ATLAS SAFETY & SECURITY DESIGN, INC.

THE ALCHEMY OF CPTED: LESS MAGIC, MORE SCIENCE

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ABSTRACT: The interdisciplinary roots of Crime Prevention Through Environmental Design (CPTED) are based on the fields of sociology, psychology, ecology of crime, environmental criminology, criminal justice, and architecture. CPTED has borrowed tenets from the social sciences and the physical sciences to create a holistic approach to explaining the environment and people's behavior. Social sciences use the scientific method to have schools of thought, or paradigms, that structure the ways problems and behaviors are defined and solved. While science is often confused with technology, science is the way of thought and investigation for formulation of concepts and hypothesis. Science examines the real world by measuring, observing, and testing. Yet, in the physical sciences the rules of science are based on the process of the scientific method. CPTED practices, theory, and strategies are allegedly based on the scientific method. So too should CPTED. CPTED is often practiced like Alchemy, the alternate form of science which is often based on rules of thumb, mysticism, and subjective interpretation.

The science of Alchemy was revealed as a "false science" for using improper scientific methodology to create gold from lead. Today, the CPTED practitioner is often asked to change lead (urban crime environments) to gold (Main Street USA, New Urbanism, Gated Communities). CPTED has an established process to evaluate the linkages

between the built environment and criminal behavior, yet CPTED, as a "environmental design science", has failed because of the lack of systematic testing and evaluation of projects and the lack of standardization. The CPTED practitioner often reinvents the process for each project.

This presentation critically examines the evolution of CPTED and what the future and long term goals should be for the successful implementation of CPTED into the built environment. With the increasing threat to society from workplace violence, terrorism, and street crime, there is a clear and present need for moving CPTED from the creative magic of feel good untested strategies to a systematic process that stands to the rigors of the scientific method. CPTED must progress to having predictable and measurable results similar to our parallel universe of fire prevention/life safety. The progression of CPTED into the next century depends on becoming more a science and less mysticism. With CPTED becoming more of a science comes standardization, the use of a scientific method, use of the risk assessment model, and systematic evaluations of successes and failures of CPTED applications in order to be able to replicate the successes and avoid foreseeable mistakes.

INTRODUCTION

In the beginning there was the evolution of human-kind, and civilizations grew. As society developed, individuals did not always follow the groundrules of their norms and rules. Crime and criminal behavior demanded boundaries and punishments for those members of society that did not comply. Conflicts were settled by laws and process. Today, we have a sophisticated and complex jurisprudence system of justice.

The theory and concepts of CPTED were developed similar to the story of the ten commandments: The story of the ten commandments were a result of the freedom of the slaves of Egypt into the desert to form their own destiny. As the slaves of the pharaohs, the Jews were forced from their homeland by the Egyptians and wandered the desert for 40 years. While in the desert, the group became unruly, engaging in illegal and offensive activity. Their faith was wavering from being socially and economically isolated in the desert for too long. Moses went up to the Mountains and received a message from God on what acceptable human conduct should be: the Ten Commandments.

In the CPTED view of the world, unruly criminal behavior sends the first generation of CPTED gurus (Oscar Newman, Richard Gardner, and Tim Crow representing Westinghouse Corp.) to different mountains where they return with the formulation of the commandments of Defensible Space and CPTED. Newman’s early works bordered on architectural determinism, and Westinghouse’s four test projects for CPTED were so intricate and complicated that they were difficult to measure and evaluate any discernible success. The many physical and social factors made evaluation almost impossible to isolate and measure what was creating the changes in behavior and environment. The implementation of defensible space and CPTED looked and felt good, but lacked the basis in comprehensive logic and the scientific method.

The pioneer's of the CPTED and Defensible Space movements became the lighting rods for social and architectural change. Public housing now incorporates the principles of New Urbanism and CPTED in their designs. Urban infill is replacing suburban flight. Main Street USA is boasting hundreds of success stories around the United States. There are thousands of persons trained and practicing CPTED around the world.

DEVELOPMENT OF SCIENCE

Every single culture has had a theory of the formation of the universe and the laws that rule it. Such a system is called a cosmology. The first coherent non-religious cosmology was developed during ancient Greece. The system of the world devised by the Greeks described correctly all phenomena known at the time; its most refined version, the Ptolemaic system, survived for more than one thousand years.

These promising developments came to a stop during the Middle Ages but took off with a vengeance during the Renaissance. During this time Copernicus developed his system of the world where the center of the Universe was the Sun and not the Earth. In the same era, Galileo defined and developed the science of mechanics with all its basic postulates. Galileo was also the creator of the idea of relativity, later used by Einstein to construct his Special and General theories.

The next great player was Isaac Newton, who provided a framework for understanding all the phenomena known at the time. In fact, most of our daily experience is perfectly well described by Newton's mathematical formulae.

The cosmology based on the ideas of Galileo and Newton reigned supreme up until the end of the 19th century: by this time it became clear that Newton's laws were unable to describe correctly electric and magnetic phenomena. It is here that Einstein enters the field. He showed that the Newtonian approach does not describe correctly situations in which bodies move at speeds close to that of light (in particular it does not describe light accurately). Einstein also provided the generalization of Newton's equations to the realm of such high speeds: the Special Theory of Relativity.

Not content with this momentous achievements, Einstein argued that the Special Theory of Relativity itself was inapplicable under certain conditions, for example, near very heavy bodies. He then provided the generalization which encompasses these situations as well: the General Theory of Relativity. This is perhaps the most amazing development in theoretical physics in 300 years. Without any experimental motivation, Einstein single handily developed General Theory of Relativity, and using it predicted some of the most surprising phenomena observed to date: the bending of light near heavy bodies, the existence of very massive objects whose gravitational force is so strong it traps all objects, including light, etc.

Introduction to the Scientific Method

The year 1543 may be taken as the beginning of the scientific revolution, for it was then that Copernicus published The Revolution of the Heavenly Bodies and Vesalius, on the structure of the human body. Within a century and a half, man's conception of himself and the universe he inhabited was altered, and the scholastic method of reasoning was replace by new scientific methods. The scientific method is the process by which scientists, collectively and over time, endeavor to construct an accurate (that is, reliable, consistent, and non-arbitrary) representation of the world.

Recognizing that personal and cultural beliefs influence both our perceptions and our interpretations of natural phenomena, we aim through the use of standard procedures and criteria to minimize those influences when developing a theory. The scientific method attempts to minimize the influence of bias or prejudice in the experimenter when testing an hypothesis or a theory. The scientific method has four steps:

1. Observation and description of a phenomenon or group of phenomena.

2. Formulation of an hypothesis to explain the phenomena. In physics, the hypothesis often takes the form of a causal mechanism or a mathematical relation.

3. Use of the hypothesis to predict the existence of other phenomena, or to predict quantitatively the results of new observations.

4. Performance of experimental tests of the predictions by several independent experimenters and properly performed experiments.

If the experiments bear out the hypothesis it may come to be regarded as a theory or law of nature (more on the concepts of hypothesis, model, theory, and law below). If the experiments do not bear out the hypothesis, it must be rejected or modified. What is key in the description of the scientific method just given is the predictive power (the ability to get more out of the theory than you put in; Barrow, 1991) of the hypothesis or theory, as tested by experiment. It is often said in science that theories can never be proved, only disproved. There is always the possibility that a new observation or a new experiment will conflict with a long-standing theory.

Experimental tests may lead either to the confirmation of the hypothesis or to the ruling out of the hypothesis. The scientific method requires that an hypothesis be ruled out or modified if its predictions are clearly and repeatedly incompatible with experimental tests. Further, no matter how elegant a theory is, its predictions must agree with experimental results if we are to believe that it is a valid description of nature. In physics, as in every experimental science, "experiment is supreme" and experimental verification of hypothetical predictions is absolutely necessary.

Experiments may test the theory directly or may test for consequences derived from the theory using mathematics and logic. The necessity of experiment also implies that a theory must be testable. Theories which cannot be tested because they have no observable ramifications do not qualify as scientific theories.

If the predictions of a long-standing theory are found to be in disagreement with new experimental results, the theory may be discarded as a description of reality, but it may continue to be applicable within a limited range of measurable parameters.

We are all familiar with theories which had to be discarded in the face of experimental evidence. In the field of astronomy, the earth-centered description of the planetary orbits was overthrown by the Copernican system in which the sun was placed at the center of a series of concentric, circular planetary orbits. Later, this theory was modified, as measurements of the planets motions were found to be compatible with elliptical, not circular orbits, and still later planetary motion was found to be derivable from Newton's laws.

Error in experiments have several sources. First, there is error intrinsic to instruments of measurement. Because this type of error has equal probability of producing a measurement higher or lower numerically than the "true" value, it is called random error. Second, there is non-random or systematic error, due to factors which bias the result in one direction. No measurement, and therefore no experiment, can be perfectly precise. At the same time, in science we have standard ways of estimating and in some cases reducing errors. Thus it is important to determine the accuracy of a particular measurement and, when stating quantitative results, to quote the measurement error. A measurement without a quoted error is meaningless. The comparison between experiment and theory is made within the context of experimental errors. Scientists ask: how many standard deviations are the results from the theoretical prediction? Have all sources of systematic and random errors been properly estimated?

The scientific method attempts to minimize the influence of the scientist's bias on the outcome of an experiment. That is, when testing an hypothesis or a theory, the scientist/researcher may have a preference for one outcome or another, and it is important that this preference not bias the results or their interpretation. The most fundamental error is to mistake the hypothesis for an explanation of a phenomenon, without performing experimental tests. Sometimes "common sense" and "logic" tempt us into believing that no test is needed. There are numerous examples of this dating from the Greek philosophers to the present day.

Another common mistake is to ignore or rule out data which do not support the hypothesis. Ideally, the experimenter is open to the possibility that the hypothesis is correct or incorrect. Sometimes, however, a scientist may have a strong belief that the hypothesis is true (or false), or feels internal or external pressure to get a specific result. In that case, there may be a psychological tendency to find "something wrong", such as systematic effects, with data which do not support the scientist's expectations, while data which do agree with those expectations may not be checked as carefully. The expectation is that all data must be handled in the same way.

In a field where there is active experimentation and open communication among members of the scientific community, the biases of individuals or groups may cancel out because experimental tests are repeated by different scientists who may have different biases. In addition, different types of experimental setups have different sources of systematic errors. Over a period spanning a variety of experimental tests (usually at least several years), a consensus develops in the community as to which experimental results have stood the test of time.

In physics and other science disciplines, the words "hypothesis," "model," "theory," and "law" have different connotations in relation to the stage of acceptance or knowledge about a group of phenomena.

A hypothesis is a limited statement regarding cause and effect in specific situations; it also refers to our state of knowledge before experimental work has been performed and perhaps even before new phenomena have been predicted. The word "model" is reserved for situations when it is known that the hypothesis has at least limited validity.

A scientific theory or law represents an hypothesis, or a group of related hypotheses, which has been confirmed through repeated experimental tests. Theories are often formulated in terms of a few concepts and equations, which are identified with "laws of nature," suggesting their universal applicability. Accepted scientific theories and laws become part of our understanding of the universe and the basis for exploring less well-understood areas of knowledge. Theories are not easily discarded; new discoveries are first assumed to fit into the existing theoretical framework. It is only when, after repeated experimental tests, the new phenomenon cannot be accommodated that scientists seriously question the theory and attempt to modify it. The validity that we attach to scientific theories as representing realities of the physical world is to be contrasted with the facile invalidation implied by the expression, "It's only a theory." For example, it is unlikely that a person will step off a tall building on the assumption that they will not fall, because "Gravity is only a theory."

When consistency is obtained, the hypothesis becomes a theory and provides a coherent set of propositions which explain a class of phenomena. A theory is then a framework within which observations are explained and predictions are made.

The great advantage of the scientific method is that it is unprejudiced. One does not have to believe a given researcher; one can redo the experiment and determine whether his/her results are true or false. The conclusions will hold irrespective of the state of mind, or the religious persuasion, or the state of consciousness of the investigator and/or the subject of the investigation. Faith, defined as belief that does not rest on logical proof or material evidence, does not determine whether a scientific theory is adopted or discarded.

A theory is accepted not based on the prestige or convincing powers of the proponent but on the results obtained through observations and/or experiments which anyone can reproduce. The results obtained using the scientific method are repeatable. In fact, most experiments and observations are repeated many times (certain experiments are not repeated independently but are repeated as parts of other experiments). If the original claims are not verified the origin of such discrepancies is hunted down and exhaustively studied.

When studying the cosmos we cannot perform experiments; all information is obtained from observations and measurements. Theories are then devised by extracting some regularity in the observations and coding this into physical laws.

There is a very important characteristic of a scientific theory or hypothesis which differentiates it from, for example, an act of faith: the theory or hypothesis can be "falsifiable". This means that there must be some experiment or possible discovery that could prove the theory untrue. For example, Einstein's theory of Relativity made predictions about the results of experiments. These experiments could have produced results that contradicted Einstein, so the theory was (and still is) falsifiable. In contrast, the theory that the moon is populated by little green men who can read our minds and will hide whenever anyone on Earth looks for them and will flee into deep space whenever a spacecraft comes near is not falsifiable. These green men are designed so that no one can ever see them. On the other hand, the theory that there are no little green men on the moon is scientific: you can disprove it by catching one. Similar arguments apply to abominable snow-persons, UFOs, and the Loch Ness Monster.

A frequent criticism made of the scientific method is that it cannot accommodate anything that has not been proved. The argument then points out that many things thought to be impossible in the past are now everyday realities. This criticism is based on a misinterpretation of the scientific method. When a hypothesis passes the test it is adopted as a theory it correctly explains a range of phenomena it can, at any time, be falsified by new experimental evidence. When exploring a new set or phenomena scientists do use existing theories but, since this is a new area of investigation, it is always kept in mind that the old theories might fail to explain the new experiments and observations. In this case new hypotheses are devised and tested until a new theory emerges.

There are many types of "pseudo-scientific" theories which wrap themselves in a mantle of apparent experimental evidence but that, when examined closely, are nothing but statements of faith. Alchemy is an example of such a "pseudo-science".

Webster defines Alchemy as: "A medieval chemical philosophy whose chief aim was the conversion of base metals into gold. 2: An apparently magical power". Alchemy was practiced by the Egyptians over 4000 years ago in order to create gold from other metals. The real aim of Alchemy is the transmutation of all elements: physical, mental, and spiritual. Conventional science has achieved the medieval dream of element conversion with atomic fire. New elements are being created regularly and old ones transmuted to energy and chaos. The "Philosophers Stone" of spiritual transformation sought by the old and new alchemists has been forgotten by conventional science. Alchemy is considered "bad science" by most conventional scientists.

Changes in scientific thought and theories occur, of course, sometimes revolutionizing our view of the world (Kuhn,1962). Again, the key force for change is the scientific method and its emphasis on experiment. While the scientific method is necessary in developing scientific knowledge, it is also useful in everyday problem solving. What do you do when your telephone doesn't work? Is the problem in the hand set, the cabling inside your house, the hookup outside, or in the workings of the phone company? The process you might go through to solve this problem could involve scientific thinking and the results might contradict your initial expectations.

Like any good scientist, you may question the range of situations (outside of science) in which the scientific method may be applied. From what has been stated above, we determine that the scientific method works best in situations where one can isolate the phenomenon of interest by eliminating or accounting for extraneous factors and where one can repeatedly test the system under study after making limited, controlled changes in it.

There are, of course, circumstances when one cannot isolate the phenomena or when one cannot repeat the measurement over and over again. In such cases the results may depend in part on the history of a situation. This often occurs in social interactions between people. For example, when a lawyer makes arguments in front of a jury in court, she or he cannot try other approaches by repeating the trial over and over again in front of the same jury. In a new trial, the jury composition will be different. Even the same jury hearing a new set of arguments cannot be expected to forget what they heard before.

The scientific method is intricately associated with science, the process of human inquiry that pervades the modern era on many levels. While the method appears simple and logical in description, there is perhaps no more complex question than that of knowing how we come to know things. The scientific method distinguishes science from other forms of explanation because of its requirement of systematic experimentation.

TESTING THE SCIENCE OF CPTED

CPTED has generally been practiced without the benefit of a systematic process or assessment as dictated in the scientific method. Most practitioners are in law enforcement and have gained their CPTED expertise by attending one or several trainings. The police officer CPTED practitioner is seldom given the time, resources, or expertise to conduct pre and post evaluations of crime hot spots requiring improvements. The universal solution has been to conduct a "quick and dirty" study of a troubled neighborhood or housing project requiring attention from crimes, illegal drugs, or gang related activity. The typical practitioner developed recommendations without the benefit of gathering all of the relevant information, without the benefit of power or authority to implement recommendations, without the power to make design or management decisions that perpetuate the problems, nor without the ability or resources to evaluate or measure the success or failure of the recommendations. Each new site or crime project invoked reinventing the process again without a standard code or protocol.

The CPTED practitioner often goes to a potential crime site with their CPTED toolbox of "experience". Like a magician empowered to pull a rabbit from a hat, the CPTED practitioner must often pull the divergent forces of architecture, operational/ management practices, governmental bureaucracy, and vested interests together in a collaborative process. Each new situation requires creative problem solving. But there is no standard of care. There is no minimum standards of what the process should be or the criteria for evaluation. With the exception of several cities with CPTED codes/ordinances/resolutions there is virtually no common guidelines for the practitioners to follow other than their own experience or resources.

The standardization of fire prevention, as a very close cousin of crime prevention, is based upon the belief (theory), practice, and principal that the people's safety is the highest law. The building and life safety codes have as its fundamental goals the preservation of human life and property from fire and other life safety hazards related to buildings and building construction through enlightened and proper design, construction and inspection of all buildings and structure, uniformity in building regulations, the development of better methods of construction based on rational analysis, and the establishment of a sound basis for the growth of a defined geographic area.

The National Fire Protection Association's Life Safety Code had its origin by an assigned committee in 1913. The committee devoted its attention to the study of notable fires involving loss of life after analyzing the causes of this loss of life. This work led to the preparation of standards for the construction and arrangement of exit facilities for factories, schools, and other building types. In 1921, the Committee was enlarged to include representation of certain interested groups not previously participating, and work was started on further development and integration of life safety features in all classes of occupancy. The first edition of the Building Exits Code was published by the National Fire Protection Association in 1927. However, the Code was not in suitable form for adoption into law, as it had been drafted as a reference document containing many advisory provisions useful to designers of buildings, but not appropriate for legal use. The Committee re-edited the Code and results were incorporated into the 1956 edition and subsequently refined and updated over the years. (NFPA, Life Safety Code, 1988. P.101x)

Imagine the changes in our built environment if a crime prevention committee had been developed in the early 1900's to prevent and reduce the loss of life resulting from crime in our built environment. How would the architecture have changed if a Code had been established to rationally and logically determine the minimum requirements for safe and crime resistant buildings. What if specific requirements and provisions had been established for security and crime prevention through standards and codes and adopted as law and national standards of care?

WHY IS FIRE PREVENTION DIFFERENT THAN CRIME PREVENTION?

Fire prevention and life-safety codes developed a systematic and scientific process to establish measurable and predictable criteria for buildings to prevent fires, structural failures, and other life-threatening events. It has been Proposed by Saville (1998) that a documented crime prevention risk assessment process can be conducted during the development of new urban designs. A crime prevention risk assessment, in conjunction with implementable crime prevention recommendations, represents the most systematic and comprehensive method devised to date for determining the potential problems that an urban development site might experience. (Saville, 1998).

The history of urban planning, architecture, and environmental criminology has recorded many instances where significant criminal problems arose when architectural development proceeded without a comprehensive crime/security risk assessment. The CPTED risk assessment has been developed to respond to the need for a more targeted approach: that crime reduction must proceed from as good an understanding as possible of the actual crimes being committed at that point in time in that area and that targeted crime reduction seeks to break down the idea of crime into a more clear picture of exactly what crimes, against what targets, where, and by whom.

Risk assessments have been developed by combining scientific field research and analytical methods with the practical experience of crime prevention practitioners and the perceptions of community members. There are four minimum criteria for conducting crime risk assessments. These criteria represent a combination of quantitative (statistical) and qualitative (perception) approaches. Specific research techniques for each risk assessment criteria are determined by factors at each site such as the size, scope of development, and timing of a project and what problems currently exist in the surrounding area. (Saville, 1998)

This implementation of a CPTED risk assessment process provides a guideline or standard of care for developers, CPTED practitioners, architects and planners, CPTED consultants, and police officers. The following guide provides an overview of the minimum CPTED risk assessment steps a CPTED trained practitioner should be looking for in order to determine which CPTED strategies make sense and which do not.

CPTED can be applied before or after a site is developed. It can also be applied on the basis of scale: small, medium, or large projects. This guide shows the minimum kinds of risk assessment research tactics that should be conducted prior to the development of CPTED strategies. (Saville,1998)

THE CPTED RISK ASSESSMENT GUIDE

	BEFORE	AFTER
SMALL SCALE	CATEGORY 1 TACTICS	CATEGORY 2 TACTICS
MEDIUM SCALE	CATEGORY 3 TACTICS	CATEGORY 4 TACTICS
LARGE SCALE	CATEGORY 5 TACTICS	CATEGORY 6 TACTICS

Category 1: This is a very small scale of development, before construction has begun.

Category 2: This is a very small scale of development, after the development has been built. It may be up for redevelopment, or you may have been asked to help resolve ongoing problems there.

Category 3: This is a medium small scale of development, perhaps a new townhouse complex or a urban park. It is before the development has been built.

Category 4: This is a medium scale development, after the development has been built.

Category 5: This is a very large scale of development, before the development has been built. This is the most complex level of CPTED review and normally an independent CPTED report would be written.

Category 6: This is a very large scale of development, before the development has been built. This is the most complex level of CPTED review and normally an independent CPTED report would be written. It is essentially the same as with category 5 except that a safety audit is included since there is now a site to audit. The risk assessment at this level should include site visits - local knowledge is absolutely crucial to the process. The collaborative research process is used with both users of the new development, local residents, the developer and architects, police and other relevant persons.

RISK ASSESSMENT TASK TABLE (Available Upon Request)
Please send us an e-mail by clicking here and requesting the Risk Assessment Task Table which will be sent to you. Please be sure to include your name, phone number, and mailing address.

The appropriate CPTED risk assessment allows the CPTED practitioner to determine which CPTED tactics need to be applied. Based on the scale of the development or building, varying amounts of data and analysis will be required in order to make well based decisions.

THE ROLE OF ARCHITECTURE

The CPTED Risk Assessment Process is the vehicle that will provide the justification and information needed for the planners, architects, and developers to design safe buildings. The architects and developers have to design buildings resistant to fire and other life threatening situations because they are required to by code. But crime is not included as a life threatening activity, even though recent acts of terrorism and workplace violence has reached the level of death and destruction in some of the nation's biggest fire tragedies. There is a clear and present need to provide the same process for crime prevention as fire prevention to the architectural community.

Architecture by definition is built for people. Architecture is the enclosure in which people live their lives. The behavior of people within the architecture demonstrates the dynamically moving social fabric of people. Considering an individual's behavior in their space allows for the validation of the design. (Heimsath, 1977)

Many social sociologists, while acknowledging the problem of a dysfunctional community, cannot see the connection of social disorder to architecture. On a small scale, architecture may influence a particular building or particular rooms or a particular group of people. But, when architecture is conceived as the building process affecting the culture of a society, then the decision to locate low-income minorities in high densities without significant social programs is of critical influence on subsequent behavior. For example, the placement and size of Cabrini Green Housing was determined as a design decision, not as a social decision. The owner and architect set the social organization in motion by deciding on the building, the location, the density , and the configuration. (Heimsath, 1977. P.14)

The subsequent housing disaster's at Cabrini Green in Chicago, Pruitt Igoo in St. Louis, and dozens of other projects around the United States finally awoke the sleeping bureaucratic giant, U.S. Housing Urban Development. Current HOPE VI projects are using low-rise townhouse plans that incorporate Defensible Space/CPTED strategies and New Urbanism/Traditional Neighborhood Design principles. The primary emphasis should be on revitalizing the residents of public housing, not just the residences of public housing (HOPE VI Developments, Issue 35, April 1999. P. 3). Current public housing developments need to be not only meeting the goals of providing a clean, functional, and safe living environment, but also providing the resident an opportunity for self-sufficiency. Besides good architecture, other critical needs for the residents to succeed are a "triad" of job training (so people are employable), day care (so people are available to attend both job training and their new jobs), and a foundation of education, especially adolescents.

For the building process to come to life, there are three key roles of players. The first is the architect, who designs the building for the owner. The owner commissions the building and typically manages it after the building is finished. The third role is that of regulatory government, local, state, and federal. The architect, operating for the owner, works within the constraints of regulatory government as expressed through deed restrictions, zoning laws, health, fire, and building codes. Thus, the built environment is a reflection of the needs of the owner, as defined by the owner, a product of the regulatory guidelines of the government agencies protecting health and safety, and the experience and insight of the architect, as demonstrated through the design. If change is to occur within the building process, it is going to occur within the existing roles of these three partners.

Owners will ask that architects design what is economically sound, socially useful, and aesthetically pleasing. Regulatory agencies will control, through a series of prohibitions or incentives, the physical health and safety aspects of a building. Architects will design within the accepted standards of care of the profession and the aspirations of the community as a whole, as the architectural professionals perceive them. If positive change is going to occur in the building process, it could occur by a dramatic change in society's needs or a shift in economics that will make certain building forms more or less feasible (for example, the change in U.S. Federal architecture after the Oklahoma City bombing and subsequent GSA Security Design Standards). These shifts would influence owners in establishing their needs. Change can occur by legislation (i.e, CPTED Codes, Ordinance, Resolutions) or by influencing the architects who are active, on-going participants in building after building.

How architects design is a product of the theory they use in design and the procedure society has established for producing buildings. Since theory can be changed or influenced without major disruption, the issue of procedure is addressed first. (Heimsath, 1977)

The current design procedure is well illustrated by the standard contract document produced by The American Institute of Architects (AIA). While the document is basically sound, it exemplifies (Heimsath,1977, P.26) two major weaknesses in the design process: the lack of both a programming phase, and a feedback or Post Occupancy Evaluation (POE) phase. The omission of these phases in turn points to the physical bias of architecture, giving little direct attention to the needs of inhabitants as dynamic beings moving in time and space.

Programming is presented in AIA documents as the responsibility of the client, " The Owner shall provide full information, including a complete program, regarding their requirements for the project." The architect is required to confirm such a program in preparing schematic designs, but the word "confirm" hardly suggests a major role in developing a data base for alternatives that might include not building at all. Additional programming steps may be undertaken by the architect if requested specifically by the owner. Payment for such services is listed as an additional service, under Article 1.3. Architects typically receive little renumeration for the programming phase that produces the behavioral data. Often architects give the program (need assessment document) away free or at little cost as a loss leader to get the job. Once the commission is secure, the programming phase is often done hastily and with minimal effort since it is not a direct billable expense. If the architectural program and behavioral data is not introduced in the beginning of the job, it cannot be effective in directing design and for the basic and irrevocable decisions that will be made subsequently without considering behavior of the intended users. (Heimsath, 1977)

Additionally, there is no feedback phase in the current design process. The scientific method uses a methodology to test hypothesis by examining the cause-and-effect relationship. The decision making and response stages of architecture are lacking a feedback process to understand the cause and effect of the design decisions on the building users and the surrounding community. There is no required feedback process built into the architectural design process. There is not even a widespread understanding by the architectural community as to the important role feedback or POE's might play. For example, design award juries are not instructed to question the users of the buildings. Design awards are given when the buildings are just opened or first occupied. There are even un-built design awards to the buildings that never were.

Often, there is a seven year cutoff date so that buildings older than seven years are not even eligible for many awards. Architects interviewed for new jobs are asked to make verbal and visual presentations. When architects are interviewed by a panel for a potential job, it often occurs in one sitting, ostensibly to compare their abilities. Seldom are the buildings which architects design considered in terms of their social success.The architect's past projects are demonstrated with slide shows or powerpoint computer presentations to showoff their physical characteristics. The buildings are seldom visited to find out how well they actually work.

The post occupancy evaluation has been a recommended practice of architects for years. In fact, back in 1986 Cooper, Marcus and Sarkissian stated that "architects usually are forced to fall back on their own experience and their perceptions of the future tenants' needs. There is, however, an alternative... post occupancy evaluations provide useful information about what works and what fails from the residents' perspectives" (Cooper Marcus and Sarkissan, 1986;1).

CONCLUSION

The science of Alchemy was revealed as a "false science" for using improper scientific methodology to create gold from lead. Today, the CPTED practitioner is often asked to change lead (typical of urban crime environments) to gold (Main Street USA, New Urbanism, Gated Communities, etc.). CPTED has an established process to evaluate the linkages between the built environment and criminal behavior; yet, CPTED as a "environmental design science" has failed because of the lack of systematic testing and evaluation of projects, the lack of a systematic risk assessment process, and the lack of standardization.

The CPTED practitioner often reinvents the process for each project. CPTED practitioners must start to read new books and articles on environmental research and how to do it. This presentation critically examined the evolution of architecture, science, and CPTED. The utilization of the scientific method and using a risk assessment model is what the future and long term goals should be for the successful implementation of CPTED into the built environment. It is time for the future of CPTED to get SMART:

- Specific goals of what crimes are to be reduced and experience outcome.
- Measurable and replicable goals and results in the form of POE's .
- Achievable goals and results by clearly defined action steps.
- Realistic goals that are well grounded and have a scientific basis.
- Timed goals for a logical sequence and ordering of action steps.

With the increasing threat to society from workplace violence, terrorism, and street crime, there is a clear and present need for moving CPTED from the magic of alchemy and untested deterministic strategies to a process that stands to the rigors of the scientific method and has predictable and measurable results. The field of fire prevention and life safety has successfully moved beyond the fear and panic to understanding the science of what causes fires and how architecture can prevent them. By understanding and improving the scientific method of CPTED we can prevent fear and the opportunity for most crime and improve the quality of life.

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