and Pigneur (2002) and Lai (2006) proposed business models applicable to any business type, whether they are internet-based or otherwise.

Osterwalder and Pigneur (2002) emphasized that a business model's strength is its way of representation, how it tells a story about the business and integrating all the elements together in one simple model. They proposed that the business model is based on four pillars: products and services; the infrastructure of activities; the relationship capital with the customers; and the financial aspects. Later, Osterwalder and Pigneur (2010) re-developed their four pillars model into 9 basic elements that identify the business model. Those elements are: value proposition; customer target; distribution channels; customer relationships; value configuration; core competency; partnerships; cost structure; and revenue model. For more information about the elements of the

Osterwalder and Pignuer business model and its composition, please refer to Osterwalder and Pignuer, 2010. In the next figure, the business model canvas is presented in addition to the definition for each of the nine elements.

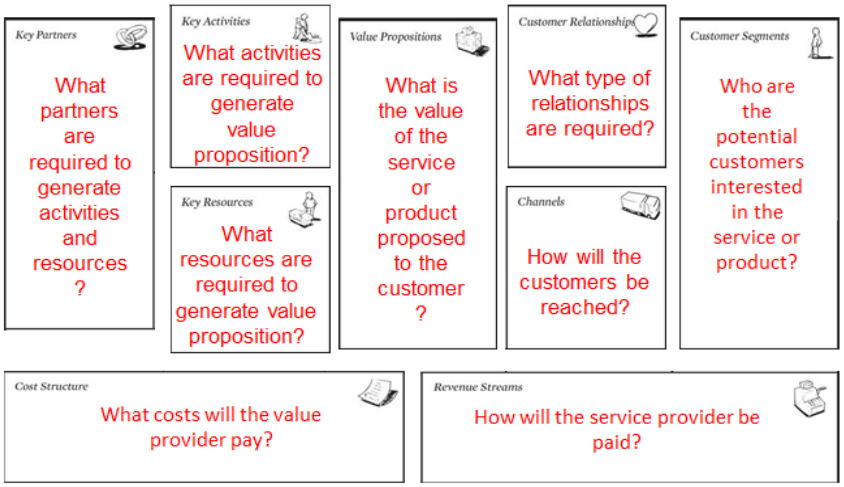

Figure 1: Osterwalder and Pignuer (2010) Business Model Canvas

3. RESEARCH OBJECTIVES:

The literature survey on the emergence of BIM in the construction market showed a gap between construction stakeholders' demand for BIM services and their ability to supply efficient BIM services. This created a new business opportunity for selling BIM services to clients'. The business model approach proved to be an effective business methodology to design or implement a new business or service. In this research, a business model for offering BIM services to the client will be developed. This business model depends on converting traditional designs to BIM based designs where the added value of BIM could be exploited without the customer having to worry about additional costs, organizational changes or trainings. The aim of this research paper is to create a business model for offering BIM services to the clients that could assist them to improve their designs and generate more business opportunities.

4. PROPOSED BUSINESS MODEL:

This business model offers specialized and value-added design services to customers. For example, many small design firms do not have the ability to BIM their design; a consultant can offer the service of transferring non-BIM (or even 2D) designs into BIM-compliant designs. BIM-based designs are, by nature, multi-stakeholder which complicates the management of design processes and data flow. There is an opportunity for offering services to manage the flow of data and design changes in such a complex environment. BIM models could also be used to optimize designs through checking for errors or mismatches and enhancing the whole design to be more efficient. The design could also be cross-referenced and linked with best practices which would guarantee more efficiency and optimized designs for the client.

However, more importantly, owners now require a multitude of new features in design such as LEED analysis and value engineering assessment. Receiving a BIM-based design file from a small consultant, a large consultant, or a specialized consultant can develop and use a set of algorithms to study the optimality of that design, its compliance with different code, or tailor the model to enhance its LEED or energy credentials. In summary, the model offers tailored BIM design services to the customer through coordinating, optimizing and certifying the design process.

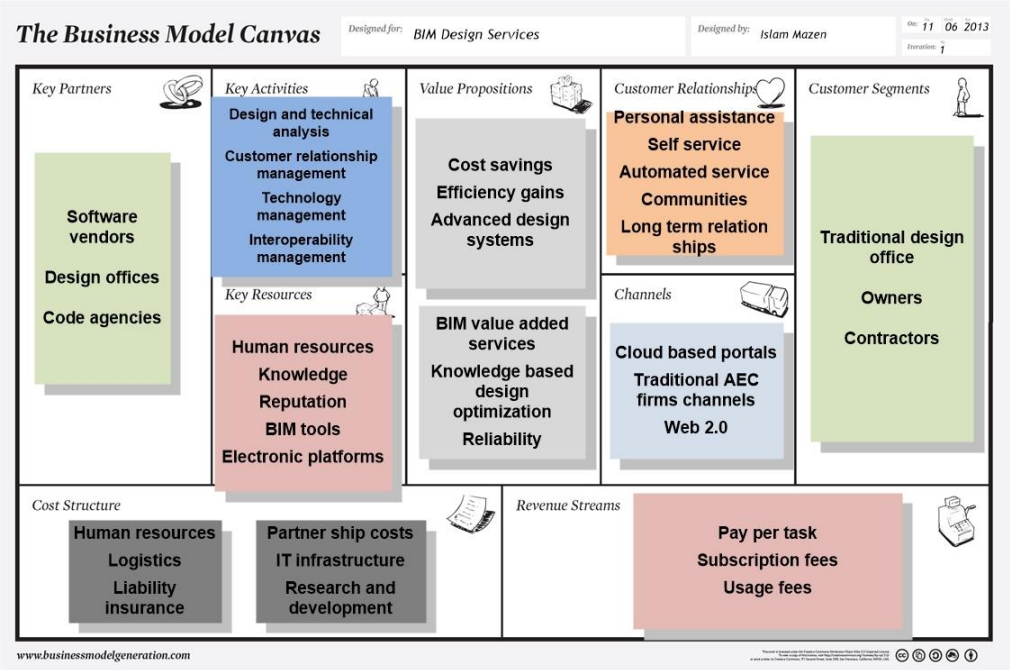

Figure 2: BIM Services Business Model Canvas

4.1 Customer Segments:

The proposed customer segments are traditional design offices, owners and contractors.

Traditional design offices seek assistance to optimize and improve their proposed designs or to add smart solutions enabled by the new design and management techniques. Some of the traditional design offices are not mature enough with using BIM tools and capabilities; as a result, they will seek assistance from other firms to convert traditional designs into BIM designs. Designers play a key role in construction projects since they are responsible for proposing a constructible, clear design that satisfies the client and is understood by the contractor. Designers are sometimes asked to produce a BIM design for their project; however, they might not have this kind of expertise, the services offered by this model enables them to have BIM expertise without having the in-house required capabilities. The proposed services guarantee that the design office can earn the business opportunity and satisfy the clients' requirements.

Owners are even less mature when it comes to BIM implementation; accordingly, they will seek expert assistance to coordinate their BIM designs. Owners want to monitor their projects and ensure that their requirements are properly projected to their projects. This business model assists owners to monitor the progress of their projects through offering accessibility to BIM project models that enable user-friendly monitoring of the design and management activities. The model also enables the owner to implement their ideas or changes into the design which reduces conflicts and saves time and money through enhancing collaboration between different stakeholders.

Contractors are profit oriented entities who seek revenue generation from their projects; as a result, they are always seeking help to extend their business scope, get more projects and seek innovative tools that could assist them in developing the required outcome with the lowest cost and highest quality. Contractors deal with many complex designs and construction activities as well as a huge amount of cash flow which lead to their slow adoption of BIM compared to other construction stakeholder due to their resistance to change. Contractors are a potential customer for BIM based services which will give them the advantage of improving their operations and qualify them for more business opportunities where BIM is a client requirement.

4.2 Customer Relationships:

Customer relationships are the channel through which the firm offers its BMs to the clients. The success of any project is highly dependent on the success of the interaction between the service provider and the client.
The first customer relationship scheme is case by case analysis. The BM provider has to assess the client and the project situation and, accordingly, form a relationship scheme and a contractual agreement that fulfills the client's and the project's requirements. This scheme is important due to the dynamic nature of the client and customer segments which require the BM providers to tailor their relationship schemes according to the customer and job requirements.

The second customer relationship scheme depends on maintaining a long-term strong relationship with the clients to ensure the generation of future business opportunities. The proposed BMs depend on offering continuous services to the client which requires a long term agreement between the client and the service provider. Trust and credibility between the BM provider and client are key factors in maintaining good relationships. The BM providers should ensure that they will be on the client's list for the next project.

Additional relationship schemes are required to ensure satisfactory services to the client and an interactive customer experience. The main purpose of the proposed BM is to sell BIM added value design services to the client. It is essential to keep the client engaged throughout the project's entire life cycle. The interaction could be online using electronic platforms and a collaborative environment or through traditional face-to-face means. The client's involvement at different stages of the BM guarantees the model's success. The online customer relationship involves offering the customer online self-service tools that enable the client to manage the offered services through accessing an online platform. The self-service tools provided to the client will be fulfilling their needs of checking or modifying the design whenever they need.

4.3 Channels:

BM channels constitute the tools that the BM provider uses in order to reach the customer segments. Knowledge is the main asset delivered to the customer in the proposed BMs, and its efficient and convenient delivery to the clients is the key to the models' success. These channels may include the traditional face-to-face mode or even the e-business mode. Information and relationships generated from such traditional channels may support or integrate with cloud generated delivery channels. Additional online channels, including web 2.0 tools and social networks, are important to enhance collaboration and communication between different parties.

Cloud BIM is an important channel for BIM based services. The connection between different stakeholders of a project is a success factor for any project. Cloud BIM offers an interactive platform over the cloud which is accessible by different project stakeholders. It offers on demand services to the project's stakeholders independent of their IT capabilities or infrastructure. Cloud BIM enhances the collaboration and interoperability between a project's parties. It also ensures that different project stakeholders can communicate and deliver their comments, changes and modifications to the other parties in an easy and convenient way thereby reducing rework and conflicts.

4.4 Value Proposition:

The BIM design services BM provides the client with integrative design solutions that offer optimized and efficient designs in addition to innovative design tools through exploiting the value of BIM.
At the most generic/basic level, providers of this BM can claim three core values:

- Cost savings: The first value provided by this BM is the total cost savings to the customer. The model ensures cost savings through enhancing the collaboration and interoperability of the entire design process, thus reducing conflicts. It also offers the client integrative design solutions and optimization processes that guarantee the required outcome with the least costs.
- Efficiency gains: This BM enhances the efficiency of the customer's design. The model works on optimizing the designs to be more efficient in many aspects including cost efficiency and energy efficiency. The main objective is creating efficient designs customized for the customer requirements and needs.

- Advanced design systems: This BM offers its customers added value through proposing advanced design systems that improve the whole design efficiency and cost. The model applies innovative design tools and methods to improve and enhance the proposed designs.

The main values generated above are a result of secondary values delivered to the customer that are more tangible.

- BIM added value services: The business model will offer the client BIM tools that will enhance the whole project management process. BIM enables good collaboration between different project stakeholders which will lead to reduced time and costs for projects. BIM offers the client many enhancements to the project's design and project management. It is a parametric design tool that adds scheduling and cost dimensions to the 3D model of the building which makes monitoring and controlling the project easier and more efficient. BIM enables early clash detection between different aspects of the design, including structural, electrical and mechanical, therefore reducing the possibility of design errors and conflicts.
- Knowledge based design: This BM depends on knowledge as its main asset. The model provides the client with improved designs dependent on the engineering knowledge and design analytics which provide the client with added value information and wisdom about their designs. Knowledge-based design enhances the design efficiency and reduces costs.
- Optimization: Value engineering and design optimization have a great impact on construction projects. This BM will offer optimization services to different construction designs in order to ensure that the designs are designed with the required quality and could be constructed in the least amount of time and with the least cost. This will offer the clients more value from their projects by guaranteeing cost and time savings without sacrificing the quality.
- Trust and reliability: This BM will guarantee the constructability and efficiency of the design through implementing design code checks and best practices. This will offer the client trust as a value where they will be assured that the designs are efficient and good enough to be executed. The certification process will also release the client from carrying full responsibility for his construction designs as the certifier will carry shared responsibility as a reviewer of the designs.

4.5 Revenue Streams:

Revenue streams are the way that this BM will generate profits to services provider.

The first payment method proposed is pay per task where the customer pays a certain agreed upon amount of money for a previously identified scope of work. This payment model is suitable for the proposed services since the offered services involve projects with a certain start and end; therefore, it is reasonable to have a pay per project scheme as a payment method.

The second proposed payment scheme is a usage fee. In this scheme, the client will pay per use of the service provided. The more the customer uses the service, the more money they pay. This revenue stream is suitable for Cloud BIM since the main value of the cloud is to offer on-demand services to the client where the services can be scaled up or down according to the exact need of the customer. The client will be assigned a certain amount per unit of work finished and, governing with the complexity and the size of the project, the service provider will get compensated for the time spent on the project.

The last proposed payment scheme is a subscription fee. The client subscribes for the services and pays continuously per a certain period of time for the services they acquire. This payment model is suitable for long term relationship between the service provider and the client. The proposing office could enter into a joint venture with the client where the client outsources all his BIM, certification and optimization projects to the firm with paying a monthly, semiannual or annual subscription for the services acquired

4.6 Key Activities:

This BM depends on three main activities that ensure the generation of the value proposition and delivering it to the customer.

- Engineering technical tasks: It is the core activities that provide the client with all of the engineering technical activities required for optimizing and improving the proposed designs. The technical tasks include BIM management, which is transforming all designs into BIM format to enable BIM capabilities

such as 3D graphical modeling, information management, parametric modeling, time and cost simulations, and project monitoring. The technical activities also include the design certification and optimization process which involves cross-referencing the designs with building codes and best practices to optimize and certify the proposed designs.

- Customer relationship management. This BM deals with customizing and improving the designs according to the customer's need which requires interaction between the customer and the provider. The service provider must understand the customer's situation and requirements in order to tailor the design to their needs. The client's sophistication as well as the project's complexity differ from one case to another; thus, the service provider must be aware of these changes and manage the relationships with the client accordingly.
- Technology and interoperability management: The construction design process involves different stakeholders with a huge amount of exchanged information. The technological structure of parties contributing to the design varies and will require effort from the service provider to manage the technological structure of the whole project to ensure that information within different parties and with different formats is well shared and leveraged among all of the project's stakeholders.

4.7 Key Resources:

The key resource important to the success of the design optimization and innovation model is the knowledge and the engineering know-how of the firm proposing this BM. The services proposed by this model involve many technical design activities that have to be backed up with strong engineering and design knowledge. The BM offered has to maintain up to date project management, BIM tools and software packages that enable the model's operation. The service provider has to acquire human resources with the design capabilities and engineering know-how required to operate the BM.

The model also depends on the reputation and prequalification of the firm. The firm offering this model should have a good reputation of being trustable and successful in past projects in order to be able to sustain itself as a certified design firm. The prequalification of the company and previous similar projects will act as key resources to acquire customer segments for offering the BIM services in addition to the certification and optimization services involved with the business model.

4.8 Cost Structure:

The main additional costs to the provider of this BM are human resources and investment in technology. The service provider has to invest in hiring people with new capabilities to enhance the company's resources and sources of knowledge. Moreover, the proposed BMs depend on offering BIM services; hence, the firm would have to pay in order to maintain an efficient information technology infrastructure and software systems, catering its services to the customer segment. The proposing company has to invest in research and development (R&D) to ensure the acquisition of up-to-date data, analytical tools, modeling tools and software packages. Additional costs may relate to investments in R&D and community outreach to showcase goodwill and enhance the image of the firm. Liability insurance is another important additional cost that should be accounted for. The provider carries responsibility by modifying the proposed designs and certifying them; therefore, they should maintain insurance as a back-up plan in case of any crisis or failure in their designs.

4.9 Key Partners:

AEC firms offering this model may require additional resources and partnerships with additional firms to help deliver this BM. In this regard, the provider may want to create a joint venture with software vendors that will provide frequent BIM and design software tools in addition to the required maintenance and updates for the software packages. They may also partner with other specialized design offices to acquire some design capabilities or engineering know-how that are not available within the firm's boundaries.

The service provider might form strategic alliances with code agencies in order to be able to access and follow any updates in the building codes, energy codes or best practices. This alliance scheme will guarantee that

the service provider has up-to-date information about the regulations and codes and, accordingly, ensure the success of design optimization and certification services.

5. CONCLUSION AND FUTURE WORK

BIM has emerged, lately, as a construction design tool that can have a positive influence on the construction industry. BIM enhances the interoperability between different project stakeholders and offers added value services to the construction design through having the ability to coordinate the whole design process, identify conflicts and even optimize designs and tailor them to certain building or energy codes. The adaptation of BIM within the construction industry is still slow. Many firms lack the ability to integrate BIM into their business processes; however, they still believe they can benefit from the added value of BIM. This gap between the demand and supply of BIM created a business opportunity for selling BIM services to the clients.

This paper proposes a business model for selling BIM services to the clients. The proposed business model acts as a generic road map for companies willing to generate a business based on selling BIM services to the clients. The business model discusses the main aspects required to invent this business including the financial aspects, logistical aspects, added value and the potential customer segments. The final business model is presented in the Osterwalder and Pignuer (2010) business model canvas.

The future research for this study includes developing this business model into a detailed business plan which has a step by step process for implementing the business model. This detailed business plan could be reformulated as a BIM implementation standard or code that other companies can benefit from. The other area of research is in the area of information technology. The information technology capabilities required to implement this business model is an area that needs to be investigated. Researchers can work on identifying the required hardware and software systems needed to support this business model.

REFERENCES

Autodesk. (2010). BIM infrastructure best practices, *Autodesk Model Performance Technical Note*.

Becerik-Gerber, B., & Rice, S. (2010). The perceived value of building information modeling in the US building industry. *ITcon, 15*, 185-201.

Young Jr., N., Jones, S., Bernstein, H., & Bernstein, H. (n.d.). The business value of BIM. In *SmartMarket Report*. McGraw-Hill Construction.

Osterwalder, A., & Yves, P. (2010). *Business Model Generation: A Handbook for Visionaries.* NewJersey: Wiley.

McAdam, B. (2010). Building information modelling: the UK legal context. *International Journal of Law in the Built Environment, 2*(3), 246-259.

Lu, W. W., & Li, H. (2011). Building information modeling and changing construction practices. *Automation in Construction, 20*(2), 99-100.

DELL& BD+C, (2010). Future-proofing BIM .

Words & Images, (2009). Building information modeling: Understanding and operating in a new paradigm. *The Foundation of Wall and Ceiling Industry*,

Liu, R., Issa, R. R. A., & Olbina, S. (2010). Factors influencing the adoption of building information modeling in the AEC industry. *International Conference on Computing in Civil and Building Engineering*,

Becerik B. and Pollalis S. N. (2006). Computer aided collaboration for managing construction projects, *Design and Technology Report Series*, Harvard Design School, Cambridge, MA, USA.

IBM Global Services, (2006).Expanding the Innovation Horizon, The global CEO study 2006, New York:

Timmers, P. (1998). Business Models for Electronic Makets. *Electronic Markets*, 8.

Weill, P., & Vitale, M. (2002). What IT infrastructure capabilities are needed toi e-business models? *MIS Quarterly Executive*, 18.

Linder, J., & Cantrell, S. (2000). *Changing business models:Surveying the landscape.* Massachusetts: Accenture.

Rappa, M. (2000). Business models on the web. *North Carolina State University*, 13.

Osterwalder, A., & Pigneur, Y. (2002). An e-business model ontology for modeling e-business. *e-Reality: Constructing the e-Economy* (p. 12). Slovenia: 15th Bled Electronic Commerce Conference.

Mahadevan, B. (2000). Business models for internet based e-commerce. *California management review*, 7.

Malone, T., Weill, P., Lai, R., D`Urso, V., Herman, G., Apel, T., & Woemer, S. (2006). Do some business models perform better than others? *MIT Sloan*, 37.