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Blending Tradition and Technology: An Ethnographic Study of Gamelan Production at Bogor Gong Factory

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ABSTRACT

This study aimed to uncover insights into how tradition and technology coexist in gamelan production, preserving cultural authenticity while embracing innovation. The research revealed a harmonious interplay between tradition and technology in the production of gamelan instruments at the Bogor Factory in Indonesia. With a historical legacy spanning 370 years, skilled artisans demonstrated an unwavering commitment to preserving Sundanese cultural heritage through traditional craftsmanship. This commitment coexists seamlessly with modern technology, exemplified by smartphone use for tonal fine-tuning. The five-stage manufacturing process highlights precision and artistry, striking a careful balance between tradition and innovation. Key figures like Mr. Krisna and Mr. Hidayat navigated technological challenges, solidifying the Gong Factory in Bogor as a living embodiment of Indonesia cultural richness, bridging the past and future with grace.

Keywords:

Culture; Gamelan; Ethnography; Technology

1. Introduction

The Bogor Gong Factory is crucial to the production of traditional *gamelan* instruments, which are essential to Javanese culture. *Gamelan* ensembles, which include *gongs*, metallophones, drums, and other instruments, are used in religious rituals, dance, theatre, and other ceremonies in Java [1]. The *gongs* themselves are considered the heart of the *gamelan*, providing the rhythmic framework for the ensemble [2]. The Bogor Gong Factory has been producing *gongs* and other bronze instruments for *gamelan* ensembles for hundreds of years, helping preserve this ancient musical tradition. The factory uses an open casting method and both mechanical and manual forging to produce the *gongs*, a complex process that requires a great skill [3]. The *gongs* produced in Bogor are considered supreme in their beauty of sound and form [2].

Gamelan music is a traditional Indonesian music form characterized by its unique construction, performance style, and cultural significance. The instruments used in *gamelan* music vary in terms of fundamental frequency, amplitude, and signal envelope due to their handmade construction and playing style [4]. *Gamelan* music has been studied in the music education context, with performance-

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based methods found to be more effective in increasing student preference and knowledge achievement compared to lecture-based methods [5]. *Gamelan* has also been explored in the field of ethnomusicology, where its role in college world music education and its adaptation to new contexts in North America have been examined [6]. In terms of cultural significance, *gamelan* is often associated with religious ceremonies, tourist audiences, and local entertainment in Indonesia [6]. The perception of Western listeners on *gamelan* music has been investigated, where both short-term and long-term memory are found to influence their perception of completeness and coherence in unfamiliar melodies [7]. Additionally, *gamelan* music has been the subject of technological advancements, such as the development of augmented reality-based *gamelan* simulations [8].

Gamelan music is an integral part of Indonesian culture, especially in Java and Bali [9-15]. *Gamelan* refers to a variety of percussion orchestras that feature bronze instruments like *gongs*, xylophones, drums, and metallophones [13]. *Gamelan* music originated in the 12th century courts of Java and was influenced by Hindu, Islamic, Chinese, and Malay cultures [16]. *Gamelan* music is deeply embedded in Javanese spiritual and social life. It is performed at rituals, dances, puppet shows, and other ceremonies [10,11]. The intricate rhythms and shimmering sounds of the *gamelan* are meant to represent the layers of the universe and put listeners and performers into a trance-like state [10]. There are many different styles of *gamelan* music, including the aggressive and fast-paced *beleganjur*, the stately *degung*, and the elegant classical court music [11].

Regional variations of *gamelan* music abound in Java, reflecting the diversity of cultures across the island. The *gamelan* traditions of Surakarta, Yogyakarta, Banyumas, Semarang, Surabaya, and Malang have distinct sounds, repertoires, and playing styles [15]. These regional differences are celebrated in national *gamelan* competitions and festivals [11]. At the same time, mass media and music education have spread certain dominant styles of *gamelan*, like the classical court music, more widely [15]. *Gamelan* music is an important symbol of Indonesian cultural heritage but continues to evolve to suit modern tastes. Contemporary composers create innovative works for *gamelan* and electronic instruments [11]. Some see new popular genres like *dangdut* as modern extensions of the *gamelan* tradition [11]. At its heart, *gamelan* music represents the diversity, spirituality, and artistic richness of Indonesian culture. Its shimmering sounds will continue to resonate for generations to come.

Gamelan ensembles, and the *gongs* that provide their rhythmic foundation, are inextricably tied to Javanese spirituality and mysticism. The musical tradition aims to manifest and express Javanese mystical concepts, like *rasa*, the feeling of spiritual bliss [1]. The *gongs* and *gamelan* ensembles play an important role in religious rituals and ceremonies, like the *ngusaba desa* in Pemaksan Bangle Temple [17]. They are also used in dance and theatre, which have religious significance in Java [1]. The popularity and spread of certain types of *gamelan* ensembles, like *gong kebyar*, show how they are used as a mean of gaining and displaying power and status in Java [18]. The *gongs* and ensembles produced in the Bogor Factory are important parts of this, as they provide the materials and musical tradition that is essential for power struggles and displays of status in Javanese culture. The Bogor Gong Factory is extremely significant as the producer of essential materials for traditional *gamelan* ensembles, which are inextricable from Javanese spirituality, power, status, and culture. The *gongs* and ensembles spread from this factory have helped preserve an ancient musical and cultural tradition in Java. Many reports regarding cultural and tradition have been well-documented [19-33]. Here, the primary objective of this study was to investigate and delve into the intricate interplay between tradition and technology within the context of *gamelan* production at the Bogor factory. By focusing on this unique fusion of elements, the study aimed to comprehensively explore and understand the methodologies, practices, and techniques employed in the creation of *gamelan* instruments. The Bogor Factory, renowned for its commitment to preserving cultural heritage,

provides a captivating setting to examine how traditional craftsmanship harmoniously coexists with modern technological advancements. Through a meticulous examination of the production processes, materials, and the role of skilled artisans, this research sought to shed light on how the synthesis of tradition and technology not only upholds the authenticity of *gamelan* but also contributes to its evolution in the contemporary world. Ultimately, the study aspired to offer valuable insights into the dynamic relationship between heritage and innovation within the realm of cultural craftsmanship.

2. Methodology

This study employed an ethnographic approach to investigate *gamelan* production, specifically focusing on the operations of Bogor Gong Factory. The main objective of the study was to examine the interaction between traditional craftsmanship and modern technology in the creation of *gamelan* instruments. Ethnographic research is a valuable method for gaining insights into people and their environments [8]. It allows for a deep exploration and analysis of cultural practices and perspectives. In the context of *gamelan* production, ethnography can provide valuable insights into traditional craftsmanship techniques and how they intersect with modern technology. Furthermore, ethnographic methods can inform the development and implementation of effective strategies in various domains, including business and management [34]. Additionally, ethnographic research can contribute to the development of culturally relevant instruments and measures in fields, such as mental health. By engaging with local communities and utilizing ethnographic methods, researchers can co-develop instruments that capture culturally significant features and enhance cultural relevance [35].

Participant observation is a widely used qualitative research technique that allows researchers to gain deep insights into the social and cultural dynamics of a particular setting [36-38]. By immersing themselves in the natural environment of the subjects, researchers can observe and understand the intricacies of their behaviours, interactions, and decision-making processes. In studying *gamelan* production, participant observation could provide valuable insights into the craftsmanship techniques, the use of tools and machinery, and the integration of traditional and modern practices. By actively participating in the production processes, the researcher could gain firsthand experiential knowledge and understand the nuances of how tradition and technology intersect.

Complementing the participant observation method, in-depth semi-structured interviews were conducted with a diverse range of key actors within the Gong Factory ecosystem [36]. By eliciting personal narratives and perspectives, the interviews unearthed valuable insights into how individuals navigate the challenges and opportunities presented by the fusion of tradition and technology [39-47]. The respondent viewpoints shed light on their motivations, struggles, and aspirations in preserving the authenticity of *gamelan* instruments while embracing technological advancements. The results of this interview were analysed with the help of the Atlas.ti 23 application.

The third facet of the research methodology implemented in this study involved archival research [48]. This particular approach necessitated a thorough examination of historical records, documents, and materials pertaining to both the Bogor Gong Factory and *gamelan* production. With this archival investigation, a temporal dimension was incorporated into the study, thereby facilitating a comparative analysis of the evolution of *gamelan* production practices over time. By examining old photographs, written records, and oral histories, a trajectory of the factory transformation from a traditional artisanal workshop to a modern production hub was traced. This historical context played a pivotal role in comprehending how the intersection of tradition and technology has influenced the factory identity and production methods.

3. Results

The establishment of *gamelan* originating from the Bogor-based Gong factory in Indonesia serves to underscore its intrinsic association with the conservation of Sundanese cultural heritage and the unwavering commitment exhibited by its skilled artisans. Rooted in a historical continuum spanning over a period exceeding 370 years, the method of crafting *gongs* remains firmly entrenched within the realm of tradition, eschewing the incorporation of modern technological advancements in favour of reliance upon the adeptness of seasoned craftsmen. Through a meticulous amalgamation of copper and tin, these craftsmen expertly forge the metals into pliant configurations, thereby configuring them into the desired dimensions characteristic of *gongs*. This profound dedication to safeguarding cultural legacy serves as a driving force propelling Sukarno and his team, as epitomized by the ritualistic process of *gong* fabrication, which inherently functions as a symbolic homage to their resolute devotion [17]. The pivotal stage of *gong* tuning, an indispensable endeavour undertaken to attain sonic perfection, substantiates the pivotal role accorded to *gongs* in augmenting the cultural tapestry of Bogor.

The venerable Gong Factory, with a lineage extending back two centuries, is situated within the environs of Bogor, Indonesia—a heritage that has been passed down through the successive passage of seven generations. Contemporary times have witnessed the evolution of this factory into an annual initiative, effectively serving as a conduit for the perpetual preservation of an esteemed tradition. The manufacture of *gamelan* instruments, encompassing the meticulous fusion of tin and molten copper, followed by the molten amalgam being channelled into moulds prior to subsequent firing and shaping through the application of skilled hammer work, stands as a hallmark of this lineage. The economic valuation of each crafted *gamelan* artifact is contingent upon its mass and dimensions, whereby *gongs* of larger proportions inherently command elevated worth within this hierarchy of assessment [49].

The crafting of Sundanese *gamelan* at the *gong* factory in Bogor followed a well-defined and intricate process that had been gleaned from observations and interviews with artisans and workers closely involved in the production. A crucial foundation of this process was the preparation of the copper-tin alloy, a blend that harmoniously combines the resonant properties of copper (Cu) and tin (Sn) [3]. This alloy mixture, typically consisting of 3 kg of copper and 1 kg of tin, formed the fundamental material from which the sonorous *gamelan* instruments were forged [50].

The manufacturing journey progressed with the transformation of the alloy mixture into a molten state through the application of heat. The liquid alloy was then meticulously poured into moulds that mirror the desired shape and form of the specific *gamelan* instruments. This initial casting phase set the groundwork for the subsequent stages of the craft. A pivotal step followed in the form of forging, where the molten alloy potential was harnessed and refined. This phase required a collaborative effort, with one individual operating a blower machine to control the fire intensity, while 3 to 4 other skilled artisans employed wooden tools to forge and shape the alloy. Through a fusion of mechanical expertise and manual dexterity, the instrument blades were meticulously shaped to attain not only the desired physical form but also the intended tonal quality.

A hallmark of this process was the symbiotic relationship between traditional craftsmanship and modern technology. As revealed in the research findings, a smartphone served as a contemporary tool for fine-tuning the instrument tonal characteristics. Mr. Krisna, the artisan in charge, employed his smartphone as an auditory guide, carefully adjusting the grinding process in response to the instrument sound. This fusion of age-old techniques and innovative tools speaks to the dynamic evolution of the craft, where centuries-old practices harmonize with present-day advancements.

The final stage of the process involved refining the tonal attributes of the *gamelan* instruments. The surfaces of the instruments, such as *bonang*, *saron*, *gong*, and *jenglong*, undergo a meticulous grinding process. This nuanced approach served to further enhance the tonal precision and consistency across the instruments [3]. Moreover, this stage is essential for addressing any porosity issues that might have arisen during the casting phase, demonstrating a holistic approach to ensuring the final sonic integrity of the instruments.

The creation of Sundanese *gamelan* at the Bogor Gong Factory is an elaborate and synergistic endeavour. By skilfully combining the artistry of alloy composition, the precision of forging techniques, and the finesse of modern technology, artisans achieve instruments that resonate not only with intricate tonal qualities but also with the echoes of generations past and the promises of the present craft. The process is a testament to the intricate balance between tradition and innovation, where each step contributes to the symphonic narrative of Sundanese culture.

Gamelan production at the Gong Factory entailed a meticulous five-stage process, each contributing to the creation of these renowned Indonesian musical instruments. These stages were carried out with precision and expertise, highlighting the artistry and craftsmanship that underlined the production of *gamelans*.

The first stage, known as the Melting Stage (Figure 1), served as the foundational step in the *gamelan*-making process. During this phase, which spanned approximately one hour, the primary raw materials, tin, and copper, were meticulously weighed to achieve the desired ratio of 1:3, where 1 kilogram of tin was combined with 3 kilograms of copper. Subsequently, these carefully measured materials were subjected to the smelting process. This entailed placing the tin and copper within a container constructed from heated clay, commencing the fusion process [51].



Fig. 1. Melting Stage (a) scales for measuring metal mixtures to be smelted (b) preparations for melting metal mixtures

The second stage, the Printing Stage (Figure 2), followed the successful completion of the Melting Stage. This stage, lasting between 10 to 15 minutes, involved the removal of the tin and copper mixture from the clay container and its precise pouring into a stone mould pre-filled with charcoal.

This precaution ensures that the product remains intact and resilient during the pouring process. The mould was then transformed into a *gamelan ricikan*, a semi-finished *gamelan* form, through the application of forging techniques [8].



Fig. 2. Printing stage in clay moulds

The subsequent stage, the Forging Stage, was instrumental in shaping the *gamelan* into its final form (Figure 3). This phase might vary in duration depending on the specific type of *gamelan* being produced. For instance, forging the *Bonang* type *gamelan* typically required 4 to 5 hours and involved the collaborative efforts of 3 to 4 skilled smiths. At this juncture, meticulous checks were conducted to ascertain the quality of the forging results. The process began with the heating of charcoal until it reached a glowing red hue, after which forging was carried out alternately by workers standing and sitting in a circle, showcasing a choreographed symphony of craftsmanship. The Finishing Stage, as the name suggests, was dedicated to enhancing the aesthetic appeal of the *gamelan*. This stage incorporated the use of modern grinding machines, a significant departure from traditional practices that prevailed a decade ago. The objective was to transform the originally black surface of the *gamelan* into a luminous and polished finish. Post-grinding, workers meticulously filed any surface imperfections, ensuring a pristine and smooth appearance.



Fig. 3. Forging Stage (a) Forging by *gamelan* craftsmen (b) Smoothing the forged *gamelan* with a grinding machine

The final and culminating stage of *gamelan* production was the Tone Tuning Stage. Here, the focus shifts from the physical attributes of the *gamelan* to its auditory characteristics (Figure 4). The tuning process, executed with great care, aimed to achieve the ideal *gamelan* tone. Skilled artisans' stroke or filed the *gamelan* until it attained the desired resonance and harmony. This process required exceptional expertise, as it necessitated the ability to discern and adjust the appropriate notes. The integration of modern technology was also observed, with workers utilizing smartphones to reference and align the *gamelan* tones with stored digital references. This stage underscores the profound dedication and skill required to create a *gamelan* that is both visually striking and harmonically captivating [52].



Fig. 4. Tone tuning stage with the help of tones already stored on the smartphone

The *gamelan* production process at the Gong Factory is a testament to the fusion of traditional craftsmanship and modern technology. The five stages—Melting, Printing, Forging, Finishing, and Tone Tuning—combine to produce instruments that not only showcase the beauty of Indonesian culture but also exemplify the precision and artistry embedded within the craft of *gamelan* making. Each stage reflects a careful balance of tradition and innovation, resulting in instruments that are not only visually stunning but also sonically enchanting.

The art of crafting *gamelan* instruments at the Gong Factory in Bogor is a harmonious blend of tradition and modern technology, guided by the wisdom of Mr. Krisna and Mr. Hidayat, who held key positions in the process. Rooted in a legacy that spans generations, the craft marries age-old techniques with contemporary tools to produce instruments that carry the cultural essence of Indonesia musical heritage. Mr. Krisna, the Chief of the Gong Factory, traced the origins of the factory tradition back to 1820, highlighting the continuity of craftsmanship over seven generations. The instruments, including *gongs*, *kempuls*, and *bonangs*, are primarily fashioned from bronze, brass, and iron. While technology has evolved, the heart of the process remains in preserving traditional methods. The crafting of the first *gong* from bronze requires exceptional skills and time, underscoring the commitment to maintaining these techniques. Mr. Hidayat, the Chief Craftsman, provided deeper insights into the intricate steps that define the production process. The careful selection of materials, the melting and forging of metals, and the shaping of instruments using clay moulds all reflect the deep-rooted traditional techniques. Skilled craftsmen, like Mr. Hidayat, ensured that the instruments are forged and tuned to perfection, preserving the tonal quality that *gamelan* music demands.

The incorporation of modern technology is evident in certain aspects (Figure 5). Grinding machines expedite the polishing process, balancing the demands of production with the desire for high-quality finishes. While technology plays a role, the essence of *gamelan* making remains intertwined with age-old traditions. The crucial balance of metals, the careful shaping, and the expert tuning continue to be carried out by the hands of dedicated artisans, ensuring that the instruments produced resonate with both historical authenticity and contemporary allure.

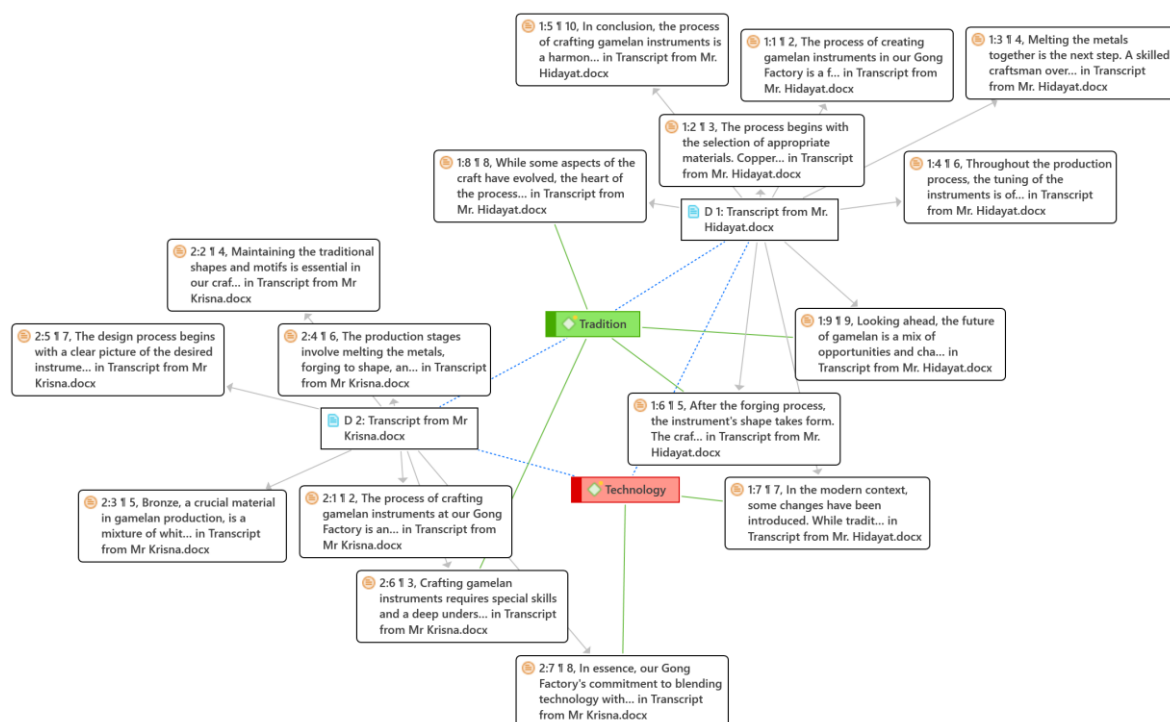


Fig. 5. Visualization of data analysis of results from interviews

Looking to the future, the challenges and opportunities that lie ahead are acknowledged. While technology offers efficiency, the soul of *gamelan* lies in preserving the meticulous craftsmanship. Their shared commitment to maintaining this equilibrium ensures that the instruments produced continue to captivate audiences, bridging the gap between cultural legacy and modern innovation. The Gong Factory in Bogor stands as a testament to the harmonious fusion of tradition and technology. Guided by the expertise of Mr. Krisna and Mr. Hidayat, the factory instruments not only produce enchanting melodies but also serve as a living embodiment of Indonesia rich cultural heritage, reflecting the past while embracing the possibilities of the future.

4. Conclusions

The intricate interplay between tradition and technology presents in the production of *gamelan* instruments at the Bogor Factory in Indonesia. With a historical continuity spanning over 370 years, the study underscores the unwavering commitment of skilled artisans to preserving Sundanese cultural heritage through traditional craftsmanship. Importantly, this commitment does not exist in isolation but rather coexists harmoniously with modern technology, as evidenced by the use of smartphones for tonal fine-tuning. The five-stage manufacturing process, described in meticulous detail, showcases the precision and artistry underlying *gamelan* making and reflects a careful balance between tradition and innovation. Through the dedication of key figures like Mr. Krisna and Mr. Hidayat, who navigate the challenges and opportunities presented by technology, the Gong Factory in Bogor emerges as a living embodiment of Indonesia cultural richness, embracing the past while embracing the future.

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