CHAPTER TWO

LITERATURE REVIEW

This chapter begins with an overview of standards and standardization, including definitions, types, and their importance, followed by a description of the standard ISO 2603:1998 Booths for Simultaneous Interpretation. Section 2.3 gives a description of conference interpreting, which then leads to factors of quality in interpretation, followed by the various factors which affect the quality of interpretation or performance of interpreters. Of these various factors, this study will review in detail the physical/environmental factors of the interpretation booth. Section 2.6 describes the differences between various users of standards as pertains to this study. An overview of post occupancy evaluation (POE), a discipline with similar purposes and methods to this study, is presented in section 2.7. The final section provides a summary of the literature review and introduces the research questions in the present study.

2.1 Standards

Standards have been around for a long time, tracing back to ancient civilizations.

In the beginning, physical standards for weights and measures were developed out of man's need to measure things, creating a set of reference points for other objects. As time went on, standards spread to commerce and trade (Spivak and Brenner, 2001). With industrialization, technical progress, and expansion of trade, there appeared a multitude of technical standards and specifications. Mass production and the industrial revolution brought issues such as interchangeability, reducing product variety, and increasing efficiency to the foreground (OECD, 1991). Today, standards are everywhere.

2.1.1 Defining Standards

Standards are a form of regulation that allows people and organizations around the world to coordinate and cooperate. "In the simplest sense, a standard is an agreed-upon way of doing something" (Spivak and Brenner, 2001).

Several definitions for *standard* exist. Here, we will examine some of the definitions laid down by formal standardization organizations and international organizations, national standardization organizations, and individual studies. Common features of these definitions include the "people" who establish standards and the "purpose" for which it is established.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) define *standard* as "a document, established by

consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context" (ISO/IEC, 1996). This definition has been adopted by CEN (European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization) in the European standard EN 45020:2006 (as cited in de Vries, 1999).

The General Agreement on Tariffs and Trade (GATT), the precursor to the World Trade Organization (WTO), provided the definition of standard as follows: "A technical specification approved by a recognized standardizing body for the repeated or continuous application, with which compliance is not mandatory" (GATT, 1979, as cited in de Vries, 1999).

Government standardization organizations also issue different definitions of standards. The Standards Act of Taiwan (1997), enforced by the Ministry of Economic Affairs, defines *standard* as: "a document approved by a recognized body and established by consensus, which provides, for common and repeated use, rules, guidelines or characteristics for products or related processes or services." The British Standards Institution (BSI) gives the following definition: "A standard is a document defining best practice, established by consensus and approved by a recognized body (such as BSI)." Standards Australia defines *standard* as: "a published document

which sets out specification and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs in the way it was intended."

De Vries (1999) compiles a number of different definitions for standards, one of which is by Gaillard (1933, p. 23, as cited in de Vries, 1999), an acting general director of the Dutch standardization institute and an employee of the American Standards Association, who states "A standard is a formulation established verbally, in writing or by other graphical method, or by means of a model, sample or other physical means of representation, to serve during a certain period of time for defining, designating or specifying certain features or a unit or basis of measurement, a physical object, an action, a process, a method, a practice, a capacity, a function, a performance, a measure, an arrangement, a condition, a duty, a right, a responsibility; a behaviour, an attitude, a concept or a conception."

The definitions above are compiled into the following table, adapted from de Vries (1999) and modified for this study:

Table 2.1

Definition of Standards

Source	Definition
'Standard' in ISO/IEC Guide 2	Document, established by the consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.
GATT (1979); EC (1983)	Technical specification approved by a recognized standardizing body for the repeated use and continuous application, with which compliance is not mandatory.
British Standards Institution (BSI)	A standard is a document defining best practice, established by consensus and approved by a recognized body
Standards Australia	A published document which sets out specification and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs in the way it was intended.
'Standard' in Standards Act of Taiwan	A document approved by a recognized body and established by consensus, which provides, for common and repeated use, rules, guidelines or characteristics for products or related processes or services.
Gaillard (1993)	A formulation established verbally, in writing or by other graphical method, or by means of a model, sample or other physical means of representation, to serve during a certain period of time for defining, designating or specifying certain features of (…)

Source: Adopted and modified from de Vries, H. J. (1999) p. 149

Over the years, many institutions, agencies, and individuals have established various definitions for standards. Generally speaking, most definitions agree that standards are established by the consensus of a recognized body, intended for

common and repeated use, and aimed at the achievement of the optimum degree of order in a given context, such as improved efficiency, consistent performance, and compatibility. An additional feature of standards is non-mandatory compliance, which will be explored further in this chapter. The rest of this section will further discuss the classification of standards.

2.1.2 Types of Standards

Much has been written on the many different classifications of standards. In this section, this study will give a brief overview. Of the multitude of standardization classifications, this paper will focus on entity-related classifications.

In order to begin to understand entity-related classifications, a clarification of the term *entity* is needed. “An entity may be

- a person or group of persons;
- a ‘thing’ such as an object, an event, an idea or a process;
- a combination of the first two kinds of entities.” (de Vries, 1999; Dul and de Vries, 2006)

De Vries (1999) distinguishes between basic standards, requiring standards, and measurement standards. *Basic standards* describe interrelated entities as to facilitate human communication about the entities, such as terminology standards. *Requiring standards* regulate entities or relations between entities, and can be further divided

into *performance standards*, which set performance criteria but do not prescribe solutions, and *solution-describing standards*, which describe solutions for matching problems. *Measurement standards* provide methods to check whether requiring standards have been met.

Simons (as cited in de Vries, 1999, p. 162) distinguishes among interference standards, compatibility standards, and quality standards. *Interference standards* are concerned with how an entity influences other entities, such as safety, health, or environmental standards. *Compatibility standards* regulate how interrelated entities should fit with one another in order to function together. *Quality standards* set requirements regarding the properties of entities to ensure a certain level of quality.

Grindley (1995) makes the distinction between "*quality standards*, concerned with the features of the product itself, and *compatibility standards*, concerned with the links with other products and services". Quality standards can be further divided into minimum attributes and product characteristics.

Wiese (as cited in de Vries, 1999, p. 163) distinguishes between horizontal compatibility, concerned with the fit between functionally equivalent entities, and vertical compatibility, regarding the fit between functionally different entities.

Table 2.2

Entity-Related Classification of Standards

Type of Standard	Definition
1. Basic Standards	structured descriptions of interrelated entities to facilitate human communication about the entities
2. Requiring Standards	set requirements for entities or relations between entities
2.1 Performance Standards	set performance criteria for the solution of matching problems
- Interference Standards	set requirements concerning the influence of an entity on other entities.
- Quality Standards	set requirements for entity properties to assure a certain level of quality
2.2 Solution-Describing Standards	describe solutions for matching problems
- Interference Standards	set requirements concerning the influence of an entity on other entities.
- Compatibility Standards	concern fitting interrelated entities to one other, in order to enable them to function together
• Horizontal Standards	concerns the fit between functionally equivalent objects
• Vertical Standards	concerns the fit between functionally different things
- Quality Standards	set requirements for entity properties to assure a certain level of quality
3. Measurement Standards	provide methods to be used to check whether requiring standards have been met

Source: complied by this study

From the above studies, we can see that there are many different ways in which to classify standards by entity. ISO 2603 Booths for Simultaneous Interpretation includes basic standards and requiring standards. Measurement standards ensure

measurement accuracy and reliability, and is usually applied to mass produced equipment, and as such, do not apply to built-in booths, which are site-specific and not manufactured for mass consumption. The two types of requiring standards, performance and solution-describing standards, are both included in ISO 2603. In other words, some standards in ISO 2603 set performance criteria, such as “the booths shall have easy access through a separate entrance from outside the hall, to avoid the interpreters disturbing the meeting when coming and going”, while some standards describe solutions, such as “the access corridor to the booths shall be at least 1.50 m wide to allow for safe and quick passage.”

2.2 Standardization

For as long as there have been standards, there has been standardization. This section will explore the definition of standardization, as well as its importance and benefits.

2.2.1 Defining Standardization

At its most basic, *standardization* is the activity of making standards. There are many definitions for standardization. As with the definitions of standards, standardization definitions are also laid out at the formal and international level, national level, and through individual studies. Just as standards are basically “an

agreed-upon way of doing something" (Spivak and Brenner, 2001), so standardization is basically the act of establishing a solution for certain problems.

The ISO and IEC definition of standardization is "[the] activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context", which has also been adopted by CEN (European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization), as cited by de Vries (1999).

According to Association Française de Normalisation (AFNOR), "the purpose of standardisation is to provide reference documents which include solutions to technical and commercial problems concerning products, goods and services repeatedly encountered in relations between economic, scientific, technical and social partners" (extract from Decree N° 84-74 of January 26, 1984, as cited in de Vries, 1999).

Barrie Dale and John Oakland (1991, as cited in de Vries, 1999) describe standardization as "an activity to improve efficiency by brining consistency to the products, services or processes. The activity generally consists of the processes of formulating, issuing and implementing standards."

Joseph Farrell and Garth Saloner (1987) define standardization as "a process by which compatibility is attained."

De Vries (1999) defines standardization as “[an] activity of establishing and recording a limited set of solutions to actual or potential matching problems, directed at benefits for the party or parties involved, balancing their needs and intending and expecting that these solutions will be repeatedly or continuously used, during a certain period, by a substantial number of the parties for whom they are meant.” In addition to offering up his own definition, de Vries collected and compiled other definition, adopted and modified for this study, into the following table: (de Vries, 1999, p. 149).

Table 2.3
Definitions of Standardization

Source	Definition
ISO/IEC Guide 2	Activity of establishing, with regard to actual or potential problems, provisions for common and repeated use, aimed at the achievement of the optimum degree of order in a given context.
Dale and Oakland (1991)	An activity to improve efficiency by bringing consistency to the products, services or processes.
Farrell and Saloner (1987)	A process by which compatibility is attained.
De Vries (1999)	[an] activity of establishing and recording a limited set of solutions to actual or potential matching problems, directed at benefits for the party or parties involved, balancing their needs and intending and expecting that these solutions will be repeatedly or continuously used, during a certain period, by a substantial number of the parties for whom they are meant.

Source: compiled by this study

In conclusion, most of the definitions listed above agree that standardization is an activity of establishing solutions (provisions, rules, guidelines, characteristics, technical specifications, etc.) for problems. This can be done by unification, simplification, and consistency, in order to achieve efficiency, compatibility, and the optimum degree of order in a given context. The rest of this section will further discuss the importance of standards.

2.2.2 Importance of Standardization

Standards are concerned with entities or relations between entities. As mentioned previously in the classification of standards, an entity can be a person or group of persons, or a “thing”, which could be an object, event, idea or process. Relations between entities can include thing-thing, person-thing, or person-person (Dul and de Vries, 2006). Thus, it could be said that standards apply to all aspects of our lives.

The pervasiveness of standards in our lives means that we are all users of standards. Users can be categorized as direct users and indirect users. Direct users, parties that read and apply standards, include designers and testers of products, services, and processes, as well as advisors and regulators. Indirect users, parties that have a stake in the application of the standard, include consumers, workers, special interest groups, and the general public (Dul and de Vries, 2006). The difference between direct and indirect users will be illustrated further in this chapter when

applied directly to booths for simultaneous interpretation.

Although there may be different priorities among direct or indirect users, it is important to conform to requirements, or standards, from the outset, so that quality is achieved from the beginning (Crosby, 1984). Not only does this ensure a higher level of quality, it also avoids the price of nonconformance (PONC), which are all the expenses involved in doing things wrong. In some cases, such as the case of interpreting booths in this study, PONC is not born by the direct users, such as those who commission the building of conference halls or architects who design them, but rather by indirect users, such as interpreters and the audience dependent on their performance. This will be discussed further in this chapter.

Standardization is important from a number of different perspectives, such as competition, compatibility, efficiency, and quality. Kondo (1996) raises a crucial point regarding the importance of standardization:

> *The necessity and importance of standardization (formulating and implementing various standards governing the product quality and performance of work) is emphasized from the standpoint of improving work efficiency and assuring product quality.*

This study would like to add that standardization is not only important for improving work efficiency and product quality, but also for the quality of work which

depends on the quality of the product governed by the standard. It is important to realize that the standardization of booths does not just improve the quality of the booths themselves, but is also an important factor in the quality of interpretation and performance of interpreters, as will be further discussed in Section 2.4.

2.3 Conference Interpreting

Before discussing conference interpreting, it is necessary to first define and categorize the different modes of interpretation. One way of categorizing interpreter-mediated events is by the communicative situation or context in which the event occurs. These include *conference interpreting* (irrespective of whether it is conducted in consecutive or simultaneous mode), *court interpreting*, *community/dialogue interpreting*, and *TV interpreting*. Another parameter by which we may categorize interpreter-mediated events is by the mode of delivery and production (Alexieva, 1997). This category includes *simultaneous interpreting*, *chuchotage* (whispering), *consecutive interpreting*, and *liaison interpreting*. "In simultaneous interpreting (SI), the interpreter, using technical equipment, perceives a sender's source language (SL) message in segments, processes and renders it immediately and continuously in the target language" (Kirchhoff, 1976). Chuchotage, or whispering, is a form of simultaneous interpreting, where interpreters sit with one

or two delegates, and without booth or electronic equipment, ‘whispers’ the interpretation to them (Taylor-Bouladon, 2007). In contrast with the two previous interpretation modes, consecutive interpretation takes place when the interpreter listens to the speaker while taking notes, then reproduces the speech in the target language. Liaison interpreting is similar to consecutive interpreting, although it usually is utilized in spontaneous, conversational discussions, rather than prepared speeches or conferences (Alexieva, 1997).

Another type of interpretation that will be mentioned in this study is *relay interpretation*, which is a type of simultaneous interpretation, but one in which the interpreter cannot understand the language of the speaker, and instead relies on the interpretation of a colleague, which he/she then interprets for the conference participants. In the end, the conference participants receive a second-hand rendering (Taylor-Bouladon, 2007).

Since *conference interpreting* refers to the act of interpretation in a conference setting in either consecutive or simultaneous mode, and *simultaneous interpreting* mainly refers to the mode of immediate and continuous interpretation, it is necessary to state that, in this paper, the author uses the terms *conference interpreting* and *simultaneous interpreting* (SI) interchangeably to refer to simultaneous interpreting in a conference setting (within a booth), unless otherwise noted.

Conference interpreting is a highly complex activity, and not simply a matter of repeating words and phrases in another language. This complex cognitive process requires the interpreter to simultaneously listen, analyze, comprehend, translate, edit, and reproduce a speaker's utterances in real-time. All interpreters work with at least two languages, which are constantly changing and evolving, requiring them to attain and maintain a high level of proficiency. The task of the interpreter, therefore, is to convey a message of the original sender in real time without loss of information content (Büler, 1986).

During a conference, interpreters work in isolation within a sound-proof booth for simultaneous interpretation (either built-in or mobile) with sound equipment. The specifications of the booth are dependent on the factors that will affect the quality of interpreting, which are described in the following section.

2.4 Quality Factors in Interpretation

Prior to exploring the issue of the factors affecting the conference interpreter or quality of interpretation, it is first necessary to understand the issue of quality in interpreting. Quality tends to be a relative term, depending on both objective and subjective factors in interpreting, and on the position of the person(s) evaluating that interpretation. Objective factors, such as working conditions and professional ethics,

are governed by professional associations.

The results of several studies based on interpreting quality from the user's perspective show that users of interpreting services focus mainly on accuracy of content, terminology accuracy, synchronicity, rhetorical skills of the interpreter, voice, and microphone discipline (Büler, 1986; Kopczynski, 1994; Moser, 1996). Other factors found to affect quality assessment include native accent, pleasant voice, fluency of delivery, logical cohesion of utterance, sense consistency with original message, completeness of interpretation, correct grammatical usage, and use of appropriate style (Büler, 1986).

Moser-Mercer (1996) proposes the notion of optimum quality:

> *Optimum quality in professional interpreting implies that an interpreter provides a complete and accurate rendition of the original that does not distort the original message and tries to capture any and all extralinguistic information that the speaker might have provided subject to the constraints imposed by certain external conditions.*

Although most interpreters are sufficiently skilled to overcome less than optimal external factors, these negative external factors nevertheless add stress to the work at hand, which may cause discomfort, distraction, or fatigue for the interpreters. Thus, interpreters can only achieve optimum quality if the appropriate external conditions

are provided.

Examples of external conditions as given by Moser-Mercer (1996) include physical environment (booth dimensions, equipment, air quality, position of booths, lighting, etc.), complexity of subject matter under discussion, change in subject matter, adversarial nature of meetings, discourse characteristics (density of text, emotionality, coherence, etc.), delivery (speaking speed, accents, graphics, presentation, etc.), preparation of interpreter (documentation), team size, length of turn, load during working day, number of consecutive meetings, speakers speaking simultaneously, interpreter's emotional response, and competence and availability of technician.

These external factors are grouped by Cooper, Davies, and Tung (1982) into the four general sources of job stress among conference interpreters: (a) physical/environmental factors, (b) task-related factors, (c) interpersonal factors, and (d) home/work interface. In the AIIC Workload Study (2002), factors on the stressfulness of the interpretation process and on interpreters themselves include *psychological* parameters (perceptions, attitudes etc.), *physical* parameters of working conditions (i.e. air quality, noise insulation, lighting etc. in booths) and *physiological* parameters (heart rate, blood pressure etc.). It goes on to classify occupational stress into environmental (noise, heat, etc.), mental (tasks requiring attention over long periods of time, decision making etc.), and stressors (interactions with colleagues,

superiors and subordinates etc.).

Table 2.4

External Factors Influencing the Quality of Interpretation

External Factors	Examples
Physical/environmental	poor ventilation/air quality, lighting, size of booths, acoustics/use and misuse of microphones/background noise, uncomfortable seating, booth equipment,
Task-related	tremendous amount of concentration required on the job, inconsideration on the part of the delegates (insufficient documentation provided to the interpreter), discourse characteristics, speech delivery, incompetent speakers, poor organization, frequent travel, evaluation or lack of feedback,
Interpersonal	relationship with colleagues, relationship with superior, relationships with delegates
Home/work interface	frequent travel, personal/family problems

Source: compiled by this study

Without a doubt, all of the external conditions listed above affect the quality of interpretation or the performance of the interpreter. Of these conditions, this study will focus on the physical environment of the conference interpreter, the booth for simultaneous interpretation.

2.4.1 Physical/Environmental Factors Affecting Quality/Performance in Interpretation

Various studies have been conducted on the conference interpreter's working environment, or booths for simultaneous interpretation. Factors affecting the quality

of the working environment include booth size, visibility, ventilation, lighting, acoustics, and seating (Cooper et al 1982, Jumpelt 1985, Altman 1990, AIIC Workload Study 2002). A brief overview of the related literature is as follows.

The International Association of Conference Interpreters (AIIC) monitors and sets guidelines for working conditions of conference interpreters. In the past, these guidelines were based on the experiences of interpreters. Though sound, they had no empirical basis, which was brought to AIIC's attention in the mid-nineties, when the US Federal Trade Commission demanded hard evidence supporting AIIC's guidelines. Thus, the AIIC Workload Study was conducted to examine the job characteristics and work environment of simultaneous interpreters (Mackintosh). The study of the physical work conditions focuses mainly on quantifiable factors of environmental quality, including carbon dioxide levels, oxygen levels, relative humidity, temperature, air velocity, lighting, ventilation, and noise.

As chairman of the AIIC Technical Committee and Special Advisor on Standards, R. Walter Jumpelt has been involved in the development of ISO and IEC standards. In his study (Jumpelt, 1985), he describes the characteristics of simultaneous interpretation (the processing of information volume, information density, and information structure), the requirements of simultaneous interpretation booths (sound insulation, acoustic separation, visibility, and ergonomic design), IEC

standards for conference system (requirements regarding sound equipment within the booth), and lessons from the past (reasons for which booths have failed to meet requirements). Jumpelt mentions that there are only a small number of facilities are wholly in accordance with ISO 2603; the noncompliance is usually not due to a shortage of funds, but rather due to an ineffective use of those funds. Exemplary facilities that conform to ISO 2603 are those take into account the importance of communicative functions from the beginning of the architectural design process.

Based on the findings of two questionnaires, one conducted among EC interpreters in Brussels and the other addressed to members of the International Association of Conference Interpreters (AIIC), Altman (1990) compiled and compared responses on the interpreters' perception of factors in effective communication. Respondents were asked to rate to what extent the ability to bridge the communication gap is affected by the following factors: familiarity with subject matter, discussion of a document not made available to the interpreter, clear view of the speaker, quality of sound transmission, speaker's speed of delivery, whether the speaker uses the interpreter's strongest foreign language, quality of speech, delegates speaking a language not their own, the interpreter's state of fatigue, the interpreter's state of health, and whether the interpretation is being recorded/broadcast. Of these factors, only clear view of speaker and quality of sound transmission are considered

physical factors that are affected by booth design. It is not surprising that both groups rated ‘quality of sound transmission’ highly in terms of affecting the interpreter’s performance. What is surprising, however, is that the first group considered ‘clear view of speaker’ to be insignificant, whereas AIIC respondents viewed it as an essential factor. Although Altman does not give any reason for the Brussels group’s lack of emphasis on visibility, this study can only speculate that perhaps it is due to a high frequency of relay interpretation.

Unlike the studies above which focus on factors or characteristics of simultaneous interpretation and the physical working environment under which it is conducted, Cooper, Davies, and Tung (1982) identify four general sources of stress for interpreters. These sources include physical environmental factors, task-related factors, interpersonal factors, and home/work interface. Poor ventilation, lighting or lack of it, size of the booths, acoustics/use and misuse of microphones/background noise, and uncomfortable seating are examples of physical environmental sources of stress. Based on the results of the interviews, a large-scale survey was conducted, in which five categories of job stressors were identified: environmental, task-related, organizational/management, delegate, and personal. In terms of environmental sources of stress, a majority of conference interpreters responded that ‘poor physical environment of booth’, ‘no daylight/view from the booth’, and ‘unable to see the face

of the speaker' were significant sources of stress at work.

Table 2.5
Main Physical/Environmental Factors

Source	Main Factors	Additional Factors
AIIC Workload Study (2002)	Visibility of speaker and/or audience Temperature, humidity and air circulation Ventilation Gaseous Tests for air quality Lighting Noise	
Altman, Janet (1990)	Quality of sound transmission Clear view of speaker	Size of booth Adequate air supply Lighting
Cooper, C.L., Davies, R., and Tung, R.L. (1982)	Ventilation Lighting Size Acoustics/ microphones/ background noise Seating	
Jumpelt, R.W. (1985)	Sound insulation Acoustic Separation Visibility Ergonomic design	TV monitors and other media Air conditioning

Source: compiled by this study

In addition to the various studies on the conference interpreter's working environment, ISO 2603: 1998 Booths for Simultaneous Interpretation also provides a list of criteria for booth conditions. Established by the International Organization for Standardization (ISO) and evaluated by the Technical Committee of the International

Association of Conference Interpreters (AIIC) and the Joint Service Interpretation-Conferences (JSIC) of the European Commission (EU), ISO 2603 was first issued in 1974, then revised in 1983 and 1998 to lay down "basic specifications to be considered when initial plans are prepared for building or renovating built-in booths for simultaneous interpretation in new or existing buildings" (ISO 2603).

The three basic requirements of interpreters' booths as specified by ISO 2603 are as follows:

1. acoustic separation between different languages spoken simultaneously, without mutual interference between languages interpreted or with the speaker in the hall;

2. efficient two-way communication between the booths and the conference hall;

3. a comfortable working environment enabling interpreters to maintain the intense effort of concentration required by their work.

Further specifications are provided for structural and design requirements for booths (siting in relation to the building, siting in relation to the conference hall, doors, access, size of booths, visibility, windows, acoustics, air conditioning, cable ducts), booth interior (lighting, colours, working surface and document storage, seating), facilities for interpreters (toilets, interpreters' room), sound equipment in the interpreters' booths (frequency response, amplitude non-linearity, noise and hum,

cross-talk between channels, level control), interpreters' control panel/console, functions of controls (incoming channel selection device, incoming channel pre-selection device, volume control, tone controls, headphone/headset terminal, monitor loudspeakers, microphone controls, outgoing channel selection device, call channel, call-line key, colour code for indicator lights), interpreters' headphones, booth microphones, and the use of public address systems in conjunction with simultaneous interpretation systems. However, due to research limitations and time restraints, not all will be discussed in this study.

Based on the review of related literature, the main physical/environmental factors affecting the quality of conference interpreting can be summarized as follows:

- Booth size
- Visibility
- Ventilation
- Lighting
- Acoustics
- Seating
- Working surface

2.5 General Characteristics of Booths for Simultaneous Interpretation

The previous section provided an overview of the literature related to the physical work environment of interpreters and the various factors involved. This section will give a more in-depth look at each of the booth factors and how they affect interpreters.

2.5.1 Booth Size

Virtually all literature on the subject of the physical work environment of interpreters and their sources of stress (Cooper et al, 1982; Jumpelt, 1985; Altman, 1990; AIIC Workload Study, 2002) cite booth size as a significant influence on the stress of the interpreter, and consequently the quality of interpretation.

ISO 2603:1998 Booths for Simultaneous Interpretation contains a general statement regarding the size of booths:

> *Each booth shall be wide enough to accommodate the required number of interpreters seated comfortably side by side, each with sufficient table space to work conveniently on several documents spread alongside each other. The booth shall be high and deep enough to provide sufficient volume of air to enable temperature control and draught-free air renewal as well as sufficient space for the occupants to enter and leave without disturbing one another.*

As this regulation is rather vague, ISO 2603 then specifies the minimum dimensions

for a booth for two interpreters: 2.50 meters wide, 2.40 meters deep, and 2.30 meters high. At least one of the booths must be 3.20 meters wide for conference halls with up to six booths, in order to accommodate three interpreters. All booths must be at least 3.20 meters wide for conference halls with more than 6 booths.

Generally, the size of the booth is dictated by the need to provide sufficient work space and air volume for interpreters. The constant jostling of elbows in a booth with insufficient work space can be a constant distraction to interpreters who need to maintain a high level of concentration on conference proceedings. Moreover, ventilation can be a problem when dealing with too small a space (Jumpelt, 1985).

As stated previously, direct and indirect ‘users’ of standards often have different views and interests. Not surprisingly, Jumpelt (1985) points out that the interests of conference center operators and conference interpreters often clashed on the issue of booth size.

Labor-related laws of many nations, such as the UK and Australia, include stipulations on workplace requirements, although most are vague on the minimum floor space required for each person.

In the United Kingdom, Regulation 10 of the Workplace (Health and Safety and Welfare) Regulations 1992 requires that each person shall have "sufficient floor area, height and unoccupied space." The Approved Code of Practice goes on to explain that

each person should have a total minimum of 11 cubic meters of space unoccupied by furniture, where the maximum height is 3 meters.

Section 21 of the Occupational Health and Safety Act of Australia states that the employer must provide and maintain for employees a "working environment that is safe and without risks to health." "A good rule of thumb for personal space is to allocate 6.25 square metres per individual workstation, including furniture and fittings, but excluding passageways and amenities" (NT WorkSafe, 2003).

2.5.2 Visibility

Many communication experts, such as Kendon (1981), Preston (2005), and Lozano and Tversky (2006), agree that in interpersonal communication, much of the message is conveyed through nonverbal means, such as "bodily activity, gesture, facial expression and orientation, posture and spacing, touch and smell, and of those aspects of utterance that can be considered apart from the referential context of what is said (Kendon, 1981)." According to Givens (2000), anthropologist and director of the Center for Nonverbal Studies, "When we speak, our attention is focused on words rather than body language. But our judgment includes both. The audience is simultaneously processing both verbal and nonverbal cues." According to Taylor-Bouladon (2007), 55% of communication is based on visual cues, with 7% based on the meaning of words and 38% on intonation.

Speech perception is processed simultaneously in audible and visible channels, which complement one another “in that one source of information is more informative when the other source is less so” (Moser-Mercer, 2005). This increases the possibility of accurately processing the information because different information is carried along different channels. The importance of multi-channel speech perception is even more pronounced in a bilingual or multilingual setting, such as an international conference, because speakers may be using a language other than their mother tongue, leading to inadequate information perceived purely through audible means. Thus, listeners and interpreters alike must integrate various information sources in order to gain successful comprehension (Moser-Mercer, 2005).

Many events take place in a conference setting which are only accessible through visual means, visual aids being the most obvious example (Jumpelt, 1985). Büler (1985) differentiates between the following types of visual information important for conference interpreting: (a) nonvocal signals from the sender (speaker), (b) nonvocal signals from the listener (delegates), and (c) nonvocal signals in the context of social interaction.

First, the ability to see a speaker’s facial expressions, hand and finger movements, direction of gaze, posture, and general appearance allows for an easier understanding of the spoken message and is generally recognized by interpreters and

laymen. Although often overlooked by architects and designers of conference halls, the second type of visual information, nonvocal signals from the listeners, is considered essential by interpreters, especially in smaller working groups (Büler, 1985), as listeners are also speakers and vice versa, making it much more important for interpreters to rely on nonverbal turntaking cues to anticipate and prepare for a switching of speakers. Thus, a clear view of the speaker and the conference room is so important to the work of the conference interpreter, that it is included in the Code of Professional Ethics. Furthermore, the "Agreement Concerning Conditions of Employment of Short-term Conference Interpreters" (AIIC-United Nations Agreement, 2000-2005) between AIIC and organizations of the United Nations simply states that facilities for meetings should comply with ISO 2603:1983 for built-in booths, ISO 4043:1981 for portable booths, and IEC 914: 1988 for equipment.

The third type of visual information, nonvocal signals in the context of social interaction, can be further divided into interaction among conference participants, between interpreters and delegates, and among interpreters (Büler, 1985). The ability to view the entire conference hall is important to interpreting, as it provides the interpreters the opportunity to witness the feedback and interplay between delegates and speakers, as well as get the feel of the general conference procedure and conference ritual. Remote interpreters, or interpreters working at somewhere other

than the conference location, though they may or may not be able to see conference proceedings via visual support, reveal a lack of ability to be immersed in the virtual environment, demotivation, lack of presence, and fatigue. Even with the help of visual support, remote interpreting is still far more stressful for interpreters, since they are not able to choose what they are looking at any given time (Moser-Mercer, 2005). As Jumpelt (1985) states, “without visual contact with the participants and the proceedings, it is difficult to identify with the subject of the conference.” Büler’s study (1982, as cited in Büler, 1985) shows that many interpreters felt it was important to have two-way visual communication between the interpreter and the delegates, as to avoid working in a vacuum and facilitate visual feedback. Büler concludes that without such a two-way visual communication, the “lack of participation produces demotivation, thus increasing stress and reducing the quality of performance.” As ISO 2603 includes standards regarding side windows (windows between booths), it is easy to conclude that visual communication among interpreters working in different booths is important. Büler (1985) cites the exchange of information on documents or terminology and to provide the feeling of not being isolated as two reasons why visibility between booths is considered essential by interpreters.

Gree’s article (Gree, AIIC website) provides quite a few examples of poor booth

design, most of which have notably failed to provide interpreters with an adequate view of conference proceeding. One example is the Pierre Baudis Convention Centre in Toulouse, which houses booths with staggered glass panels, allowing interpreters to neither read slides nor follow conference proceedings. Another is the Agbar Tower, designed by acclaimed architect Jean Nouvel, whose booth windows cause so strong a glare that interpreters work “whilst deeply absorbed in contemplating [their] own reflection” (Gree, AIIC website).

In summary, nonverbal messages are integral to the communication process. Interpreters depend on these messages to supplement their understanding of the spoken message. In addition, visual information also provides cues for interpreters, allowing them to anticipate and prepare for a switch in topics or speakers. A lack of visual communication can lead to demotivation, isolation, increase of stress, fatigue, and lower quality in performance of interpreters.

2.5.3 Ventilation

As stated earlier in the overview of ISO 2603, one of the three requirements that interpreters’ booths are designed to meet is “a comfortable working environment enabling interpreters to maintain the intense effort of concentration required by their work.” Studies conducted on the effects of ventilation on health, comfort, and productivity in non-industrial indoor environments show a strong association between

ventilation and comfort and health, as indicated by Sick Building Syndrome symptoms, inflammation, infections, allergy, and short-term sick leave, as well as an association between ventilation rate and productivity, as indicated by performance of office work (Wargocki et al, 2002). Sick Building Syndrome consists of a number of general symptoms, such as lethargy and headaches, mucous membrane symptoms, such as a blocked or stuffy nose, dryness of the throat, and dry eyes, and skin symptoms, which are caused by factors within the building, such as ventilation rate, temperature, and humidity (Burge, 2004). Indeed, a well-ventilated booth is essential to both the comfort of the interpreter as well as the quality of interpretation. ISO 2603 goes on to give specific standards regarding air quality within the booth:

> *The air supply should be 100% fresh (i.e. not recycled). The air conditioning system shall be independent from that of the rest of the building and of the conference hall. Air renewal shall be seven times per hour and the carbon dioxide concentration shall not exceed 0.1%. The temperature shall be controllable between 18 and 22 C by means of an individual regulator in each booth. Relative humidity shall be between 45% and 65%.*

In the United States, the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) has established and updated ASHRAE Standard 62, providing designers of buildings with a guide to ventilation for acceptable indoor

air quality (IAQ). The 1981 standard's acceptable carbon dioxide levels were stated as to be maintained below 1,000 parts per million (ppm), but this was later revised and eventually dropped in the latest 2004 standard. This recommendation was used not only to maintain carbon dioxide levels, but also as an indicator of other factors. Carbon dioxide is an indicator of how well the ventilation system is working, or what amount of outside air is entering the building. If there is a high concentration of carbon dioxide, it is likely that there is a buildup of other contaminates that may be hard to detect, which results in poor indoor air quality.

According to recommendations by the Taiwan Environmental Protection Administration, carbon dioxide levels should not exceed 1,000 ppm, and temperatures should be controlled between 15 to 28 degrees Celsius.

High levels of carbon dioxide are also associated with headaches, eye problems, nasal symptoms, respiratory tract conditions, and general feelings of fatigue (Burge et al, 1987). The accepted level of 1,000 ppm for carbon dioxide as suggested by ISO 2603, ASHRAE, and Taiwan EPA may still be too high as "studies have shown that a level of 1000ppm carbon dioxide will reduce the ability to concentrate by about 30 percent" (Myhrvold, Olsen, and Laridsen, 1996).

ISO 2603 stipulates that booth temperature should be controllable between 18 and 22 degrees Celsius. The Taiwan Environmental Protection Administration gives a

recommended range of 15 to 28 degrees Celsius. Burge (2004) finds that, in Northern Europe, temperatures above 23 degrees Celsius cause increased Sick Building Syndrome symptoms.

Not only is carbon dioxide levels and temperatures important to indoor air quality, humidity is critical as well. In terms of humidity, ISO 2603 considers the optimal range to be from 45% to 65%. ASHRAE standards are somewhat more relaxed, recommending that “indoor humidities should be maintained between 30 and 70 percent in occupied buildings” (as cited in Burton, 2006). It is usual to hear of complaints that the air is “too clammy” or “smells funny” when the indoor air is too humid, from 65 to 70 percent, because this high level of humidity either “requires lower temperatures and more air movement to achieve comfort” or “supports the growth of microbiological agents such as bacteria, mold, and fungi” (Burton, 2006).

The effects of poor indoor air quality, as caused by factors such as ventilation, temperature, and humidity, on the performance of office workers and their symptoms are well documented. It is reasonable to say that these negative effects have a significant impact on interpreters and the quality of their work. In one study, some interpreters noted that “the ventilation was so poor that ‘I’m obliged to walk in and out of the booth’” (Cooper, 1982). Ventilation is an important factor in booth quality; however, due to time restraints and the limited scope of this study, a cursory

examination of this subject, rather than a full-scale research, will be conducted.

2.5.4 Acoustics

One of the main requirements laid out in the introduction of ISO 2603 is "acoustic separation between different languages spoken simultaneously, without mutual interference between languages interpreted or with the speaker in the hall" and "efficient two-way communication between the booths and the conference hall." As mentioned previously, interpreting is an act that requires a high level of concentration, and background noises from adjacent booths, the meeting hall, or other parts of the building are distractions for interpreters, thereby prohibiting interpreters from producing optimum quality interpretation. In Altman's study (1990), interpreters consider the quality of sound transmission to be a most crucial factor in the interpreter's ability to bridge the communication gap.

Technical specifications are provided in ISO 2603 with regard to acoustics, sound-proofing, and sound equipment. However, this study will not go into detail in this subject due to the limited scope of study.

2.5.5 Lighting

During a conference, interpreters not only have to see the speaker, delegates, and conference hall in general, but also have to refer to many documents before them, such as lists of terminology, prepared speeches by the speakers, proceedings of the

conference, and other materials. Therefore, a well-lit booth is essential for producing optimum quality interpretation.

Cooper (1982) mentions sufficient lighting or lack of it as one of the physical environmental factors in job stress. Interpreters have commented that lighting which is too strong can cause excessive strain or sensitivity to the eyes. Likewise, a lack of lighting makes it difficult for interpreters to refer to their documents or notes. If lighting installations are poorly designed or placed, visual discomfort can arise, resulting in red, sore, itchy, and watering eyes; headaches and migraine attacks, gastrointestinal problems; and aches and pains associated with poor posture. There are many different aspects of lighting that can cause visual discomfort, such as insufficient light and glare (Boyce, 2006). Poor lighting, such as too much or too little light, can strain the eyes and cause discomfort, which in turn makes it difficult to perform to one's best ability (CCOHS website). Glare occurs when there is too much light, either directly from the light source or a reflection, causing the eyes to adjust to the brightest level of light, thereby making it more difficult to see the details in darker or duller areas (Boyce, 2006; CCOHS website).

ISO 2603 stipulates many regulations for booth lighting. For one, lighting in the booth should be independent from those in the conference hall, since hall lighting may be dimmed for slides or presentations. Booths should have both work lights for

illuminate the working surface, and general lights for which a switch should be available by the booth door. Light sources should not cause glare, and should be placed in a way so as to avoid shadows being cast by the working interpreter. In addition, ISO 2603 requires that both work and general lighting systems be equipped with dimmer switches located within reach of the interpreter working. This study speculates that dimmer switches are necessary for interpreters to control the amount of light they receive so as to avoid too much or too little light.

Although there are many issues to explore in terms of lighting, due to restraints of time and scope, this study will only touch upon this subject in further research.

2.5.6 Seating

Due to the increase of muskoskeletal problems of office workers due to inappropriate seating, the importance of sitting posture and design of seats have been recognized by researchers, designers, and manufacturers (Marmaras and Nathanael, 2006). Sitting is hard work, in terms of ergonomic and occupational health perspectives. Continuous seating for prolonged periods of time has been shown to cause discomfort, aching, or even irreversible injuries (Marmaras and Nathanael, 2006), even diseases of the spine (Cranz, 1998). In addition to personal discomfort, poor seating can cause one to suffer from fatigue, poor performance, and interference with work (Eastman Kodak Company, 1983).

The increasing awareness of the importance of seating has given rise to a number of ergonomic requirements, including (a) the seat height should be adjustable, (b) the seat should be stable, (c) the seat should allow the user to move freely, (d) the seat should have armrests, and (e) the seat lining material should be water absorbent (Marmaras and Nathanael, 2006). Eastman Kodak Company (1983) recommends the use of chairs with casters for seated workplaces without footrests.

For interpreters, uncomfortable seating is one of the physical environmental factors in sources of stress (Cooper, 1982). Interpreters suffer from discomfort when chairs do not provide sufficient support, especially when they are required to work for lengthy periods (Cooper, 1982). The layout of the conference hall and visibility from the booth may also aggravate posture, as interpreters often need to bend forward to see the presentation, resulting in unnecessary strain on their necks and backs (Cooper, 1982).

To ensure a comfortable working environment for interpreters, ISO 2603 states that “for each interpreter and technician, there shall be a comfortable chair with the following characteristics: five legs, adjustable height, adjustable back-rest, arm-rests, castors producing no perceptible noise, and upholstery of heat-dissipating material.” In addition, the standard adds that “independent, movable foot-rests should be available”

In this section, it is clear that sitting for long periods of time in inappropriate seating can cause discomfort and poor performance. Thus, it is crucial to provide interpretation booths with comfortable seating in order to ensure optimal quality interpreting.

2.5.7 Working Surface

In addition to the above physical/environmental factors, appropriate and sufficient work surface is also essential to interpreting quality.

Sanders and McCormick (1992) propose the following general ergonomic recommendations for work surfaces: (a) if at all possible, the work surface height should be adjustable to fit individual physical dimensions and preferences; (b) the work surface should be at a level that places the working height at elbow height, with shoulders at relaxed posture; and (c) the work surface should provide adequate clearance for a person's thighs. An ergonomic workplace should improve work performance by minimizing the physical strain and workload of the working person, facilitating task execution, ensuring occupational health and safety, and achieving ease of use of the various workplace environment (Marmaras and Nathanael, 2006).

ISO 2603 describes the working surface for interpretation booths as being positioned at the front of the booth across the full width, at a height of 0.73m ± 0.01m, and providing a useable depth clear of equipment and fixtures of 0.45m in relation to

the interpreters' angle of vision into the hall. The standards for working surface height, along with those for adjustable seating, ensure the occupational health and safety of the interpreter, minimizing the strain to their bodies. The positioning of the table and its depth is to help facilitate the interpreters' work, allowing them to face towards the hall while having enough working surface to read documents and perhaps, in these modern times, use their notebook computers.

2.6 Discrepancy Between Direct and Indirect Users

As mentioned previously in Section 2.2.2, we are all users of standards. However, users can be differentiated into direct and indirect users. In brief, direct users include those who read and apply standards; indirect users are those who, while not directly applying the standards themselves, have a stake in the application of the standard. In the case of booths for simultaneous interpretation, direct users include conference hall operators who commission the design of the building, and architects who conduct the design and construction of the building. Here, indirect users would include interpreters who occupy the booths while interpreting, the clients who employ their services, and the audience who rely on the interpretation for effective understanding and communication.

Obviously, booths for simultaneous interpretation are aimed to be used by

conference interpreters. However, as indirect users of the standard ISO 2603, interpreters, for the most part, are not directly involved in the establishing of the standard, nor do they have any input in the designing or building process of a conference hall/interpretation booth unless consulted. Ideally, the direct users such as conference hall operators, designers, and architects would design and construct booths in accordance with ISO 2603, but since the ISO 2603 is an international, voluntary standard, direct users are under no obligation to adopt them. Therefore, as Brunsson and Jacobsson (2000) mentions, the direct users (architects, designers, and/or their clients who commission the construction of a conference hall) must be convinced that following the standard would be beneficial.

In the case that interpreters' needs or ISO 2603 standard is not adhered to from the outset of booth design and construction, it is often the indirect users, such as the interpreters and the audience dependent upon the interpreters' output, who pay the price of nonconformance (PONC), although this price may not be measured in monetary terms (Dul and de Vries, 2006; Crosby, 1984). A poorly designed booth means that interpreters must rely much more heavily on their own abilities to make up for the shortcomings in external conditions, which may cause discomfort, distraction, and fatigue for interpreters. Although most interpreters are sufficiently skilled to overcome these negative external factors, any drop in interpretation quality or

performance will be received by the audience, who ultimately rely on the interpreters for communicative purposes. There are cases in which built-in booths have been later renovated or modified to comply with ISO 2603 standard, which have been far more costly for conference hall operators than if the standard had been adhered to in the first place (Gree, AIIC website).

Standardization is generally expected to improve things: a standard is something good, and usually the best. One of the possible incentives for following standards is to join an elite group or organization of adopters, who can claim that their product, service, idea or process is of high quality. This confers a certain status and identity which differentiates them from the rest of the field. Since most standards are voluntary, as was stated previously in the text, this is one of the possible ways in which standards are made more appealing as to attract more adopters and direct users.

Although not a major focus of this study, the differences between direct and indirect users of standards for interpretation booths will be explored, developing possible theories and explanations for the discrepancies between the standard ISO 2603, interpreters' needs, and current conditions.

2.7 Post Occupancy Evaluation

As this study closely resembles the diagnostic tool and system of post occupancy evaluation (POE), it is necessary to first examine the definition, process model, and benefits of this system.

Post occupancy evaluation is based on the idea that the design of spaces can be improved by asking users about their needs, and the term itself refers to “any activity that originates out of an interest in learning how a building performs once it is built and how satisfied building users are with the environment that has been created” (Federal Facilities Council, 2001). Preiser (1988, p.19, as cited in Presier, 1995) gives the following definition of POE: “Post-occupancy evaluation is the process of systematically comparing actual building performance with explicitly stated performance criteria.” Zimring and Reizenstein (1980) define POE as “examinations of the effectiveness for human users of occupied design environments.” POE identifies the attitudes and behaviors of building occupants, assesses how well buildings match their needs, and suggests ways to improve building design, performance, and fitness for purpose (Turpin-Brooks & Viccars, 2006; Green & Moss, 1998). In short, POE is concerned with measuring the satisfaction of users with the built environment.

The methodology of POE is discussed in considerable detail elsewhere (Green &

Moss, 1998; Jaunzens, 2002; Preiser, 1995; Preiser, 2002; Preiser & Schramm, 2002; Preiser, in Federal Facilities Council, 2001; Turpin-Brooks & Viccars, 2006) and will be discussed only briefly here. Typically, a POE has three phases: (a) planning, (b) conducting, and (c) analysis of results and application. The planning phase is preparatory, and establishes the parameters and purpose of study. The second phase – conducting – is concerned with the collection of data through interviews, questionnaires, direct observation of building occupants, and measurement of physical attributes such as lighting and spatial provision, as well as the analysis of data. The final application phase presents the results and recommends actions to be taken (Green & Moss, 1998; Preiser, 1995; Preiser, 2001;).

There are also three types of post occupancy evaluations – indicative; investigative, and diagnostic. Indicative POEs raise awareness of issues in building performance by way of a quick walk-through evaluations and interviews with knowledgeable personnel; investigative POEs utilize interviews, questionnaires, field studies, and measurements of a number of buildings of the same type to thoroughly understand the causes and effects of building performance; and diagnostic POEs are the most time-consuming of the three types, using sophisticated data gathering and analysis techniques to create new knowledge about aspects of building performance (Preiser, 1995; Preiser, 2001; Turpin-Brooks & Viccars, 2006).

Post occupancy evaluations provide many benefits to the stakeholders in buildings, who include investors, owners, operators, designers, contractors, maintenance personnel, and users or occupants (Federal Facilities Council, 2001). Jaunzens et al (2002) examines potential benefits to clients, end users, facilities managers, and project team (designers) from POE studies. The evaluation benchmarks building performance and suggest ways to improve environmental conditions and reduce costs for clients. Benefits for end users include ensuring that the working environment is satisfactory and supportive, and allows them to voice their concerns. Facilities managers are able to become aware of likely problem areas and prioritize funding and spatial use because of POE studies, and designers will be able to gain feedback in order to develop better and smoother design processes in the future (Jaunzens et al, 2002).

Although this study does not examine entire buildings or conference centers, the model of post occupancy evaluation can still be applied here in learning how an interpretation booth performs and how satisfied interpreters are with the built environment. It is hoped that this process not only benefits interpreters, but also conference hall operators, conference organizers, designers and architects, conference speakers and audience members, and the entire conference industry in Taiwan.

2.8 Summary and Research Questions of this Study

This chapter has reviewed many of the characteristics of standards and standardization. It is clear that, when applied to interpreter's booths, standards are used for creating working environments of a certain quality, in order to ensure the optimum quality of conference interpretation.

As stipulated in ISO 2603 and discussed in various articles, many factors are involved in ensuring the quality of interpretation booths, such as booth size, visibility, ventilation, lighting, acoustics, seating, and working surface. Chapter 3 describes this study's methods in gathering data regarding existing booth conditions, the needs of interpreters with regard to booths, and the importance of various booth factors as determined by interpreters. The methods of post occupancy evaluation provide a useful guideline in which to assess user satisfaction with the built environment. Another interesting issue worth investigating is the different interests of various parties involved in the booth, namely, the standardizers who establish the standards, the client who commissions the building of the conference center, the architect responsible for the design, the interpreters who use the booth, and the audience who receive the interpretation conducted within the booth. However, this issue is not directly related to the present study, and will only be touched upon.