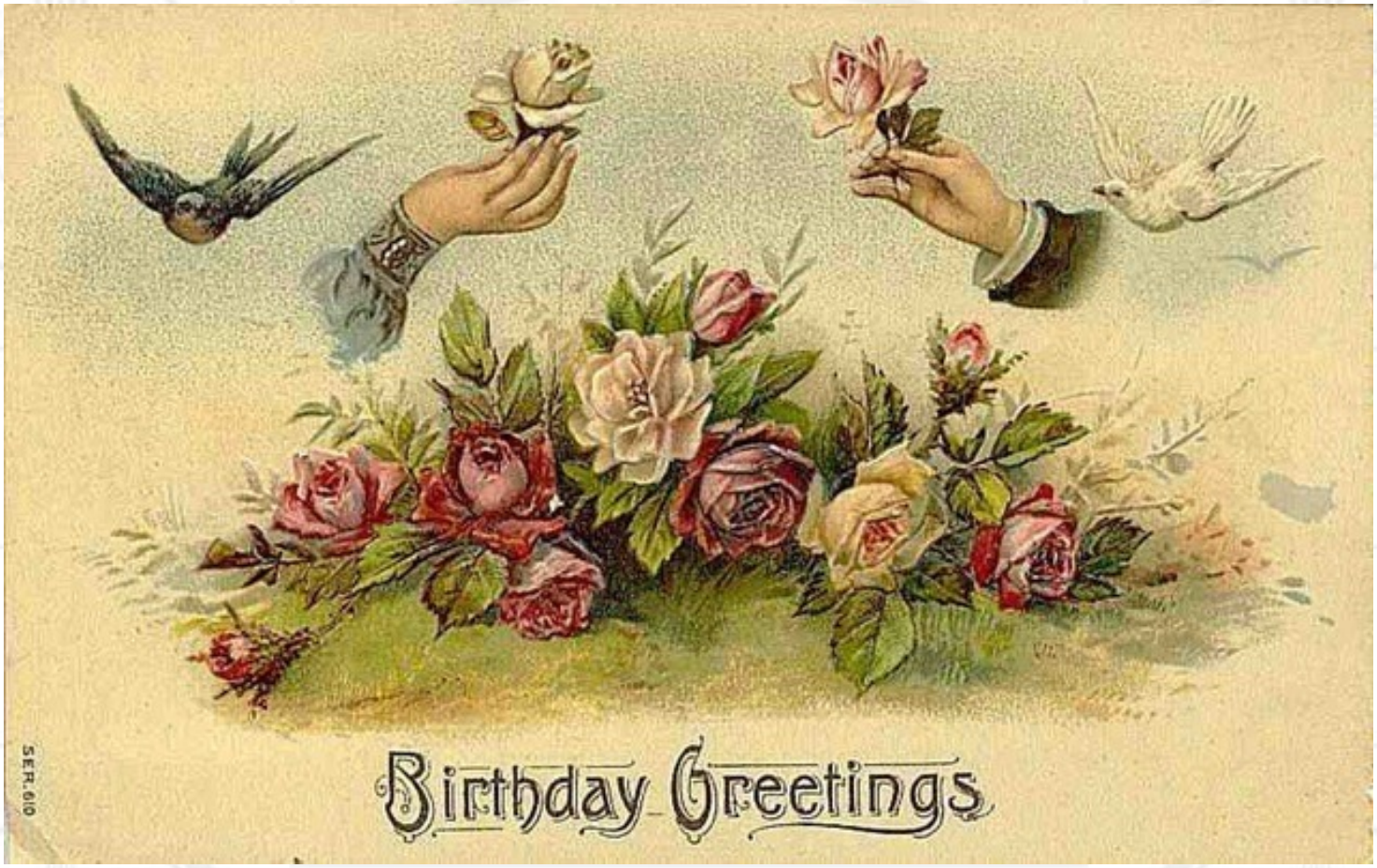
The Media Streaming Journal

May 2016



Covering Audio and Video Internet Broadcasting

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Welcome to The Media Streaming Journal

Greetings,

With this edition, we celebrate one year of circulation around the world. What started as a small concept blossomed into a full-fledged reality.

I would like to thank everyone that has made this a reality and a continued success. Without all the support and feedback, none of this would have ever been possible.

Please feel free to contact either the Publication Director (Derek Bullard) or myself if you have any questions or comments regarding The Media Streaming Journal.

Namaste

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The Grand Master of Digital Disaster
(Editor In Chief)

The Media Streaming Journal

What is in this edition of the Media Streaming Journal

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The Trending Web

Information is an infinite commodity that has a critical role in any business. It is important to have complete access, determine the relative importance and assess the meaning of that information. This will allow you fully integrate that information into your overall planning.

Google Trends

https://www.google.com/trends/ http://www.google.com/trends/hottrends

Youtube Trends

https://www.youtube.com/trendsdashboard

Twitter trends

http://trendsmap.com/ https://twitter.com/search-advanced

Google Plus trends

https://plus.google.com/explore

Tumblr trends

https://www.tumblr.com/explore/trending

Reddit trends

http://redditmetrics.com/

Real-time social media search and analysis

http://www.socialmention.com/

Estimate web traffic trends

http://www.alexa.com/siteinfo

Competitive website intelligence

https://www.semrush.com

Get traffic insight between websites

https://www.similarweb.com/

Listening Around The Web

The diversity of the Internet allows people from all around the world to share their love and interest of music. Unfortunately, many eclectic stations have been forced closed due to the recent increase in the United States streaming royalty rates. Gem Radio has managed to shine on despite these turbulent times. You can continue to enjoy the one hit wonders that made the era of New Wave a fond memory. Gem Radio broadcasts from Europe and continues to expand its amazing collection of music from that golden era of oddly delightful music.

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Understand Video Codecs Comparisons

Understanding the characteristics used in assessing video codec comparisons allows people to select the best codec for the job.

There are several characteristics that are used in the overall asssment process.

Video quality per bitrate (or range of bitrates). Commonly video quality is considered the main characteristic of codec comparisons. Video quality comparisons can be subjective or objective.

Performance characteristics such as compression/decompression speed, supported profiles/options, supported resolutions, supported rate control strategies, etc.

General software characteristics

- Manufacturer
- Supported OS (Linux, Mac OS, Windows)
- Version number
- Date of release
- Type of license (commercial, free, open source)
- Supported interfaces (VfW, DirectShow, etc.)
- Price (value for money, volume discounts, etc.)

Video quality

The quality the codec can achieve is heavily based on the compression format the codec uses. A codec is not a format, and there may be multiple codecs that implement the same compression specification – for example, MPEG-1 codecs typically do not achieve quality/size ratio comparable to codecs that implement the more modern H.264 specification. But quality/size ratio of output produced by different implementations of the same specification can also vary.

Each compression specification defines various mechanisms by which raw video (in essence, a sequence of full-resolution uncompressed digital images) can be reduced in size, from simple bit compression (like Lempel-Ziv-Welch) to psycho-visual and motion summarization, and how the output is stored as a bit stream. So long as the encoder component of the codec adheres to the specification it can choose any combination of these methods to apply different parts of the content. The decoder component of a codec that also conforms to the specification recognizes each of the mechanisms used, and thus interprets the compressed stream to render it back into raw video for display (although this will not be identical to the raw video input unless the compression was lossless). Each encoder implements the specification according to its own algorithms and parameters, which means that the compressed output of different codecs will vary, resulting in variations in quality and efficiency between them.

Prior to comparing codec video-quality, it is important to understand that every codec can give a varying degree of quality for a given set of frames within a video sequence. Numerous factors play a role in this variability. First, all codecs have a bitrate control mechanism that is responsible for determining the bitrate and quality on a per-frame basis. A difference between variable bitrate (VBR) and constant bitrate (CBR) creates a trade-off between a consistent quality over all frames, on the one hand, and a more constant bitrate, which is required for some applications, on the other. Second, some codecs differentiate between different types of frames, such as key frames and non-key frames, differing in their importance to overall visual quality and the extent to which they can be compressed. Third, quality depends on prefiltrations, which are included on all present-day codecs. Other factors may also come into play.

For a sufficiently long clip, it is possible to select sequences that have suffered little from the compression, and sequences that have suffered heavily, especially if CBR has been used, whereby the quality between frames can vary highly due to different amounts of compression needed to achieve a constant bitrate. So, in a given long clip, such as a full-length movie, any two codecs may perform quite differently on a particular sequence from the clip, while the codecs may be approximately equal (or the situation reversed) in quality over a wider sequence of frames. Press-releases and amateur forums

sometimes select sequences known to favor a particular codec or style of rate-control in reviews.

Objective video quality

Objective video evaluation techniques are mathematical models that seek to predict human judgments of picture quality, as often exemplified by the results of subjective quality assessment experiments. They are based on criteria and metrics that can be measured objectively and automatically evaluated by a computer program. Objective methods are classified based on the availability of an original pristine video signal, which is considered to be of high quality (generally not compressed). Therefore, they can be classified as:

- Full reference methods (FR), where the whole original video signal is available

- Reduced reference methods (RR), where only partial information of the original video is available, and

- No-reference methods (NR), where the original video is not available at all.

Subjective video quality

This is concerned with how video is perceived by a viewer, and designates his or her opinion on a particular video sequence. Subjective video quality tests are quite expensive with regard to time (preparation and running) and human resources.

There are many ways of showing video sequences to experts and recording their opinions. A few of them have been standardized, mainly in ITU-R Recommendation BT.500-13 and ITU-T Recommendation P.910.

The reason for measuring subjective video quality is the same as for measuring the Mean Opinion Score for audio. Opinions of experts can be averaged, and the average mark is usually given with confidence interval. Additional procedures can be used for averaging. For example, experts who give unstable results may be rejected (for instance, if their correlation with average opinion is low).

In case of video codecs, this is a very common situation. When codecs with similar objective results show results with different subjective results, the main reasons can be:

Pre- and postfilters are widely used in codecs. Codecs often use prefilters such as video denoising, deflicking, deshaking, etc. Denoising and deflicking normally maintain PSNR value while increasing visual quality (the best slow denoising filters also increase PSNR on medium and high bitrates). Deshaking greatly decreases PSNR, but increases visual quality. Postfilters show similar characteristics — deblocking and deringing maintain PSNR, but increase quality; graining (suggested in H.264) essentially increases video quality, especially on big plasma screens, but decreases PSNR. All filters increase compression/decompression time, so they enhance visual quality but decrease the speed of coding and decoding.

Motion estimation (ME) search strategy can also cause different visual quality for the same PSNR. So-called true motion search commonly will not reach minimum sum of absolute differences (SAD) values in codec ME, but may result in better visual quality. Such methods also require more compression time.

Rate control strategy. VBR commonly cause better visual quality marks than CBR for the same average PSNR values for sequences.

It is difficult to use long sequences for subjective testing. Commonly, three or four ten-second sequences are used, while full movies are used for objective metrics. Sequence selection is important — those sequences that are similar to the ones used by developers to tune their codecs are more competitive.

Performance comparison

Speed comparison

Number of frames per second (FPS) commonly used for compression/decompression speed measurement.

The following issues should be considered when estimating probable codec performance differences:

Decompression (sometimes compression) frame time uniformity - Big differences in this value can cause annoyingly jerky playback.

SIMD support by processor and codec - E.g., MMX, SSE, SSE2, each of which change CPU performance on some kinds of tasks (often including those with which codecs are concerned).

Multi-threading support by processor and codec – Sometimes turning on Hyper-threading support (if available on a particular CPU) causes codec speed to decrease)

RAM speed – generally important for most codec implementations

Processor cache size – low values sometimes cause serious speed degradation, e.g. for CPUs with low cache such as several of the Intel Celeron series.

GPU usage by codec - some codecs can drastically increase their performance by taking advantage of GPU resources.

So, for example, codec A (being optimized for memory usage – i.e., uses less memory) may, on modern computers (which are typically not memory-limited), give slower performance than codec B. Meanwhile, the same pair of codecs may give opposite results if running on an older computer with reduced memory (or cache) resources.

Profiles support

Modern standards define a wide range of features and require very substantial software or hardware efforts and resources for their implementation. Only selected profiles of a standard are typically supported in any particular product. (This is very common for H.264 implementations for example.)

The H.264 standard includes the following seven sets of capabilities, which are referred to as profiles, targeting specific classes of applications:

Baseline Profile (BP): Primarily for lower-cost applications with limited computing resources, this profile is used widely in videoconferencing and mobile applications.

Main Profile (MP): Originally intended as the mainstream consumer profile for broadcast and storage applications, the importance of this profile faded when the High profile (HiP) was developed for those applications.

Extended Profile (XP): Intended as the streaming video profile, this profile has relatively high compression capability and some extra tricks for robustness to data losses and server stream switching.

High Profile (HiP): The primary profile for broadcast and disc storage applications, particularly for high-definition television applications. (This is the profile adopted into HD DVD and Blu-ray Disc, for example.)

High 10 Profile (Hi10P): Going beyond today's mainstream consumer product capabilities, this profile builds on top of the High Profile, adding support for up to 10 bits per sample of decoded picture precision.

High 4:2:2 Profile (Hi422P): Primarily targeting professional applications that use interlaced video, this profile builds on top of the High 10 Profile, adding support for the 4:2:2 chroma sampling format while using up to 10 bits per sample of decoded picture precision.

High 4:4:4 Predictive Profile (Hi444PP): This profile builds on top of the High 4:2:2 Profile, supporting up to 4:4:4 chroma sampling, up to 14 bits per sample, and additionally supporting efficient lossless region

coding and the coding of each picture as three separate color planes.

Multiview High Profile: This profile supports two or more views using both inter-picture (temporal) and MVC inter-view prediction, but does not support field pictures and macroblock-adaptive frame-field coding.

The standard also contains four additional all-Intra profiles, which are defined as simple subsets of other corresponding profiles. These are mostly for professional (e.g., camera and editing system) applications:

- High 10 Intra Profile: The High 10 Profile constrained to all-Intra use.

- High 4:2:2 Intra Profile: The High 4:2:2 Profile constrained to all-Intra use.

- High 4:4:4 Intra Profile: The High 4:4:4 Profile constrained to all-Intra use.

- CAVLC 4:4:4 Intra Profile: The High 4:4:4 Profile constrained to all-Intra use and to CAVLC entropy coding (i.e., not supporting CABAC).

Moreover, the standard now also contains three Scalable Video Coding profiles.

- Scalable Baseline Profile: A scalable extension of the Baseline profile.

- Scalable High Profile: A scalable extension of the High profile.

- Scalable High Intra Profile: The Scalable High Profile constrained to all-Intra use.

An accurate comparison of codecs must take the profile variations within each codec into account.

Supported rate control strategies

Videoc odecs rate control strategies can be classified as:

Variable Bitrate (VBR) is a strategy to maximize the visual video quality and minimize the bitrate. On fast-motion scenes, a variable bitrate uses more bits than it does on slow-motion scenes of similar duration, yet achieves a consistent visual quality. VBR is commonly used for video CD/DVD creation and video in programs.

Constant Bitrate (CBR) is used when the available bandwidth is fixed. There is no bitrate fluctuation. This is typically used for real-time and non-buffered video streaming e.g. in videoconferencing, satellite and cable broadcasting.

https://en.wikipedia.org/wiki/Comparison_of_video_codecs

What Is Your Target Market

A target market is a select group of potential or current consumers, which a business decides to aim its marketing and advertising strategies at in order to sell a product or service. Defining a ‘target market’ is the first stage in the marketing strategy of a business, and is a process of market segmentation. Market segmentation can be defined as the division of a market into its select groups, based on a variety of factors such as needs, characteristics and behaviors, so that the application of the marketing mix can be appropriate to the individual. Segmentation of the market gives a business the ability to define its target market for its product or service, and effectively apply the marketing mix to achieve the desired results.

A target market is a common tool utilized by many marketers and business to determine the set of customers they intend to focus on and serve their marketing messages to. A target market is defined by the Oxford Dictionary as “A particular group of consumers at which a product or service is aimed” (Oxford Dictionary, 2016). A target market is determined and defined by the goals set out in the marketing plan. From the marketing plan the marketer can establish the appropriate target audience necessary to successfully complete effective marketing communications (Percy, Rossiter, & Elliott, 2001, p. 65). Distinguishing the target market is a key decision for any businesses as it is the group of individuals whom the marketing is tailored for. Once a business has determined their target market an offering can be designed to satisfy the particular needs and wants of the particular audience (Hoyer, Macinnis, & Pieters, 2013, p. 7). The target audience is often segregated by factors such as demographic and psychographic differences. The audience within these target segments can have different regional, ethnic, lifestyle, and monetary and religious requirements. Tailoring the offering to a target market allows the marketer to effectively satisfy the particular needs and wants of the consumers within this audience (Hoyer, Macinnis, & Pieters, 2013, p. 13).

The marketing mix is the combination of what are commonly called the ‘4 P’s’. These are price, place (distribution), product and promotion, in no particular order. The target market, defined by the market segmentation, requires a unique set of the 4 P’s to have the product or service effectively and efficiently marketed to it. For example, the marketing of a new women's perfume would require the segmentation of the market to be focusing almost exclusively on the female portion of the market, but would also have to consider the 4 P’s before it was determined. In the terms of perfume, this may include what price bracket the product was to be aimed at, where the product was to be sold, the quality and aroma of the product and how it was to be promoted. With all these considered, the product can be efficiently marketed. Therefore, the combination of the target market with the marketing mix is crucial to the success of the product or service.

Determining the Target Audience

A business must identify and understand its target audience if their marketing campaign is to be successful. It allows the business to craft their products or services to the wants and needs of customers, in order to maximize sales and therefore revenue. A successful marketing campaign connects with consumers on a personal level, which will help the business to develop long-term relationships with customers (Sherlock, 2014).

Not all consumers are the same; so determining the target audience is key to reaching the loyal and high profit customers and help ensure a return on investment (Cahill, 1997, p. 10-11). To effectively determine the brands target audience, marketing managers should consider the three main general aspects of target audience grouping, Demographics, Psychographics and consumer lifestyle (Percy, Rossiter, & Elliott, 2001, p. 65).

To determine the target audience, the business must first identify what problem their product or service solves, or what need or want it fulfills (Sherlock, 2014). The problem must be one that consumers are aware of and thus will be interested in pursuing a solution. For example, a problem could be a lack of cheap air-conditioning units on the market. If a business enters the air-conditioning unit market selling their units at a low price, consumers who couldn’t afford the other air-conditioning units will see this as a solution to the problem, and will purchase the new units. The problem that the business solves can be identified by searching for similar business’ or business ideas. If the search is unsuccessful, then there remains to be a problem that the business can solve (Sherlock, 2014).

The business must determine what kind of people are facing the problem they identified. This is based on consumer demographic, psychographic, geographic information and behavior (Sherlock, 2014).

Demographic Information

Demographic information involves statistical aspects of consumers such as gender, ethnicity, income, qualification and marital status (Sharma 2015). Demographic information is important to the business because it gives a basic background of the customers the business is intending to aim its marketing campaign at. This helps them to judge on a basic level how to communicate effectively with who they have identified as the target audience. Demographics are key because they provide the foundation of who the business will be targeting (Sherlock, 2014). Demographics is statistical information that does not require in-depth analysis to provide an answer, thus a business would use quantitative methods of data collection. This method will provide a statistical approach to identifying the target audience.

Psychographic Information

Psychographics is the use of sociological, psychological and anthropological factors, as well as consumer behavior, style of living and self-concept to determine how different market segment groups make decisions about a philosophy, person or product (Weinstein, 2014). Psychographic information can be utilized by the business to gain a deeper understanding of the consumer groups they intend to target, by analyzing the more intimate details of the consumer's lifestyle and thinking processes so as to gain understanding of their preferences. Things like finances, interests, hobbies and lifestyle will all be filtered by the business to create a target audience that will in theory be open to the product and will connect with the business through a marketing campaign aimed at them (Dowhan, 2013).

Behavioral Information

Consumer behavior is the purchase decision process, what influences their purchase decision, what purposes they use the purchased good for, and their responses and attitudes to the product (Cheng et al, 2015). Cheng et al explains that consumer's behavior is affected by messages sent by the business, which in turn affects their attitudes towards brands and products, and ultimately what products they choose to purchase (Cheng et al, 2015). When determining their target audience, a business must examine consumer behavior trends. Behavioral trends could include online purchasing instead of in-store purchasing, or modern consumers purchasing a new smartphone annually. They should then select a segment of consumers whose behavior aligns with the functionality and purpose of the product to be the intended audience for a marketing campaign. Target consumers can be identified by businesses as they will indicate that there is a demand for the product by their behavioral signals (Dowhan, 2013). Their interests, hobbies and past purchase activity provides a platform on which the business can base their marketing campaign (Dowhan, 2013).

Geographic Information

Geographic information is essentially where the customer is located, and is vital to the business when they are determining their target audience. This is because customers located in different geographic areas are going to encounter different things that influence their purchase decisions (Kahie, 1986). These can be any number of things, including resources, cultures and climates, which can cause their behavior, psychographic information and influences to differ with those who are in same demographic but are geographically distant (Kahie, 1986). For example, a city or area with a heavy drinking culture will encounter high liquor sales, whereas a city or area with a minimal drinking culture will experience low liquor sales. Each country has consumers of the same demographic, but due to the cultural influence of the geographical area, their purchase decisions are different.

A basic example of a consumer profile is: males aged 35–40 who live in the U.S.A and have a university level education (demographic), are a sociable extrovert from a top-middle economic class and live an active lifestyle (psychographic), lives in Nashville, Tennessee (geographic) and makes small and frequent purchases without considering the product's brand (behavioral). This profile will allow the business to tailor their marketing campaign to attract specific consumers.

There are several methods of demographic, psychographic, geographic and behavioral data collection.

There are also quantitative methods of data collection, being statistical processes such as surveys and questionnaires, and qualitative methods, being in-depth approaches such as focus groups or comprehensive interviews (Dudley et al. 2014). The different aspects of consumers are all essential to a business when it is planning a marketing campaign, as the information that the business gathers will determine what the most profitable target market for the campaign is, and how to reach this market.

The business must also look to their competitors to see what processes they are currently taking to try and solve the problem, and which consumers they are targeting (Sherlock, 2014). This will allow the business to get an idea of the type of consumer they will be targeting, and what the best way is to communicate with this type of consumer. This information can be used to allow the business to differentiate slightly from the competition in order to give them a competitive advantage once the marketing campaign begins.

Once the target audience has been identified, the business must then create content for the campaign that will resonate and effectively communicate with the consumer (Sherlock, 2014). Tracie Sherlock emphasizes that the level of content with which the business will be reaching the consumer should be of high quality, as 92% of marketers specify that high level content is valuable for a campaign (Sherlock, 2014). This high level of content well help consumers to connect on a more personal level with the business, and contribute to a successful communication process from the business to the target audience and then feedback from the target audience to the business.

Once the business has gathered data from consumers about their demographic, psychographic, geographic and behavioral situations, they can analyze this and use it to identify a rough target audience. This can be refined by the analysis of competitor’s processes and targets, allowing the business to formulate a more segmented target audience. Then the segmented target audience can be refined into a clear objective of which consumers the business is targeting, thus creating the specific target audience for a marketing campaign.

Lifestyle

A lifestyle is defined as “a persons pattern of behavior” which is closely related to consumer’s personality and values (Hoyer, Macinnis, & Pieters, 2013, p. 401). The lifestyle of a customer is often determined by the consumers purchasing behavior and product preference (Lin, 2002, p. 250). This gives marketers an understanding of what type of lifestyle consumers live. A lifestyle is defined with three main sections, activities, interests and opinions (AIO). If a marketer can conduct lifestyle research through previous purchasing behavior it gives an excellent understanding of AIO’s enabling target audiences to be effectively determined (Hoyer, Macinnis, & Pieters, 2013, p. 401-403). An example is if a consumer purchases a set of fishing gear online, it is safe to assume that marketer can place

Target Audience vs. Target Market

Two key marketing terms include target audience and target market. Distinguishing the correct target market(s) and defining your target audience is a crucial step when owning a business. Although both are very similar, it is essential to understand the key differences between the two.

A target audience is generally associated with a business's marketing message, which usually highlights key advantages and benefits of a business's product or service. A target audience usually consist of “company employees, society as a whole, media officials, or a variety of other groups” (Tambien, E., n.d.). Tom Duncan the author of “The Principles of Advertising and IMC,” and founder of the Integrated Marketing Communication (IMC) graduate program at the University of Colorado, defines target audience as “a group that has significant potential to respond positively to a brand message” (Northwestern University., n.d.) (Duncan, T., 2005). This 'group' being the intended audience is usually targeted through particular marketing communication channels such as advertising, which then aims to create a positive interaction towards the brand (Tyson, R., 2014). If this is successful, the audience will play a huge roll in influencing other potential customer's to purchase the product or service. A good example of this is when a child is positively reached through a communication channel such as a TV advertisement for toys, the child then shares this information to the target market (being the parent in this case) who will then be influenced to go purchase the toy. The target audience can often be confused with the target market, which is targeted at potential buyers.

A target market is a selected group of consumers, who share common needs or characteristics. Often these characteristics can be segmented into four different marketing groups being geographic, demographic, psychographic or behavioral (Kotler, P., Burton, S., Deans, K., Brown, L., & Armstrong, G., 2013). Once a company has defined their target market they will aim their products, services and marketing activities towards these consumers in a way that will hopefully persuade them to purchase the product or service (Kotler, et al., 2013). The impact of this will result in either a gratifying or deficient marketing strategy.

Strategies For Reaching Target Audiences

Reaching a target audience is a staged process, started by the selection of the sector of the target market. A successful appeal to a target audience requires a detailed media plan, which involves many factors in order to achieve an effective campaign.

The use of media is what differentiates target markets from target audiences. While target markets are marketed to with business strategies, the use of advertising and other media tools is what makes marketing to target audiences a more effective way of appealing to a select group of individuals. The effectiveness of a target audience campaign is dependent on how well the company knows their market; this can include things such as behaviors, incentives, cultural differences and societal expectations. Failure to identify these trends can lead to campaigns being targeted at the wrong audiences, and ultimately a loss of money or no change at all. An example of this type of failure was Chef Boyardee, who planned a campaign to appeal to teenage boys, who were the largest consumers of their product. What they had not considered however was that the purchasers of their goods may be different from the consumers, which was the case, as mothers were the leading purchasers, even though their boys were consuming the product. Factors like these are things that are considered at a more in-depth level with a detailed media plan, one that cannot be found in a simpler target market strategy. Following through a media plan requires attention at every stage, and requires a range of factors to be considered. In order, these include:

1.Targets

2. Media Types

3. Media Tactics

4. Media Vehicles

5. Media Units

6. Media Schedule

7. Media Promotions

8. Media Logistics

9. Contingency Plans

10. Calendar

11. Budget and Integrated Marketing

Each of these sections goes into even more detail, such as media units, which includes such minute details as the length of a broadcast commercial or the size of a print advertisement.

A thoroughly followed, planned and implemented media plan is required to achieve outright success in a campaign. Therefore ignoring any of the factors can lead to a mis-communication with consumers and ultimately a failure to fully reach the whole target audience effectively.

Effective marketing consists of identifying the appropriate target audience, and being able to appoint the correct marketing strategy in order to reach and influence them. Four key targeting strategies largely used within businesses are; undifferentiated (mass) marketing, differentiated (segmented) marketing, concentrated (niche) marketing, and lastly micro (local or individual) marketing (Kotler, et al., 2013).

Undifferentiated (mass) marketing is a strategy used to capture a whole audience, rather than focusing on the differences in segmented markets. A business will typically design one product line and focus on what consumer demands are most frequent, in order to create a marketing program that will appeal to the greatest amount of purchases. This strategy commonly uses mass distribution and advertising to help create an admirable product and is possibly one of the most cost effective. The narrow product line,

undifferentiated advertising program and absence of segmented market research and planning, all contribute to keeping the costs down. Many do not believe in this strategy, due to the high amount of competition and the difficulty in creating a product that satisfies a majority of consumers (Kotler, et al., 2013).

Differentiated (segmented) marketing strategy is when a business chooses to target multiple segments of the audience, by creating a different variations of its product for each. An example of this is V energy drinks who offer a large range of products including; V regular, V sugar free, V zero, V double espresso (V-Energy.,n.d.). Typically when using this marketing strategy, recognition of the company is widened and repeat purchasing is strengthened, with customers gaining products that are more tailored to their needs. This strategy unfortunately is not cost effective and involves a lot of research and development, as well as a whole range of promotion that is unique to each specific product. Although, this strategy often has more sales than those who use a undifferentiated marketing strategy. When considering this strategy one must consider the increased sales against the increased cost (Kotler, et al., 2013).

Concentrated (niche) marketing is a “market coverage strategy in which a company goes after a large share of one or a few sub-markets (Kotler, et al., 2013).” This strategy enables companies to create a strong market position without mass production, distribution or advertising. This strategy is usually beneficial as it does not involve a lot of competition. A business is able to gain greater knowledge of their distinct segment, as they are more focused on the segmentation needs and reputation that it acquires. Many businesses using this strategy are now turning to the web to set up their shop, not only because it is cost effective but allows them to become more recognizable (Kotler, et al., 2013).

Micro-marketing strategy (local or individual) targets very narrowly compared to a undifferentiated marketing strategy. Generally a business using this strategy will adjust its product, and marketing program to fit the needs of different market segments and niches. A good example of this is shown in the real-estate industry who’s goal is often to determine what type of house the client is looking for. Micro-marketing includes both local and individual marketing. Often this strategy can be costly, due to the customization and shortage of an economy of scale (Kotler, et al., 2013).

Local marketing is “tailoring brands and promotions to the needs and wants of the local customer groups, cities, neighborhoods and even specific stores (Kotler, et al., 2013).” This type of marketing does have difficulties especially when it comes to manufacturing and marketing costs, meeting the mixed requirements for each market location and brand image familiarity. New developing technologies and fragmented markets regularly exceed these obstacles (Kotler, et al., 2013).

Individual marketing refers to accommodating merchandise and marketing programs, to the desired demands of individual customers. An example of this is Coca-Cola who enables customers to personalize their coke cans by being able to print their name or choice of text onto the can packaging (Coca-cola., n.d.). Despite the extra costs for the business, allowing customer to design and create a product they desire to suit their own needs, can create value and loyalty towards the business. It is also a way the business can stand out against it's competitors (Kotler, et al., 2013).

Strategies for reaching target markets

Marketers have outlined four basic strategies to satisfy target markets: undifferentiated marketing or mass marketing, differentiated marketing, concentrated marketing, and micro marketing/ niche marketing.

Mass marketing is a market coverage strategy in which a firm decides to ignore market segment differences and go after the whole market with one offer. It is type of marketing (or attempting to sell through persuasion) of a product to a wide audience. The idea is to broadcast a message that will reach the largest number of people possible. Traditionally mass marketing has focused on radio, television and newspapers as the medium used to reach this broad audience.

For sales teams, one way to reach out to target markets is through direct marketing. This is done by buying consumer database based on the segmentation profiles you have defined. These database usually comes with consumer contacts (e.g. email, mobile no., home no., etc.). Caution is recommended when undertaking direct marketing efforts - check the targeted country's direct marketing laws.

Target audiences are formed from different groups, for example: adults, teens, children, mid-teens, preschoolers, men, women.

To market to any given audience effectively, it is essential to become familiar with your target market; their habits, behaviors, likes, and dislikes. Markets differ in size, assortment, geographic scale, locality, types of communities, and in the different types of merchandise sold. Because of the many variations included in a market it is essential, since you cannot accommodate everyone's preferences, to know exactly who you are marketing to.

To better become acquainted with the ins and outs of your designated target market legend, a market analysis must be completed. A market analysis is a documented examination of a market that is used to enlighten a business's preparation activities surrounding decisions of inventory, purchase, workforce expansion/contraction, facility expansion, purchases of capital equipment, promotional activities, improvement of daily operations and many other aspects.

Strategic plan & Segmentation: For all marketing organizations undertaking a strategic plan need to use target marketing as a key decision area, (Dibb & Simkin 1998). Target marketing is also part of the segmentation process, where groups who share the same needs and wants are segmented into specific categories. According to Dibb and Simkin, (1998) the final process of target marketing is the design of marketing mix Programme. The marketing mix tools are made up of four broad groups known as the 4 Ps, product, price, place, and promotion, (Kotler et al., 2014). The use of the marketing mix Programme will provide sufficient data and knowledge to enforce appropriate marketing strategies to reach the specific target audience. Target marketing strategy can be segmentation: Market segmentation demonstrates dividing the market into distinct groups that may require different products or services (Kotler et al., 2014). Using the strategy of market segmentation can allow the marketer to have sufficient knowledge of the consumer characteristics. Knowledge of consumer's demographic, geographic, psychographic and behavioral variables can enable relevant marketing processes to reach the target audience directly. These distinct groups are four main markets such as geographic, demographic, psychographic and behavioral…

Geographic Geographic segmentation is the market appealing to particular geographic areas such as, nations, regions, countries, cities or neighborhoods (Kotler et al., 2014). Particular knowledge of geographic preferences allows businesses and organizations to modify or change their product to allocate to their market, (Kotler et al., 2014).

Demographic sgmentation attempts to divide the market into demographic field such as age, life cycle, gender, income, occupation, education, religion, and nationality, (Kotler et al., 2014). Some companies offer different products and market strategies to allocate to various age and life cycles, other companies focus on specific age of life cycle groups. Kotler et al., (2014) states an example, Disney cruise lines primarily focus on families with children large or small, and most destinations offer children and parent orientated activities. This shows that the Disney cruise line company has a specific segment of their target market being families with children.

Psychographic Segments customers into different variables based on social class, lifestyle, or personality characteristics, (Kotler et al., 2014). According to Kotler et al., (2014) people who in the same demographic area can have completely different psychographic characteristics. Marketers generally segment target markets into consumer lifestyles and their social class. In terms social class segment category, marketers are aware that the type of social class has a large effect on preferences for cars, clothes, home furnishings, leisure activities, reading habits, and retailers, (Kotler et al., 2014).

Behavioral Consumers are dividing by their knowledge, attitude, and use or response of the product, (Kotler et al., 2014). Marketer can group buyers according to the occasion when they made the purchase or use of the product. For example Kotler et al., (2014) suggests that air travel is generated by occasions relative to business, vacation, or family. Another way marketers can group buyers using behavioral variables is user status and usage rate. They can be segmented into nonusers, former users, potential users, first-time users and regular users of a product, (Kotler et al., 2014). Usage rate is the segmentation into light, medium and heavy product users. According to Kotler, et al, (2014) heavy product users are usually a small percentage of the market but account for a high percentage of total consumption. Loyalty status can prove to be very significant to a marketer's product or service. Kotler et

al., (2014) expresses, a reason for increasing customer loyalty is that “loyal customers are pricing insensitive compared to brand-shifting patrons.”

Marketing Mix: To understand the effects on marketing on audience improvement the basic marketing principles need to be outlined, and examine the correct role that marketing strategies can influence a process of building a target audience. According to, Galvin, (1998) marketing is considered to be as simple as selling or promoting a product or service (a client, customer or consumer) who is in need of the distinct product. The process of planning and executing the conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual customer and organisations, (Galvin, 1998). As well as segmentation, the marketing mix is also a significantly important marketing strategy to pinpoint the target audience and further market appropriately to that specific audience. The marketing mix involves a process of designing the packaging, pricing of the product, distributing of the product, and promotion or communicating about the product, (Galvin, 1998) these processes are known as the 4 P’s. The market strategy and the marketing mix allow room to create value for customers and build profitable customer relationships (Kotler et al., 2014). These customer relationships can create an idea of exactly what target audience applies to the specific product, if few or more consumers have similar characteristics and purchase the product regularly for similar behavioral reasons therefore the target audience may fit within that category.

Direct Marketing: Direct marketing is targeting individual consumers to both obtain an immediate response and cultivate lasting consumer relationships, (Kotler et al., 2014). According to Evans, O’Malley and Patterson, (1995) the direct marketing industry has been the fastest growing sector of marketing communications. There are multiple forms of direct marketing such as direct mail, the telephone, direct-response television, e-mail, the Internet and other tools to connect with specific consumers, (Kotler et al., 2014). Evans, O’Malley and Patterson, (1995) state that as well as Kotler et al., (2014) they consider leaflet drops and samples to be a form of direct marketing also. Using these direct forms of communication customers of the product or service will receive personal, efficient and easy accessed information on the product. This could influence the customer to be more convinced to purchase the product or service. In this case, for strategies for reaching the target market this is arguably the most straightforward and direct process for reaching the appropriate target audience (Evans, O’Malley & Patterson, 1995).

Communication Strategies

The shift of communication strategies

In previous years marketing communications channels have undergone huge changes, shifting away from traditional mass-market type advertisements such as television and radio. This is due to advancements in technology and the Internet era developing brand new communication channels such as web advertising, social media and blogs (Bruhn, Schoenmueller, & Schäfer, 2012, p. 770-772). Many businesses such as Coca-Cola are engaging with their target audience through these modern media channels opening up a two way communication from brand to consumer and consumer to brand. This approach is generating the brands following, through social media vehicles, becoming an increasing source where consumers can find brand content and information. By increasing engagement with target audiences, businesses have the opportunity to increase brand equity through both traditional media and social media (Bruhn, Schoenmueller, & Schäfer, 2012, p. 781-782).

Traditional communication

Traditional media vehicles such as television, radio and press have been utilized by marketers for many years but has limitations when trying to reach an individual target audience. The advantage traditional media gives businesses, is the ability to reach a huge audience. This type of marketing is commonly known as mass marketing and account for 70% of media spending (Hoyer, Macinnis, & Pieters, 2013, p. 118-120). These media vehicles are better suited when a brand is attempting to stay relevant or build brand awareness due to the mass market it communicates with (Bruhn, Schoenmueller, & Schäfer, 2012, p. 781-782). Although traditional media is affective of generating brand awareness, in today’s market more and more consumers are engaging in online behaviour where they are engaging in more than one media channel at a time. Traditional media cannot target this consumer effectively where an Omni-channel marketing approach is needed (Brynjolfsson, 2013). Traditional media is considered

expensive for smaller businesses with limited ability to market to the intended target audience, rather this mass marketing approach serves the message market wide with small indentation to the intended audience (Bruhn, Schoenmueller, & Schäfer, 2012, p. 781-782). To reach today's target audience effectively traditional media such as television advertisements must be implemented in an integrated marketing communications campaign rather than the sole media vehicle to deliver a brands message (Hoyer, Macinnis, & Pieters, 2013, p. 3-7)

Online Communications

Marketers can use online media to better reach their target audience. Once marketers understand the segments of their target market they can generate a marketing message suitable for the intended target audience. Communicating to consumers through tools such as web banners, social media and email, allow for direct targeting to the consumer. This serves up a custom message to a consumer, which is already engaged and interested in the offering. An example of this is remarketing, this allows for advertisers to see a consumer's web history, tracking them online to see exactly which websites they have visited. The marketer can then hit the same consumer with a related product from a previously visited website in an attempt to sell and advertise the product through web banners which was earlier turned down by the customer (Libert, Grande, & Asch, 2015).

Social media such as Twitter, Snapchat discover, YouTube and Facebook allow a two-way communication between the business and consumer, which cannot be achieved by traditional media. This communication benefits both the business utilizing social media as a tool and the consumer as they can build meaningful relationships with the business and other consumers, creating a community surrounding the brand. This community can provide new insights for the business, identifying problems and offer solutions through social interactions (Tsimonis & Dimitriadis, 2014, p. 328-330). When businesses have a successful social platform which generates an interactive community around the brand, it enables better relationship building which improves the brands image and consumer based brand equity (Bruhn, Schoenmueller, & Schäfer, 2012, p. 781-782).

The power of persuasion on the target audience

The role that social influence and persuasion play has a sizable emphasis on target audience, and how the message is developed into society. How these messages are conveyed to the target audience, plays a key role tailored to the target audience to trigger deep or shallow processing, from using the best path to persuasion. The target audience analysis process requires a tremendous amount of work, to identify the characteristics of the broad target audience, refining this audience on several dimensions. The specific conformity of the target audience to the desired supporting psychological operations objective is the product of assiduous work, mainly of the target audience analysis phase of influence process, this validates the importance of this role to the overall operation enabling decision makers, to gain substantial objectives in the information environment (Topolniski, 2013).

https://en.wikipedia.org/wiki/Target_audience

Not All Microphones Are The Same

Did you know that there is more than one type of microphone available for the capturing of audio? Now you can explore the mysterious aura that surrounds the audio microphone.

Microphones are referred to by their transducer principle, such as condenser, dynamic, etc., and by their directional characteristics. Sometimes other characteristics such as diaphragm size, intended use or orientation of the principal sound input to the principal axis (end- or side-address) of the microphone are used to describe the microphone.

Condenser microphone

The condenser microphone, invented at Bell Labs in 1916 by E. C. Wente, is also called a capacitor microphone or electrostatic microphone - capacitors were historically called condensers. Here, the diaphragm acts as one plate of a capacitor, and the vibrations produce changes in the distance between the plates. There are two types, depending on the method of extracting the audio signal from the transducer: DC-biased microphones, and radio frequency (RF) or high frequency (HF) condenser microphones. With a DC-biased microphone, the plates are biased with a fixed charge (Q). The voltage maintained across the capacitor plates changes with the vibrations in the air, according to the capacitance equation ($C = Q/V$), where Q = charge in coulombs, C = capacitance in farads and V = potential difference in volts. The capacitance of the plates is inversely proportional to the distance between them for a parallel-plate capacitor. The assembly of fixed and movable plates is called an "element" or "capsule".

A nearly constant charge is maintained on the capacitor. As the capacitance changes, the charge across the capacitor does change very slightly, but at audible frequencies it is sensibly constant. The capacitance of the capsule (around 5 to 100 pF) and the value of the bias resistor (100 MΩ to tens of GΩ) form a filter that is high-pass for the audio signal, and low-pass for the bias voltage. Note that the time constant of an RC circuit equals the product of the resistance and capacitance.

Within the time-frame of the capacitance change (as much as 50 ms at 20 Hz audio signal), the charge is practically constant and the voltage across the capacitor changes instantaneously to reflect the change in capacitance. The voltage across the capacitor varies above and below the bias voltage. The voltage difference between the bias and the capacitor is seen across the series resistor. The voltage across the resistor is amplified for performance or recording. In most cases, the electronics in the microphone itself contribute no voltage gain as the voltage differential is quite significant, up to several volts for high sound levels. Since this is a very high impedance circuit, current gain only is usually needed, with the voltage remaining constant.

RF condenser microphones use a comparatively low RF voltage, generated by a low-noise oscillator. The signal from the oscillator may either be amplitude modulated by the capacitance changes produced by the sound waves moving the capsule diaphragm, or the capsule may be part of a resonant circuit that modulates the frequency of the oscillator signal. Demodulation yields a low-noise audio frequency signal with a very low source impedance. The absence of a high bias voltage permits the use of a diaphragm with looser tension, which may be used to achieve wider frequency response due to higher compliance. The RF biasing process results in a lower electrical impedance capsule, a useful by-product of which is that RF condenser microphones can be operated in damp weather conditions that could create problems in DC-biased microphones with contaminated insulating surfaces. The Sennheiser "MKH" series of microphones use the RF biasing technique.

Condenser microphones span the range from telephone transmitters through inexpensive karaoke microphones to high-fidelity recording microphones. They generally produce a high-quality audio signal and are now the popular choice in laboratory and recording studio applications. The inherent suitability of this technology is due to the very small mass that must be moved by the incident sound wave, unlike other microphone types that require the sound wave to do more work. They require a power source, provided either via microphone inputs on equipment as phantom power or from a small battery. Power is necessary for establishing the capacitor plate voltage, and is also needed to power the microphone electronics (impedance conversion in the case of electret and DC-polarized microphones, demodulation or detection in the case of RF/HF microphones). Condenser microphones are also available with two

diaphragms that can be electrically connected to provide a range of polar patterns (see below), such as cardioid, omnidirectional, and figure-eight. It is also possible to vary the pattern continuously with some microphones, for example the Røde NT2000 or CAD M179.

A valve microphone is a condenser microphone that uses a vacuum tube (valve) amplifier. They remain popular with enthusiasts of tube sound.

Electret condenser microphone

An electret microphone is a type of capacitor microphone invented by Gerhard Sessler and Jim West at Bell laboratories in 1962. The externally applied charge described above under condenser microphones is replaced by a permanent charge in an electret material. An electret is a ferroelectric material that has been permanently electrically charged or polarized. The name comes from electrostatic and magnet; a static charge is embedded in an electret by alignment of the static charges in the material, much the way a magnet is made by aligning the magnetic domains in a piece of iron.

Due to their good performance and ease of manufacture, hence low cost, the vast majority of microphones made today are electret microphones; a semiconductor manufacturer estimates annual production at over one billion units. Nearly all cell-phone, computer, PDA and headset microphones are electret types. They are used in many applications, from high-quality recording and lavalier use to built-in microphones in small sound recording devices and telephones. Though electret microphones were once considered low quality, the best ones can now rival traditional condenser microphones in every respect and can even offer the long-term stability and ultra-flat response needed for a measurement microphone. Unlike other capacitor microphones, they require no polarizing voltage, but often contain an integrated preamplifier that does require power (often incorrectly called polarizing power or bias). This preamplifier is frequently phantom powered in sound reinforcement and studio applications. Monophonic microphones designed for personal computer (PC) use, sometimes called multimedia microphones, use a 3.5 mm plug as usually used, without power, for stereo; the ring, instead of carrying the signal for a second channel, carries power via a resistor from (normally) a 5 V supply in the computer. Stereophonic microphones use the same connector; there is no obvious way to determine which standard is used by equipment and microphones.

Only the best electret microphones rival good DC-polarized units in terms of noise level and quality; electret microphones lend themselves to inexpensive mass-production, while inherently expensive non-electret condenser microphones are made to higher quality.

Dynamic microphone

Dynamic microphones (also known as magneto-dynamic microphones) work via electromagnetic induction. They are robust, relatively inexpensive and resistant to moisture. This, coupled with their potentially high gain before feedback, makes them ideal for on-stage use.

Moving-coil microphones use the same dynamic principle as in a loudspeaker, only reversed. A small movable induction coil, positioned in the magnetic field of a permanent magnet, is attached to the diaphragm. When sound enters through the windscreen of the microphone, the sound wave moves the diaphragm. When the diaphragm vibrates, the coil moves in the magnetic field, producing a varying current in the coil through electromagnetic induction. A single dynamic membrane does not respond linearly to all audio frequencies. Some microphones for this reason utilize multiple membranes for the different parts of the audio spectrum and then combine the resulting signals. Combining the multiple signals correctly is difficult and designs that do this are rare and tend to be expensive. There are on the other hand several designs that are more specifically aimed towards isolated parts of the audio spectrum. The AKG D 112, for example, is designed for bass response rather than treble. In audio engineering several kinds of microphones are often used at the same time to get the best results.

Ribbon microphone

Ribbon microphones use a thin, usually corrugated metal ribbon suspended in a magnetic field. The ribbon is electrically connected to the microphone's output, and its vibration within the magnetic field generates the electrical signal. Ribbon microphones are similar to moving coil microphones in the sense

that both produce sound by means of magnetic induction. Basic ribbon microphones detect sound in a bi-directional (also called figure-eight, as in the diagram below) pattern because the ribbon is open on both sides. Also, because the ribbon is much less mass it responds to the air velocity rather than the sound pressure. Though the symmetrical front and rear pickup can be a nuisance in normal stereo recording, the high side rejection can be used to advantage by positioning a ribbon microphone horizontally, for example above cymbals, so that the rear lobe picks up only sound from the cymbals. Crossed figure 8, or Blumlein pair, stereo recording is gaining in popularity, and the figure-eight response of a ribbon microphone is ideal for that application.

Other directional patterns are produced by enclosing one side of the ribbon in an acoustic trap or baffle, allowing sound to reach only one side. The classic RCA Type 77-DX microphone has several externally adjustable positions of the internal baffle, allowing the selection of several response patterns ranging from "figure-eight" to "unidirectional". Such older ribbon microphones, some of which still provide high quality sound reproduction, were once valued for this reason, but a good low-frequency response could only be obtained when the ribbon was suspended very loosely, which made them relatively fragile. Modern ribbon materials, including new nanomaterials have now been introduced that eliminate those concerns, and even improve the effective dynamic range of ribbon microphones at low frequencies. Protective wind screens can reduce the danger of damaging a vintage ribbon, and also reduce plosive artifacts in the recording. Properly designed wind screens produce negligible treble attenuation. In common with other classes of dynamic microphone, ribbon microphones don't require phantom power; in fact, this voltage can damage some older ribbon microphones. Some new modern ribbon microphone designs incorporate a preamplifier and, therefore, do require phantom power, and circuits of modern passive ribbon microphones, i.e., those without the aforementioned preamplifier, are specifically designed to resist damage to the ribbon and transformer by phantom power. Also there are new ribbon materials available that are immune to wind blasts and phantom power.

Carbon microphone

A carbon microphone, also known as a carbon button microphone (or sometimes just a button microphone), uses a capsule or button containing carbon granules pressed between two metal plates like the Berliner and Edison microphones. A voltage is applied across the metal plates, causing a small current to flow through the carbon. One of the plates, the diaphragm, vibrates in sympathy with incident sound waves, applying a varying pressure to the carbon. The changing pressure deforms the granules, causing the contact area between each pair of adjacent granules to change, and this causes the electrical resistance of the mass of granules to change. The changes in resistance cause a corresponding change in the current flowing through the microphone, producing the electrical signal. Carbon microphones were once commonly used in telephones; they have extremely low-quality sound reproduction and a very limited frequency response range, but are very robust devices. The Boudet microphone, which used relatively large carbon balls, was similar to the granule carbon button microphones.

Unlike other microphone types, the carbon microphone can also be used as a type of amplifier, using a small amount of sound energy to control a larger amount of electrical energy. Carbon microphones found use as early telephone repeaters, making long distance phone calls possible in the era before vacuum tubes. These repeaters worked by mechanically coupling a magnetic telephone receiver to a carbon microphone: the faint signal from the receiver was transferred to the microphone, where it modulated a stronger electric current, producing a stronger electrical signal to send down the line. One illustration of this amplifier effect was the oscillation caused by feedback, resulting in an audible squeal from the old "candlestick" telephone if its earphone was placed near the carbon microphone.

Piezoelectric microphone

A crystal microphone or piezo microphone uses the phenomenon of piezoelectricity—the ability of some materials to produce a voltage when subjected to pressure - to convert vibrations into an electrical signal. An example of this is potassium sodium tartrate, which is a piezoelectric crystal that works as a transducer, both as a microphone and as a slimline loudspeaker component. Crystal microphones were once commonly supplied with vacuum tube (valve) equipment, such as domestic tape recorders. Their high output impedance matched the high input impedance (typically about 10 megohms) of the vacuum tube input stage well. They were difficult to match to early transistor equipment, and were quickly

supplanted by dynamic microphones for a time, and later small electret condenser devices. The high impedance of the crystal microphone made it very susceptible to handling noise, both from the microphone itself and from the connecting cable.

Piezoelectric transducers are often used as contact microphones to amplify sound from acoustic musical instruments, to sense drum hits, for triggering electronic samples, and to record sound in challenging environments, such as underwater under high pressure. Saddle-mounted pickups on acoustic guitars are generally piezoelectric devices that contact the strings passing over the saddle. This type of microphone is different from magnetic coil pickups commonly visible on typical electric guitars, which use magnetic induction, rather than mechanical coupling, to pick up vibration.

Fiber optic microphone

A fiber optic microphone converts acoustic waves into electrical signals by sensing changes in light intensity, instead of sensing changes in capacitance or magnetic fields as with conventional microphones.

During operation, light from a laser source travels through an optical fiber to illuminate the surface of a reflective diaphragm. Sound vibrations of the diaphragm modulate the intensity of light reflecting off the diaphragm in a specific direction. The modulated light is then transmitted over a second optical fiber to a photo detector, which transforms the intensity-modulated light into analog or digital audio for transmission or recording. Fiber optic microphones possess high dynamic and frequency range, similar to the best high fidelity conventional microphones.

Fiber optic microphones do not react to or influence any electrical, magnetic, electrostatic or radioactive fields (this is called EMI/RFI immunity). The fiber optic microphone design is therefore ideal for use in areas where conventional microphones are ineffective or dangerous, such as inside industrial turbines or in magnetic resonance imaging (MRI) equipment environments.

Fiber optic microphones are robust, resistant to environmental changes in heat and moisture, and can be produced for any directionality or impedance matching. The distance between the microphone's light source and its photo detector may be up to several kilometers without need for any preamplifier or other electrical device, making fiber optic microphones suitable for industrial and surveillance acoustic monitoring.

Fiber optic microphones are used in very specific application areas such as for infrasound monitoring and noise-canceling. They have proven especially useful in medical applications, such as allowing radiologists, staff and patients within the powerful and noisy magnetic field to converse normally, inside the MRI suites as well as in remote control rooms. Other uses include industrial equipment monitoring and audio calibration and measurement, high-fidelity recording and law enforcement.

Laser microphone

Laser microphones are often portrayed in movies as spy gadgets, because they can be used to pick up sound at a distance from the microphone equipment. A laser beam is aimed at the surface of a window or other plane surface that is affected by sound. The vibrations of this surface change the angle at which the beam is reflected, and the motion of the laser spot from the returning beam is detected and converted to an audio signal.

In a more robust and expensive implementation, the returned light is split and fed to an interferometer, which detects movement of the surface by changes in the optical path length of the reflected beam. The former implementation is a tabletop experiment; the latter requires an extremely stable laser and precise optics.

A new type of laser microphone is a device that uses a laser beam and smoke or vapor to detect sound vibrations in free air. On 25 August 2009, U.S. patent 7,580,533 issued for a Particulate Flow Detection Microphone based on a laser-photocell pair with a moving stream of smoke or vapor in the laser beam's path. Sound pressure waves cause disturbances in the smoke that in turn cause variations in the amount of laser light reaching the photo detector. A prototype of the device was demonstrated at the 127th

Audio Engineering Society convention in New York City from 9 through 12 October 2009.

Liquid microphone

Early microphones did not produce intelligible speech, until Alexander Graham Bell made improvements including a variable-resistance microphone/transmitter. Bell's liquid transmitter consisted of a metal cup filled with water with a small amount of sulfuric acid added. A sound wave caused the diaphragm to move, forcing a needle to move up and down in the water. The electrical resistance between the wire and the cup was then inversely proportional to the size of the water meniscus around the submerged needle. Elisha Gray filed a caveat for a version using a brass rod instead of the needle. Other minor variations and improvements were made to the liquid microphone by Majoranna, Chambers, Vanni, Sykes, and Elisha Gray, and one version was patented by Reginald Fessenden in 1903. These were the first working microphones, but they were not practical for commercial application. The famous first phone conversation between Bell and Watson took place using a liquid microphone.

MEMS microphone

The MEMS (MicroElectrical-Mechanical System) microphone is also called a microphone chip or silicon microphone. A pressure-sensitive diaphragm is etched directly into a silicon wafer by MEMS processing techniques, and is usually accompanied with integrated preamplifier. Most MEMS microphones are variants of the condenser microphone design. Digital MEMS microphones have built in analog-to-digital converter (ADC) circuits on the same CMOS chip making the chip a digital microphone and so more readily integrated with modern digital products. Major manufacturers producing MEMS silicon microphones are Wolfson Microelectronics (WM7xxx) now Cirrus Logic, InvenSense (product line sold by Analog Devices), Akustica (AKU200x), Infineon (SMM310 product), Knowles Electronics, Memstech (MSMx), NXP Semiconductors (division bought by Knowles), Sonion MEMS, Vesper, AAC Acoustic Technologies, and Omron.

More recently, there has been increased interest and research into making piezoelectric MEMS microphones which are a significant architectural and material change from existing condenser style MEMS designs.

Speakers as microphones

A loudspeaker, a transducer that turns an electrical signal into sound waves, is the functional opposite of a microphone. Since a conventional speaker is constructed much like a dynamic microphone (with a diaphragm, coil and magnet), speakers can actually work "in reverse" as microphones. The result, though, is a microphone with poor quality, limited frequency response (particularly at the high end), and poor sensitivity. In practical use, speakers are sometimes used as microphones in applications where high quality and sensitivity are not needed such as intercoms, walkie-talkies or video game voice chat peripherals, or when conventional microphones are in short supply.

However, there is at least one other practical application of this principle: Using a medium-size woofer placed closely in front of a "kick drum" (bass drum) in a drum set to act as a microphone. The use of relatively large speakers to transduce low frequency sound sources, especially in music production, is becoming fairly common. A product example of this type of device is the Yamaha Subkick, a 6.5-inch (170 mm) woofer shock-mounted into a 10" drum shell used in front of kick drums. Since a relatively massive membrane is unable to transduce high frequencies, placing a speaker in front of a kick drum is often ideal for reducing cymbal and snare bleed into the kick drum sound. Less commonly, microphones themselves can be used as speakers, almost always as tweeters. Microphones, however, are not designed to handle the power that speaker components are routinely required to cope with. One instance of such an application was the STC microphone-derived 4001 super-tweeter, which was successfully used in a number of high quality loudspeaker systems from the late 1960s to the mid-70s.

Capsule design and directivity

The inner elements of a microphone are the primary source of differences in directivity. A pressure microphone uses a diaphragm between a fixed internal volume of air and the environment, and responds uniformly to pressure from all directions, so it is said to be omnidirectional. A pressure-gradient

microphone uses a diaphragm that is at least partially open on both sides. The pressure difference between the two sides produces its directional characteristics. Other elements such as the external shape of the microphone and external devices such as interference tubes can also alter a microphone's directional response. A pure pressure-gradient microphone is equally sensitive to sounds arriving from front or back, but insensitive to sounds arriving from the side because sound arriving at the front and back at the same time creates no gradient between the two. The characteristic directional pattern of a pure pressure-gradient microphone is like a figure-8. Other polar patterns are derived by creating a capsule that combines these two effects in different ways. The cardioid, for instance, features a partially closed backside, so its response is a combination of pressure and pressure-gradient characteristics.

A microphone's directionality or polar pattern indicates how sensitive it is to sounds arriving at different angles about its central axis. The polar patterns illustrated above represent the locus of points that produce the same signal level output in the microphone if a given sound pressure level (SPL) is generated from that point. How the physical body of the microphone is oriented relative to the diagrams depends on the microphone design. For large-membrane microphones such as in the Oktava (pictured above), the upward direction in the polar diagram is usually perpendicular to the microphone body, commonly known as "side fire" or "side address". For small diaphragm microphones such as the Shure (also pictured above), it usually extends from the axis of the microphone commonly known as "end fire" or "top/end address".

Some microphone designs combine several principles in creating the desired polar pattern. This ranges from shielding (meaning diffraction/dissipation/absorption) by the housing itself to electronically combining dual membranes.

Omnidirectional

An omnidirectional (or nondirectional) microphone's response is generally considered to be a perfect sphere in three dimensions. In the real world, this is not the case. As with directional microphones, the polar pattern for an "omnidirectional" microphone is a function of frequency. The body of the microphone is not infinitely small and, as a consequence, it tends to get in its own way with respect to sounds arriving from the rear, causing a slight flattening of the polar response. This flattening increases as the diameter of the microphone (assuming it's cylindrical) reaches the wavelength of the frequency in question. Therefore, the smallest diameter microphone gives the best omnidirectional characteristics at high frequencies.

The wavelength of sound at 10 kHz is 1.4" (3.5 cm). The smallest measuring microphones are often 1/4" (6 mm) in diameter, which practically eliminates directionality even up to the highest frequencies. Omnidirectional microphones, unlike cardioids, do not employ resonant cavities as delays, and so can be considered the "purest" microphones in terms of low coloration; they add very little to the original sound. Being pressure-sensitive they can also have a very flat low-frequency response down to 20 Hz or below. Pressure-sensitive microphones also respond much less to wind noise and plosives than directional (velocity sensitive) microphones.

Unidirectional

A unidirectional microphone is primarily sensitive to sounds from only one direction. The diagram above illustrates a number of these patterns. The microphone faces upwards in each diagram. The sound intensity for a particular frequency is plotted for angles radially from 0 to 360°. (Professional diagrams show these scales and include multiple plots at different frequencies. The diagrams given here provide only an overview of typical pattern shapes, and their names.)

Cardioid, Hypercardioid, Supercardioid

The most common unidirectional microphone is a cardioid microphone, so named because the sensitivity pattern is "heart-shaped", i.e. a cardioid. The cardioid family of microphones are commonly used as vocal or speech microphones, since they are good at rejecting sounds from other directions. In three dimensions, the cardioid is shaped like an apple centered around the microphone which is the "stem" of the apple. The cardioid response reduces pickup from the side and rear, helping to avoid feedback from

the monitors. Since these directional transducer microphones achieve their patterns by sensing pressure gradient, putting them very close to the sound source (at distances of a few centimeters) results in a bass boost due to the increased gradient. This is known as the proximity effect. The SM58 has been the most commonly used microphone for live vocals for more than 50 years demonstrating the importance and popularity of cardioid mics.

A cardioid microphone is effectively a superposition of an omnidirectional and a figure-8 microphone; for sound waves coming from the back, the negative signal from the figure-8 cancels the positive signal from the omnidirectional element, whereas for sound waves coming from the front, the two add to each other. A hyper-cardioid microphone is similar, but with a slightly larger figure-8 contribution leading to a tighter area of front sensitivity and a smaller lobe of rear sensitivity. A super-cardioid microphone is similar to a hyper-cardioid, except there is more front pickup and less rear pickup. While any pattern between omni and figure 8 is possible by adjusting their mix, common definitions state that a hypercardioid is produced by combining them at a 3:1 ratio, producing nulls at 109.5°, while supercardioid is produced with a 5:3 ratio, with nulls at 126.9°.

Bi-directional

"Figure 8" or bi-directional microphones receive sound equally from both the front and back of the element. Most ribbon microphones are of this pattern. In principle they do not respond to sound pressure at all, only to the change in pressure between front and back; since sound arriving from the side reaches front and back equally there is no difference in pressure and therefore no sensitivity to sound from that direction. In more mathematical terms, while omnidirectional microphones are scalar transducers responding to pressure from any direction, bi-directional microphones are vector transducers responding to the gradient along an axis normal to the plane of the diaphragm. This also has the effect of inverting the output polarity for sounds arriving from the back side.

Shotgun and parabolic microphones

Shotgun microphones are the most highly directional of simple first-order unidirectional types. At low frequencies they have the classic polar response of a hypercardioid but at medium and higher frequencies an interference tube gives them an increased forward response. This is achieved by a process of cancellation of off-axis waves entering the longitudinal array of slots. A consequence of this technique is the presence of some rear lobes that vary in level and angle with frequency, and can cause some coloration effects. Due to the narrowness of their forward sensitivity, shotgun microphones are commonly used on television and film sets, in stadiums, and for field recording of wildlife.

Boundary or "PZM"

Several approaches have been developed for effectively using a microphone in less-than-ideal acoustic spaces, which often suffer from excessive reflections from one or more of the surfaces (boundaries) that make up the space. If the microphone is placed in, or very close to, one of these boundaries, the reflections from that surface have the same timing as the direct sound, thus giving the microphone a hemispherical polar pattern and improved intelligibility. Initially this was done by placing an ordinary microphone adjacent to the surface, sometimes in a block of acoustically transparent foam. Sound engineers Ed Long and Ron Wickersham developed the concept of placing the diaphragm parallel to and facing the boundary. While the patent has expired, "Pressure Zone Microphone" and "PZM" are still active trademarks of Crown International, and the generic term "boundary microphone" is preferred. While a boundary microphone was initially implemented using an omnidirectional element, it is also possible to mount a directional microphone close enough to the surface to gain some of the benefits of this technique while retaining the directional properties of the element. Crown's trademark on this approach is "Phase Coherent Cardioid" or "PCC," but there are other makers who employ this technique as well.

Application-specific designs

A lavalier microphone is made for hands-free operation. These small microphones are worn on the body. Originally, they were held in place with a lanyard worn around the neck, but more often they are fastened to clothing with a clip, pin, tape or magnet. The lavalier cord may be hidden by clothes and

either run to an RF transmitter in a pocket or clipped to a belt (for mobile use), or run directly to the mixer (for stationary applications).

A wireless microphone transmits the audio as a radio or optical signal rather than via a cable. It usually sends its signal using a small FM radio transmitter to a nearby receiver connected to the sound system, but it can also use infrared waves if the transmitter and receiver are within sight of each other.

A contact microphone picks up vibrations directly from a solid surface or object, as opposed to sound vibrations carried through air. One use for this is to detect sounds of a very low level, such as those from small objects or insects. The microphone commonly consists of a magnetic (moving coil) transducer, contact plate and contact pin. The contact plate is placed directly on the vibrating part of a musical instrument or other surface, and the contact pin transfers vibrations to the coil. Contact microphones have been used to pick up the sound of a snail's heartbeat and the footsteps of ants. A portable version of this microphone has recently been developed. A throat microphone is a variant of the contact microphone that picks up speech directly from a person's throat, which it is strapped to. This lets the device be used in areas with ambient sounds that would otherwise make the speaker inaudible.

A parabolic microphone uses a parabolic reflector to collect and focus sound waves onto a microphone receiver, in much the same way that a parabolic antenna (e.g. satellite dish) does with radio waves. Typical uses of this microphone, which has unusually focused front sensitivity and can pick up sounds from many meters away, include nature recording, outdoor sporting events, eavesdropping, law enforcement, and even espionage. Parabolic microphones are not typically used for standard recording applications, because they tend to have poor low-frequency response as a side effect of their design.

A stereo microphone integrates two microphones in one unit to produce a stereophonic signal. A stereo microphone is often used for broadcast applications or field recording where it would be impractical to configure two separate condenser microphones in a classic X-Y configuration (see microphone practice) for stereophonic recording. Some such microphones have an adjustable angle of coverage between the two channels.

A noise-canceling microphone is a highly directional design intended for noisy environments. One such use is in aircraft cockpits where they are normally installed as boom microphones on headsets. Another use is in live event support on loud concert stages for vocalists involved with live performances. Many noise-canceling microphones combine signals received from two diaphragms that are in opposite electrical polarity or are processed electronically. In dual diaphragm designs, the main diaphragm is mounted closest to the intended source and the second is positioned farther away from the source so that it can pick up environmental sounds to be subtracted from the main diaphragm's signal. After the two signals have been combined, sounds other than the intended source are greatly reduced, substantially increasing intelligibility. Other noise-canceling designs use one diaphragm that is affected by ports open to the sides and rear of the microphone, with the sum being a 16 dB rejection of sounds that are farther away. One noise-canceling headset design using a single diaphragm has been used prominently by vocal artists such as Garth Brooks and Janet Jackson. A few noise-canceling microphones are throat microphones.

Powering

Microphones containing active circuitry, such as most condenser microphones, require power to operate the active components. The first of these used vacuum-tube circuits with a separate power supply unit, using a multi-pin cable and connector. With the advent of solid-state amplification, the power requirements were greatly reduced and it became practical to use the same cable conductors and connector for audio and power. During the 1960s several powering methods were developed, mainly in Europe. The two dominant methods were initially defined in German DIN 45595 as de:Tonaderspeisung or T-power and DIN 45596 for phantom power. Since the 1980s, phantom power has become much more common, because the same input may be used for both powered and unpowered microphones. In consumer electronics such as DSLRs and camcorders, "plug-in power" is more common, for microphones using a 3.5 mm phone plug connector. Phantom, T-power and plug-in power are described in international standard IEC 61938.

Connectors

The most common connectors used by microphones are:

- Male XLR connector on professional microphones
- ¼ inch (sometimes referred to as 6.3 mm) phone connector on less expensive musician's microphones, using an unbalanced 1/4 inch (6.3 mm) TS phone connector. Harmonica microphones commonly use a high impedance 1/4 inch (6.3 mm) TS connection to be run through guitar amplifiers.

- 3.5 mm (sometimes referred to as 1/8 inch mini) stereo (sometimes wired as mono) mini phone plug on prosumer camera, recorder and computer microphones.

Some microphones use other connectors, such as a 5-pin XLR, or mini XLR for connection to portable equipment. Some lavalier (or "lapel", from the days of attaching the microphone to the news reporters suit lapel) microphones use a proprietary connector for connection to a wireless transmitter, such as a radio pack. Since 2005, professional-quality microphones with USB connections have begun to appear, designed for direct recording into computer-based software.

Impedance-matching

Microphones have an electrical characteristic called impedance, measured in ohms (Ω), that depends on the design. In passive microphones, this value describes the electrical resistance of the magnet coil (or similar mechanism). In active microphones, this value describes the output resistance of the amplifier circuitry. Typically, the rated impedance is stated. Low impedance is considered under 600 Ω. Medium impedance is considered between 600 Ω and 10 kΩ. High impedance is above 10 kΩ. Owing to their built-in amplifier, condenser microphones typically have an output impedance between 50 and 200 Ω.

The output of a given microphone delivers the same power whether it is low or high impedance[citation needed]. If a microphone is made in high and low impedance versions, the high impedance version has a higher output voltage for a given sound pressure input, and is suitable for use with vacuum-tube guitar amplifiers, for instance, which have a high input impedance and require a relatively high signal input voltage to overcome the tubes' inherent noise. Most professional microphones are low impedance, about 200 Ω or lower. Professional vacuum-tube sound equipment incorporates a transformer that steps up the impedance of the microphone circuit to the high impedance and voltage needed to drive the input tube. External matching transformers are also available that can be used in-line between a low impedance microphone and a high impedance input.

Low-impedance microphones are preferred over high impedance for two reasons: one is that using a high-impedance microphone with a long cable results in high frequency signal loss due to cable capacitance, which forms a low-pass filter with the microphone output impedance[citation needed]. The other is that long high-impedance cables tend to pick up more hum (and possibly radio-frequency interference (RFI) as well). Nothing is damaged if the impedance between microphone and other equipment is mismatched; the worst that happens is a reduction in signal or change in frequency response.

Some microphones are designed not to have their impedance matched by the load they are connected to. Doing so can alter their frequency response and cause distortion, especially at high sound pressure levels. Certain ribbon and dynamic microphones are exceptions, due to the designers' assumption of a certain load impedance being part of the internal electro-acoustical damping circuit of the microphone.

Digital microphone interface

The AES 42 standard, published by the Audio Engineering Society, defines a digital interface for microphones. Microphones conforming to this standard directly output a digital audio stream through an XLR or XLD male connector, rather than producing an analog output. Digital microphones may be used either with new equipment with appropriate input connections that conform to the AES 42 standard, or else via a suitable interface box. Studio-quality microphones that operate in accordance with the AES 42 standard are now available from a number of microphone manufacturers.

Measurements and specifications

Because of differences in their construction, microphones have their own characteristic responses to sound. This difference in response produces non-uniform phase and frequency responses. In addition, microphones are not uniformly sensitive to sound pressure, and can accept differing levels without distorting. Although for scientific applications microphones with a more uniform response are desirable, this is often not the case for music recording, as the non-uniform response of a microphone can produce a desirable coloration of the sound. There is an international standard for microphone specifications, but few manufacturers adhere to it. As a result, comparison of published data from different manufacturers is difficult because different measurement techniques are used. The Microphone Data Website has collated the technical specifications complete with pictures, response curves and technical data from the microphone manufacturers for every currently listed microphone, and even a few obsolete models, and shows the data for them all in one common format for ease of comparison. Caution should be used in drawing any solid conclusions from this or any other published data, however, unless it is known that the manufacturer has supplied specifications in accordance with IEC 60268-4.

A frequency response diagram plots the microphone sensitivity in decibels over a range of frequencies (typically 20 Hz to 20 kHz), generally for perfectly on-axis sound (sound arriving at 0° to the capsule). Frequency response may be less informatively stated textually like so: "30 Hz–16 kHz ±3 dB". This is interpreted as meaning a nearly flat, linear, plot between the stated frequencies, with variations in amplitude of no more than plus or minus 3 dB. However, one cannot determine from this information how smooth the variations are, nor in what parts of the spectrum they occur. Note that commonly made statements such as "20 Hz–20 kHz" are meaningless without a decibel measure of tolerance. Directional microphones' frequency response varies greatly with distance from the sound source, and with the geometry of the sound source. IEC 60268-4 specifies that frequency response should be measured in plane progressive wave conditions (very far away from the source) but this is seldom practical. Close talking microphones may be measured with different sound sources and distances, but there is no standard and therefore no way to compare data from different models unless the measurement technique is described.

The self-noise or equivalent input noise level is the sound level that creates the same output voltage as the microphone does in the absence of sound. This represents the lowest point of the microphone's dynamic range, and is particularly important should you wish to record sounds that are quiet. The measure is often stated in dB(A), which is the equivalent loudness of the noise on a decibel scale frequency-weighted for how the ear hears, for example: "15 dBA SPL" (SPL means sound pressure level relative to 20 micropascals). The lower the number the better. Some microphone manufacturers state the noise level using ITU-R 468 noise weighting, which more accurately represents the way we hear noise, but gives a figure some 11–14 dB higher. A quiet microphone typically measures 20 dBA SPL or 32 dB SPL 468-weighted. Very quiet microphones have existed for years for special applications, such the Brüel & Kjaer 4179, with a noise level around 0 dB SPL. Recently some microphones with low noise specifications have been introduced in the studio/entertainment market, such as models from Neumann and Røde that advertise noise levels between 5–7 dBA. Typically this is achieved by altering the frequency response of the capsule and electronics to result in lower noise within the A-weighting curve while broadband noise may be increased.

The maximum SPL the microphone can accept is measured for particular values of total harmonic distortion (THD), typically 0.5%. This amount of distortion is generally inaudible,[citation needed] so one can safely use the microphone at this SPL without harming the recording. Example: "142 dB SPL peak (at 0.5% THD)". The higher the value, the better, although microphones with a very high maximum SPL also have a higher self-noise.

The clipping level is an important indicator of maximum usable level, as the 1% THD figure usually quoted under max SPL is really a very mild level of distortion, quite inaudible especially on brief high peaks. Clipping is much more audible. For some microphones the clipping level may be much higher than the max SPL.

The dynamic range of a microphone is the difference in SPL between the noise floor and the maximum SPL. If stated on its own, for example "120 dB", it conveys significantly less information than having the self-noise and maximum SPL figures individually.

Sensitivity indicates how well the microphone converts acoustic pressure to output voltage. A high

sensitivity microphone creates more voltage and so needs less amplification at the mixer or recording device. This is a practical concern but is not directly an indication of the microphone's quality, and in fact the term sensitivity is something of a misnomer, "transduction gain" being perhaps more meaningful, (or just "output level") because true sensitivity is generally set by the noise floor, and too much "sensitivity" in terms of output level compromises the clipping level. There are two common measures. The (preferred) international standard is made in millivolts per pascal at 1 kHz. A higher value indicates greater sensitivity. The older American method is referred to a 1 V/Pa standard and measured in plain decibels, resulting in a negative value. Again, a higher value indicates greater sensitivity, so −60 dB is more sensitive than −70 dB.

Measurement microphones

Some microphones are intended for testing speakers, measuring noise levels and otherwise quantifying an acoustic experience. These are calibrated transducers and are usually supplied with a calibration certificate that states absolute sensitivity against frequency. The quality of measurement microphones is often referred to using the designations "Class 1," "Type 2" etc., which are references not to microphone specifications but to sound level meters. A more comprehensive standard for the description of measurement microphone performance was recently adopted.

Measurement microphones are generally scalar sensors of pressure; they exhibit an omnidirectional response, limited only by the scattering profile of their physical dimensions. Sound intensity or sound power measurements require pressure-gradient measurements, which are typically made using arrays of at least two microphones, or with hot-wire anemometers.

Microphone calibration

To take a scientific measurement with a microphone, its precise sensitivity must be known (in volts per pascal). Since this may change over the lifetime of the device, it is necessary to regularly calibrate measurement microphones. This service is offered by some microphone manufacturers and by independent certified testing labs. All microphone calibration is ultimately traceable to primary standards at a national measurement institute such as NPL in the UK, PTB in Germany and NIST in the United States, which most commonly calibrate using the reciprocity primary standard. Measurement microphones calibrated using this method can then be used to calibrate other microphones using comparison calibration techniques.

Depending on the application, measurement microphones must be tested periodically (every year or several months, typically) and after any potentially damaging event, such as being dropped (most such microphones come in foam-padded cases to reduce this risk) or exposed to sounds beyond the acceptable level.

Microphone array and array microphones

A microphone array is any number of microphones operating in tandem. There are many applications:

- Systems for extracting voice input from ambient noise (notably telephones, speech recognition systems, hearing aids)

- Surround sound and related technologies

- Locating objects by sound: acoustic source localization, e.g., military use to locate the source(s) of artillery fire. Aircraft location and tracking.

- High fidelity original recordings

- 3D spatial beamforming for localized acoustic detection of subcutaneous sounds

Typically, an array is made up of omnidirectional microphones distributed about the perimeter of a space, linked to a computer that records and interprets the results into a coherent form.

Microphone windscreens

Windscreens (or windshields – the terms are interchangeable) provide a method of reducing the effect of wind on microphones. While pop-screens give protection from unidirectional blasts, foam “hats” shield wind into the grille from all directions, and blimps / zeppelins / baskets entirely enclose the microphone and protect its body as well. This last point is important because, given the extreme low frequency content of wind noise, vibration induced in the housing of the microphone can contribute substantially to the noise output.

The shielding material used – wire gauze, fabric or foam – is designed to have a significant acoustic impedance. The relatively low particle-velocity air pressure changes that constitute sound waves can pass through with minimal attenuation, but higher particle-velocity wind is impeded to a far greater extent. Increasing the thickness of the material improves wind attenuation but also begins to compromise high frequency audio content. This limits the practical size of simple foam screens. While foams and wire meshes can be partly or wholly self-supporting, soft fabrics and gauzes require stretching on frames, or laminating with coarser structural elements.

Since all wind noise is generated at the first surface the air hits, the greater the spacing between shield periphery and microphone capsule, the greater the noise attenuation. For an approximately spherical shield, attenuation increases by (approximately) the cube of that distance. Thus larger shields are always much more efficient than smaller ones. With full basket windshields there is an additional pressure chamber effect, first explained by Joerg Wuttke, which, for two-port (pressure gradient) microphones, allows the shield/microphone combination to act as a high-pass acoustic filter.

Since turbulence at a surface is the source of wind noise, reducing gross turbulence can add to noise reduction. Both aerodynamically smooth surfaces, and ones that prevent powerful vortices being generated, have been used successfully. Historically, artificial fur has proved very useful for this purpose since the fibres produce micro-turbulence and absorb energy silently. If not matted by wind and rain, the fur fibres are very transparent acoustically, but the woven or knitted backing can give significant attenuation. As a material it suffers from being difficult to manufacture with consistency, and to keep in pristine condition on location. Thus there is an interest (DPA 5100, Rycote Cyclone) to move away from its use.

In the studio and on stage, pop-screens and foam shields can be useful for reasons of hygiene, and protecting microphones from spittle and sweat. They can also be useful colored idents. On location the basket shield can contain a suspension system to isolate the microphone from shock and handling noise.

Stating the efficiency of wind noise reduction is an inexact science, since the effect varies enormously with frequency, and hence with the bandwidth of the microphone and audio channel. At very low frequencies (10–100 Hz) where massive wind energy exists, reductions are important to avoid overloading of the audio chain – particularly the early stages. This can produce the typical “wumping” sound associated with wind, which is often syllabic muting of the audio due to LF peak limiting. At higher frequencies – 200 Hz to ~3 kHz – the aural sensitivity curve allows us to hear the effect of wind as an addition to the normal noise floor, even though it has a far lower energy content. Simple shields may allow the wind noise to be 10 dB less apparent; better ones can achieve nearer to a 50 dB reduction. However the acoustic transparency, particularly at HF, should also be indicated, since a very high level of wind attenuation could be associated with very muffled audio.

https://en.wikipedia.org/wiki/Microphone