The concept of intelligent building (IB) has been evolving since the conception of the idea in the 1970’s. Intelligent building is focused on maximizing efficiency through both design and operation. A direct result of maximized efficiency is minimal impact on the environment. These elements combine to create another vital aspect of IB’s which is maximum return on investment. Designing and constructing an intelligent building involves careful analysis and attention to each of the building systems including architectural, structural, mechanical, plumbing, electrical, fire / life safety, security.

Intelligent buildings must be designed, constructed, and operated with all stakeholders in mind. A stakeholder is defined as any person who has a potential gain or loss associated with a particular building. Gains and losses vary greatly depending on the stakeholder as well as the specific building in question. Stakeholders can be divided in to the following groups: owners, designers, lenders, users, and the environment.

There are many component s associated with intelligent buildings that help to define them. The primary components of intelligent buildings are sustainability, comfort, security, and maximum return on investment (ROI).

Sustainability is attained through implementation of various “green building” standards such as Leadership for Energy and Environmental Design (LEED), Building for Environment and Economic Stability (BEES), and Environmentally Preferable Purchasing (EPP). These three standards are promoted and monitored by the U.S. Green Building Council, the U.S. Department of Commerce, and the U.S. Environmental protection Agency, respectively.

Comfort is an important component for the users, owners, and lenders. Users are more likely to inhabit, or rent, comfortable spaces which results in additional revenue for owners and quicker return on investment for lenders. Increased comfort can be attained through the use of more efficient building materials, circulation patterns, and careful orientation of buildings within sites.

The focus of security is on the building and components of the building which help make operation efficient. An example of a building component requiring security are wireless networks which are used to communicate data from sensors to databases for evaluation and reaction. This topic is explored in greater depth by Julie Colye and Greg Decker.

The component that is likely of greatest importance to the owner and lender is the return on investment (ROI). ROI is maximized by creating a design that is efficient in both planning and construction while also minimizing operating costs, such as energy consumption and maintenance.

Intelligent buildings are based on intelligent design which can lead to higher development cost. This produces a need for intelligent programs to help aid in the overall building cycle. Intelligent programs will help to optimize the design process by making it more efficient. The process known as BIM can be used to increase the efficient of the building cycle. Chuck Eastman, Ph.D., from Georgia Tech College of Architecture and Computing, defines BIM “integrating all of the geometric model information, the functional requirements and capabilities, and piece behavior information into a single interrelated description of a building project over its lifecycle. It also includes process information dealing with construction schedules and fabrication processes." The idea of BIM has been around for 30 years but lacked the advancements in computer processing to run efficiently. Now that technology has caught up, BIM is beginning to take shape and rewrite the architectural and building industries. BIM will replace traditional CADD as CADD replaced hand drafting.

BIM utilizes a database system to link the entire building cycle together. The database allows the information to be generated for a particular need by having the option to view the data as a 3D model, traditional 2D construction documents, and as binary information. The main drafting format for BIM is 3D modeling. BIM programs are designed for easy 3D modeling by having specific commands for objects within a building. The user can import or design objects for the specific command. The model mimics the real building and instantaneously gives the designer a good understanding of the relationships between the building and the systems within it. The database allows for seamless changes between the model, drawings and documents. For example, if the designers add a window to the model, the database will carry this change throughout all the other corresponding drawings and documents. This leads to increased productivity and reduction in errors which are the two main advantages of the BIM process. These advantages are best seen through the coordination between multi disciplines design phases. The BIM model and information is used in design, analysis, construction documents and the implementation levels. BIM’s database allows these phases to be better managed and share the building information more effectively.

The architect, engineers, contractors and owners will all be using the same model. They each can add their own additional discipline-specific knowledge and track the changes through a single BIM model. The BIM model is linked to an online database and if one person makes a change, it will carry out for everyone that is involved. This greatly reduces the error or lost information between fields and stages of the building cycle. Once the building model and construction documents are complete, the information can be used for estimation, project management and management programs for the faculty. This increases the efficiency for the building design, construction and management processes. In the end, BIM will help reduce the cost of designing an intelligent building by reducing errors and increasing productivity.