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Citation:

Brunt, S and Johnson, H 2013, 'Click, play and save: The iGamelan as a tool for music-culture sustainability', *Musicology Australia*, vol. 35, no. 2, pp. 221-236.

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<http://dx.doi.org/10.1080/08145857.2013.844497>

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‘Click, Play and Save’: The iGamelan as a Tool for Music-Culture Sustainability

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Abstract (100 words)

This article explores the potential for web-based interactive music resources to represent and sustain music-culture heritage via digital means. Our focus is the University of Otago’s virtual Indonesian gamelan (iGamelan): an immersive online resource featuring interactive musical instruments, an audio-video gallery, and information archive. Designed in 2010-11 for use within tertiary education contexts, the iGamelan stands alone as an innovative learning/teaching tool, and also enhances real-life instructional sessions with the University’s *pelog/slendro* Central Javanese gamelan. This article illuminates the pitfalls and achievements of the iGamelan project and, at a broader level, demonstrates how contemporary technology can sustain active music-making cultures.

Introduction

Gamelan has long been used as an educational tool to introduce University students to Indonesian music-culture.¹ As renowned ethnomusicologist Mantle Hood noted with regard to teaching and learning gamelan in 1960, it is the ‘the training of the eyes, ears, hands and voice’ (55) that leads to a real comprehension of another culture’s musical practices. His goal of bi-musicality—namely, acquiring fluency in another musical ‘language’—was often achieved through hands-on playing and listening to gamelan, as well as understanding the notation, and the cultural context for performance. Hood’s own acquisition of knowledge came from learning gamelan in Indonesia, and then teaching gamelan in western institution: two very different contexts. It is interesting to note that in 2011, students can still encounter gamelan in much the

¹ For an outline of gamelan see, for example, Sorrell (1990).

same contexts, but they are also living in the age of digital culture where mediated music is part of daily life. This article embraces this additional context and considers a new way of gamelan teaching and learning via a digital Central Javanese gamelan which was developed as an educational project at the University of Otago, New Zealand.

The interactive gamelan, or iGamelan as it has been named, was created during 2010-11 by a team of researchers and IT staff at the University, and lead by the primary investigators (who are the authors of this article) and Javanese gamelan instructor Dr. Joko Susilo. One goal for this web-based musical instrument is to function as a virtual tool to facilitate and complement the learning process before, during and after practical classes on the gamelan, which is utilized in teaching and performance at the University of Otago. Another goal has been to use the educational tool to convey the musical practice and approach of a Javanese culture bearer to undergraduate university students of ethnomusicology. In this way, the sustainability of gamelan practice and culture has been of prime importance, and is also the focus of this article.

The research team intervened throughout the production process as a way of helping the sustainability of gamelan—or at least gamelan through New Zealand ears, eyes and body—and particularly through a philosophy of celebrating cultural and musical diversity through participatory experience. For the purpose of this article, the notion of sustainable musical cultures is about creating pathways for deeper musical understanding. It recognizes the boundaries of musical homelands and their embodied musical soundscapes. But the project does move beyond the ‘musical museum’ of cultural preservation, and ideas of protecting a real or perceived authenticity. That is, if there is one single outcome the iGamelan might achieve (amongst a long list of objectives), it would be the exposure of traditional Central Javanese gamelan music and culture to a new generation of trainee musicians, who are geographically and socially removed from the gamelan’s recognized national and cultural home of Indonesia. Even though such a notion is replete with contradictions and invites accusations of inauthenticity, it will inevitably help with the musical sustainability of one of the world’s

traditional, contemporary and progressive musics.

It is useful at this early stage to briefly describe the iGamelan and outline the features and benefits, although a more detailed discussion is undertaken later in the article. The iGamelan is housed as a website which consists of a homepage (see Figure 1), and several linked pages that feature playable virtual musical instruments, as well as other information-rich media such as video, audio, images and text to enhance the online learning environment. This combination of material not only enables students to watch or listen to gamelan music, but also create and re-create music—this helps nurture musicality, cross-cultural understanding and performance and cultural knowledge. The unique features of the iGamelan’s interface offers a degree of flexible learning, online interaction and a context for assessment, and has been developed by the authors as a way of encouraging self-motivation and interest in Indonesian music amongst students taking music courses at the University of Otago.

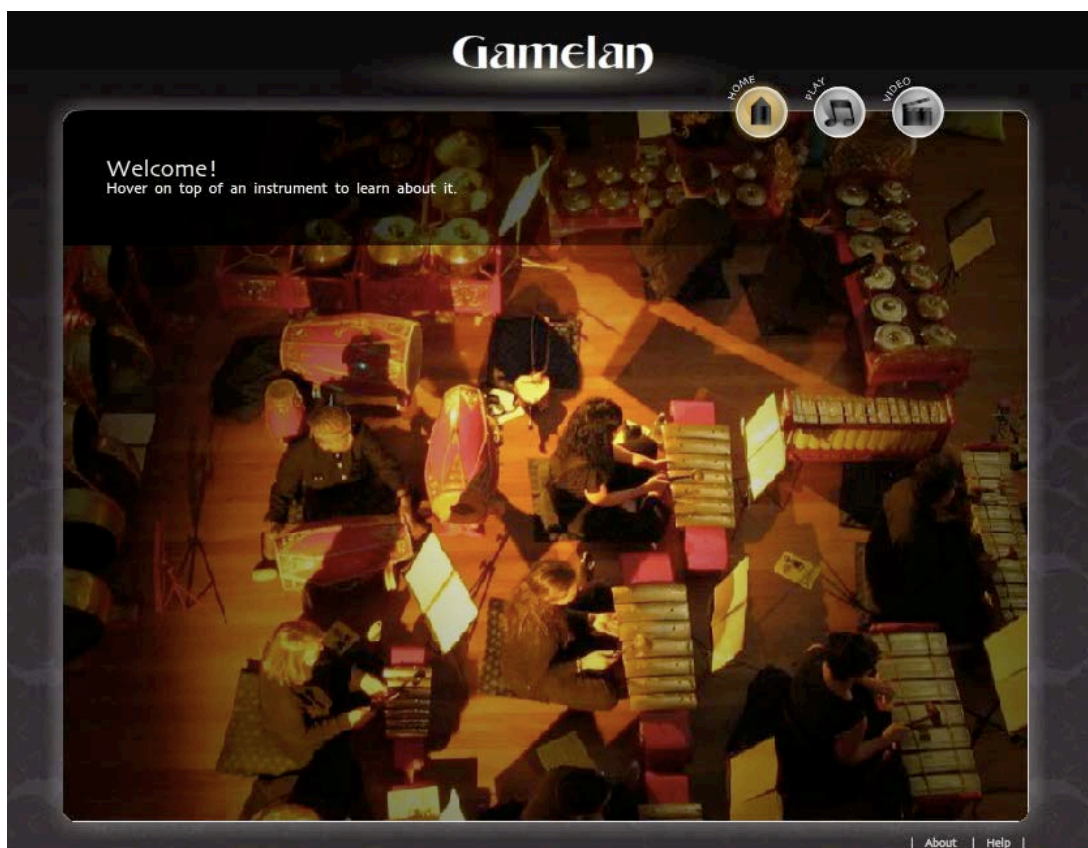


Figure 1: The iGamelan homepage

This article shows the dynamics of musicking, to borrow a term coined by Small (1998), in the Indonesian musical imagination in a transcultural context of global flows through the mediatization of gamelan in a New Zealand tertiary education setting. The discussion emphasizes the notion of the sustainability of music in three distinct spheres of cultural production, each of which is given emphasis in separate parts of this article as a way of stressing the dynamics of music traditions and their adaptability to and influences from contemporary technology and media.

This article is presented in four parts. The first part considers the cultural context of this project, and how it seeks to construct a staged or framed authenticity. The second part of the article discusses the iGamelan in terms of the creative context in which it exists. The idea of creativity is given emphasis as a way of showing how so-called traditional musics move within, between and across real and imaged cultural borders, and in doing so performers are creative in adapting to and being influenced by the contemporary technological world in which their music nowadays usually exists. The third part examines the role of digital culture in music education contexts, with particular attention being paid to online instruments. From this perspective, we consider some of the benefits and problems with the iGamelan, and draw on feedback from students who have trialed the resource for the first time. The methods used to obtain this feedback are mixed. The authors have undertaken applied research on the resource as a way of producing a usable tool in their teaching; we have collected and studied qualitative data from initial student feedback on the resource; and have critiqued our own work as well as the project as a whole. The fourth and final part of this article discusses the iGamelan in the context for which it was produced: the tertiary music education setting at the University of Otago in Dunedin, New Zealand. Throughout this discussion, the underlying theme of sustainability and gamelan is examined, with particular emphasis on the implications for music-cultures, performance practices, and ethnomusicology as a discipline in tertiary contexts.

1. Authenticity and the iGamelan

The iGamelan is based on a notion of constructing a staged or framed authenticity within a digital learning environment (cf. Titon 2009). Our collaboration with Dunedin resident and Javanese gamelan expert, Dr. Joko Susilo, (who is also a tutor in gamelan performance at the University) was undertaken with the aim of producing an online resource that focuses on three pieces of music that are perceived to be part of a traditional gamelan repertoire from Central Java. In conjunction with Dr. Susilo, we selected three contrasting musical forms: *lancaran*, *ketawang* and *ladrang*. The pieces are ‘Lancaran Singo Nebah’ (laras slendro patet manyura), ‘Ketawang Suksma Ilang’ (laras slendro patet manyura) and ‘Ladrang Slamet’ (laras slendro patet manyura).² The collaboration, which also extends to computer programmers, educators and sound and film technicians at Otago, has an objective of including the recognized cultural insider as a way of sustaining an authentic representation of a Javanese musician playing each of the instruments, and offering a culturally authoritative understanding of the musical forms and cultural background, information of which is included as part of the resource.

The iGamelan’s framed authenticity recognizes collaboration and an ethical approach to research as core principles of contemporary ethnomusicological enquiry. As Hayward (2005, 59) has stressed in his work on ‘Culturally Engaged Research and Facilitation’ (CERF), ‘it is a fundamental ethical responsibility of universities and research and arts funding organizations to affirm and support CERF’s model of engaging with and facilitating cultural communities’. In this context, the iGamelan is intended for a community of gamelan players, some sharing ethnicity and homeland, others not, but each sharing a culture of making music through gamelan performance in Dunedin. With regard to musical sustainability, and in much the same way as argued in Fargion’s (2009) work on sound archives, and Turino’s (2009) on studio recordings, the iGamelan offers a digital environment that contributes to ensuring a musical endurance of Javanese music as transmitted by an individual long-term migrant to New

² Each of these pieces is in the *slendro* (5-note) scale using the *manyura* mode. It is envisaged that a further development of the resource will also include instruments using the *pelog* (7-note) scale.

Zealand, and shows how musical culture can be sustained in modern-day mediascapes (cf. Appadurai 1996) as part of a process of education on musical diversity.

Cultural framing in the creative and performing arts has been an underpinning point of reference for many researchers for many years. For example, some studies in the field of performing arts offer comparable examples, particularly in the work of Balme (1994), as does much work on the idea of cultural performance (e.g., Balme 1998). However, we would hope that the user of the iGamelan is able to engage with Javanese culture at a much deeper level than a touristic gaze or musical simulacrum would (cf. Urry 1990). That is, the iGamelan is intended to offer a place where a Javanese culture bearer can engage with primarily outsider learners—where the intersection of cultural understanding, tertiary music education and musical sustainability combine with contemporary interactive computer technology to produce a heuristic tool that celebrates tradition, its past, present and future.

2. Creativity and Gamelan Performance

Creativity in gamelan performance has many manifestations, including recreating traditional music in authentic ways, elaborating on some instrumental parts to offer a degree of individuality in performance, improvisation on instruments and at places where this practice is recognized, and generating new music that either extends earlier styles or invents new ways of musical understanding. Within this variety of interpretations, the notion of creativity in gamelan performance has received much scholarly attention in various ways. For example, the Javanese scholar and gamelan performer, Sumarsam (2005, 116; 127; 205; 229), comments on some of these various creative processes in gamelan performance, and also notes the degree to which traditional and new music forms the contemporary repertoire. Tenzer (2000) too comments on the creative processes of gamelan, albeit here in the Balinese setting with performer Nyoman Windha generating ‘thirty minutes or more of new music on the spot’ (306), while shrugging ‘off his creativity’ (307). Other discussions of the multiple ways creativity is

inherent in many styles of gamelan music are offered by such scholars as Bakan (1999), Perlman (2004, 28–35), Sorrell (1990), and Sutton (1991). Indeed, Perlman (2004, 28) notes the lack of a coherent theory of creativity, and focuses instead on three individual's conceptualizations (7). Moreover, as Bakan (1999, 155) comments in connection with creativity in Balinese gamelan and the appropriation of 'foreign' ideas,

Asnawa acknowledged that he had become increasingly drawn to the idea of employing non-Balinese elements in his *beleganjur* creations, provided that 'the practice does not become over-indulgent'. 'It's about creativity'.

Placing gamelan in the non-Indonesian setting, Solís (2004) has extended the idea of gamelan performance and creativity into the notion of the world music ensemble, which in modern-day music studies at many universities the world over is a standard field of study as a way of offering a window into musical practices that might ordinarily be far removed from a student's original musical training. It is in such a non-Indonesian context that players are confronted with a paradox of musical creativity: whether to mimic Indonesian gamelan to the best of their ability; or to create new works or re-interpret the work of others. Many gamelan groups outside Indonesia employ a Javanese or Balinese performer with the aim of reproducing Indonesian music authentically. Other do not, or wish to use gamelan as a new medium through which to express their own non-Indonesia/Indonesian-influenced musical identity (e.g., *Gamelan Son of Lion*).³

In the New Zealand context there are six gamelan (Johnson 2006), and much creativity is evident in this transplanted context for gamelan in terms of the reproduction of Indonesian music as well as the production of new music (Brunt and Johnson 2011; Johnson 2008). At the University of Otago, for instance, the gamelan is from Surakarta (Solo) and the Department of Music employs a casual staff member, Dr. Joko Susilo, from Java and now based in Dunedin, to teach the community group, *Puspawarna Gamelan*, and students taking performance studies in gamelan as part of their degree.

³ See the official website at <http://www.gamelansonoflion.org> (accessed 11 November 2011).

Creativity takes place in the Otago gamelan setting in many of the ways already outlined above. Moreover, Soil's teaching style moves students through layers of technical and musical ability, with each level offering further ways of creating gamelan music in the ensemble context. The gamelan players learn and perform traditional pieces in this way, and also new music composed by Susilo and others (see the *Gamelan and Strings CD*; also Brunt and Johnson 2011). In terms of the gamelan's wider musical and media influences, the group plays crossover music, has recorded an album, uses amplification for some instruments and voice during performances, and utilizes lighting effects to enhance its musical productions. It is from this perspective that the iGamelan offers a continuation of a musical tradition that creates culture in New Zealand; and one that embodies the idea of gamelan creativity that is both extending tradition and offering something new.

The iGamelan offers a context of creativity in several ways for the online gamelan student. The current prototype interface allows the user to play a *saron barung* (a *saron* of medium register), either by moving the cursor and clicking the mouse to sound a note, or by pressing a pre-defined key on the computer keyboard (a part of the interface teaches the user which keys to press) (see Figure 2). This is essentially an exploratory part of the interface where the student experiences the sounds that are possible from the instrument's playing position.

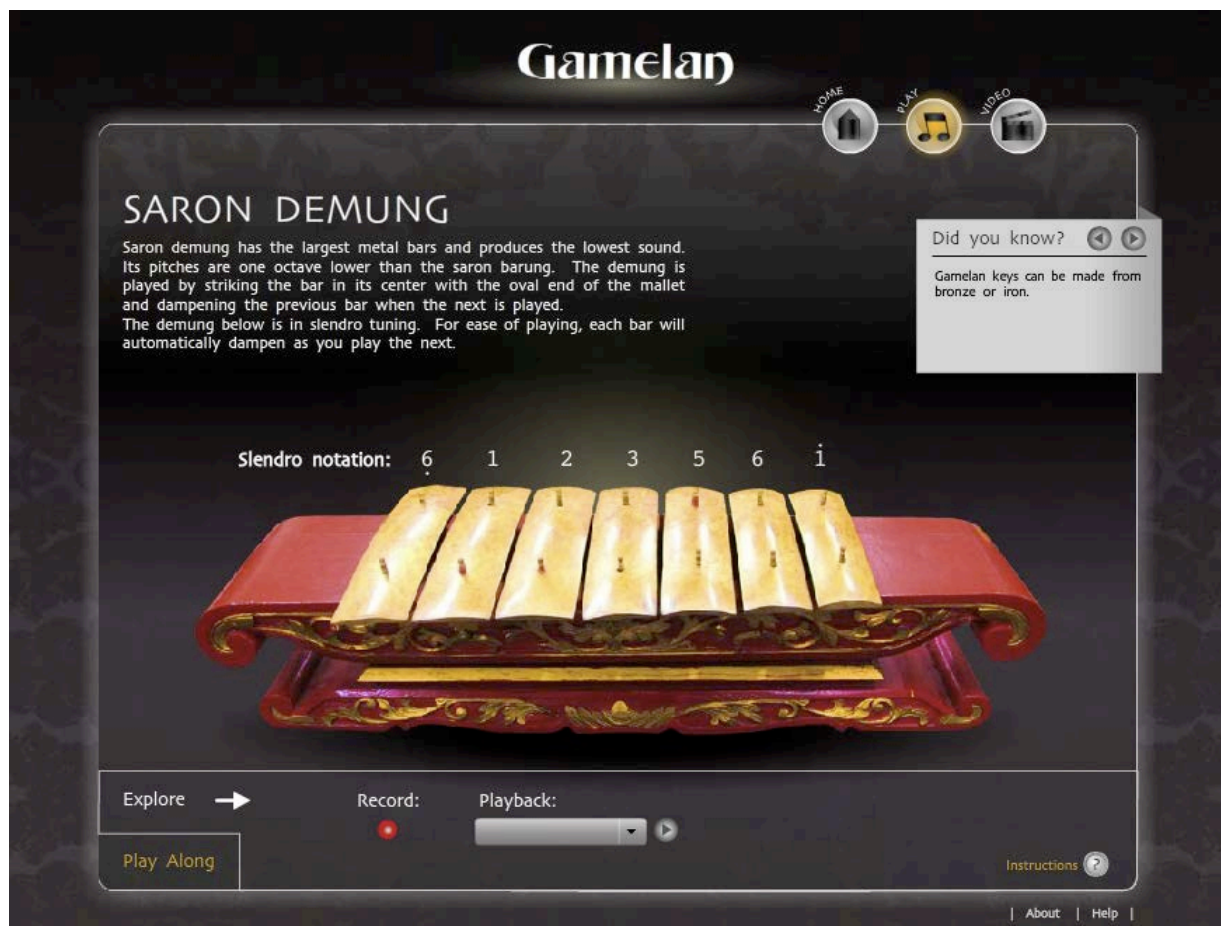


Figure 2: The saron barung interface for the iGamelan

The theme of creativity was particularly evident in student responses to the initial version of the resource that was trialed with second- and third-year students, during the first half of 2011. Students had access to the iGamelan for two blocks of 50 minutes, and were given little to no instruction as to how to operate the digital instruments or navigate through the website. This was a deliberate strategy on the part of the researchers, in order to encourage exploratory behaviour and musical creativity. Within this sphere of creativity, the students especially mentioned the resource being able to help them with improvisation, albeit one student moved into this area as a result of not being able to follow the notation that is also provided:

I found myself...improvising rather than seriously attempting to follow the notation for the saron.⁴

⁴ All responses from students noted in this paper are given anonymously and adhere to the University's guidelines for ethical approval.

This idea was reinforced by students who were learning composition as part of their University studies. They noted that the iGamelan not only offered an opportunity to perfect timing, rhythm and other aspects for a set piece, but also offered an opportunity for them to spend more time exploring the timbral possibilities of the *saron barung* for their own compositions. The polyphonic nature of the digital *saron barung*, just like the real instrument, allowed for a myriad of musical possibilities...

I found the iGamelan to be a surprisingly useful compositional tool. I was able to create and record some interesting sounding phrases.

Some students even saw the creative possibilities for the digital instrument as having the potential to affect the gamelan tradition itself, with a view to developing new and innovative musical forms:

I can also see it being used to develop new, modern gamelan styles.

The composition students, in particular, enjoyed the observed the ‘explore’ function for the interface, which allowed students to record their improvisations, save them, and play them back (i.e., ‘click, play and save’). In doing so, they envisaged new ways the iGamelan could help them with their own compositions—taking the resource beyond its initial goal of being an educational resource:

I can see some really cool compositions coming out of this program...Someone who had never experienced [a real] gamelan could play around and make something that really adds to the [other] music they are creating.

The ‘explore tool’ could be a really interesting route to [a] fusion of musical styles, as well as a tool for education about the gamelan traditions.

In terms of what this creative context means for sustaining gamelan performance, the iGamelan interface allows the real material objects of music material culture to be comprehended in an interactive online learning environment in a tertiary educational setting. Non-Indonesian students are learning about music that is distant to them, both culturally and geographically; an

extension of the technological and mediatized contexts of contemporary gamelan performance is made by offering a simulacrum of gamelan instruments in a digital environment; and creativity is espoused as an approach for online learning to encourage students to be musical while gaining cultural knowledge before they actually play on the real instruments themselves.

3. Mediatization: Music and Digital Culture

The proliferation of digital culture in recent years has opened up new possibilities for the consumption and production of music in online settings. Even a brief survey of recent technological innovations in digital technology, and its use, demonstrates the proliferation of digital music in our everyday lives (see Bakker 2005, 43–44; Hesmondhalgh 2007). For example, the establishment of mp3 as the digital audio compression standard during the early 1990s, enabled whole catalogues of music to be stored on a computer. This development, coupled with high bandwidth and faster internet speeds permitted rapid sharing of music files between users, was supported by the introduction of multi-media computers with hi-quality sound-cards and speakers. Furthermore, the development of computer software to rip audio CDs, and software to find and download mp3 audio, created an enormous number of online music databases. Some provide an illegal service which breach copyright laws (such as Napster circa 1999), while others are legal and charge a fee (such as Apple's iTunes Music Store which began in 2003), and a further category of peer-to-peer file sharing services straddle the line. Ultimately, these innovations resulted in new ways music is purchased, composed, copied, downloaded and shared, but they also demonstrate why new opportunities have emerged for the creation of unique music applications (or, software).

One of the most fascinating types of application is the 'virtual instrument': a classifying term that pertains to the iGamelan. A virtual instrument may simply be a computer interface for manipulating sound in a performance setting, or it may offer an environment that emulates a physical version. At this juncture, it would be remiss to ignore one of the most prevalent forms

of virtual instruments today, namely, applications for mobile digital devices such as Apple's iPhone, iPad, and iPod Touch. These devices are already intended to generate sound (for transmitting telephone calls, or playing music as entertainment), but they also have a range of sensor capabilities (push or slide buttons, microphones, multi-touch screens, etc), which enable interactivity (Essl and Rohs 2009, 197). As such, they offer an ideal platform for music applications, as noted by Tanaka (2009), who has examined how PDAs could stream music, and Geiger (2006) who has explored the potential for music instruments on portable touch-screen devices. Most notably, Schiemer and Havryliv (2006) have investigated how existing mobile phone technology can be used in order to produce micro-tonal musical outputs.⁵ As further digital opportunities are explored with regard to instrument simulation and mediatization of music, the scholarly study of mobile music-making will no doubt also flourish (see also Dillon 2007; Essl and Rohs 2009; Johnson 2010; Miranda and Wanderley 2006; Wang 2009).

Mediatization is part of the iGamelan in several ways. As well as offering a simulated virtual environment for playing a *saron*, the resource also acts as a audio-video gallery for students to see a cultural insider playing all the instruments included in the three pieces included in the current version.

A second level of creativity is a karaoke-type of context, where the student can choose one of several pieces of gamelan music (noted above) recorded by Dr. Joko Susilo (playing all the main instruments and dubbed to form one orchestral sound) and play along to it. The pedagogical philosophy underpinning this level of the resource is that a user/player not only hears the sounds of an entire piece of music, but also is able to play along to it. Throughout the process, much learning is left to the student in terms of experiential learning. That is, the interface allows the user to literally explore: sounding the instrument; watching recordings

⁵ Schiemer and Havryliv (2006) call this a 'Pocket Gamelan', but is not actually a simulation of the Indonesian music ensemble of the same name.

from the audio-video gallery (see Figure 3) to hear and see other pieces and parts being played by Susilo; and listening to complete pieces in the karaoke section.

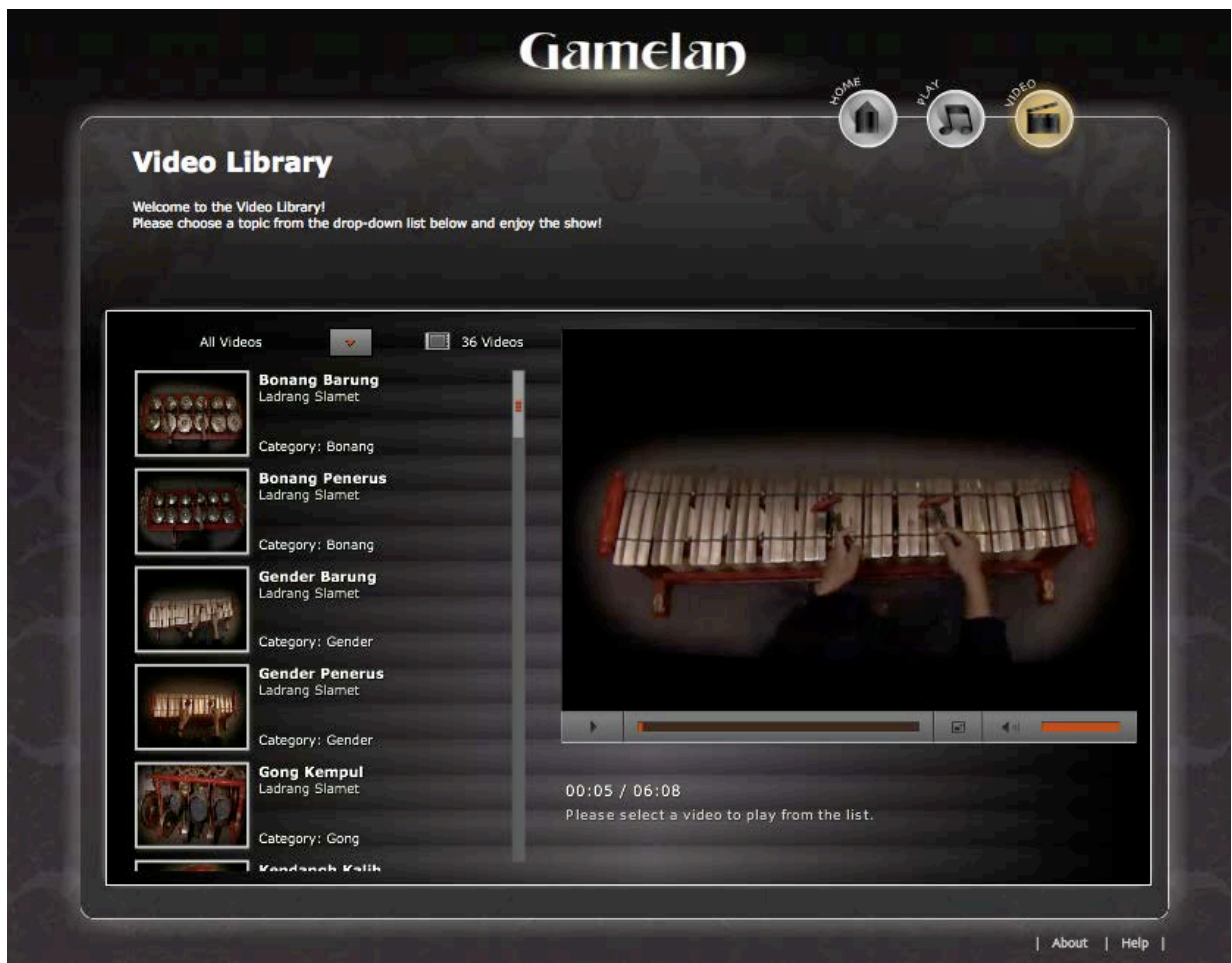


Figure 3: The video library for the iGamelan, featuring Dr. Joko Susilo playing the instruments

In terms of how students responded to this sphere of mediatization, several comments below offer valuable insight in connection with the resource helping to contribute to sustaining a cultural tradition that has creativity at its core. Several responses pointed out the unique way that the resource helps them with their musical development, especially in connection with the technology used. For example:

I noticed...my rhythm was horrible. On my second attempt, I specifically paid attention to being in rhythm, but I was still behind on the playback...It was interesting to see with the playback feature that the mistakes I made with the iGamelan were similar to the ones I made with the real gamelan.

Another student observed the link between the real instrument (*saron barung*) included in the resource, and the technology, within the New Zealand setting. They saw the benefits of learning about Indonesian culture in a virtual context: a context which could be accessed from anywhere in the world due to digital innovation:

The most rewarding aspect...is definitely the idea of combining virtual technology with gamelan, providing a cultural experience here in a totally New Zealand context in front of a computer.

The audio-video gallery—a specialist form of mediatized instruction about gamelan—was regarded as a highly valuable resource for the participants. These videos documented Susilo's own performance style for each of the instruments (such as *kenong* and *kethuk*, and *gendèr barang*) in the real gamelan ensemble housed at the University of Otago. Many of the students had never seen him—or anyone else—play some of these instruments before, and they offered a unique perspective from a cultural insider:

The videos clarify aspects of the performance and techniques that an individual is unsure of and it was wonderful to see Joko, a world-leader in gamelan, performing each instrument.

The very nature of videos permitted students to pause, rewind and replay Susilo's performances at their leisure. In this way, the technology allowed students to watch, listen and learn at their own pace. The camera used to capture these performances was positioned at an angle which either showed an instrument from the perspective of the performer (where appropriate), to ensure a degree of authenticity for the potential player. However, some instruments, such as the *suling* (end-blown bamboo flute) were viewed from above, to fully capture the fingering, mouth and breathing techniques used by Susilo.

Watching the videos, I learned a lot about the techniques of the instruments I never got to try, especially the suling flute. I noticed that even when the player's fingers don't move, sometimes the pitch changes. There must be a lot of pitch control from either by tonguing, breath control, or variation of embouchure.

The video performances also provided an opportunity for students to come to terms with the function of an instrument in the gamelan ensemble. Some students who had previously

observed Susilo playing a certain instrument in the practical workshops had only been taught very elementary musical patterns. However, upon viewing the video of the same instrument, played by Susilo in a more advanced manner, they realized the instrument had greater potential than what they had first imagined. One student in particular conveyed this realization upon viewing the videos of instruments from the *gendèr* family (metallophones with keys strung over bamboo resonators):

Watching the gendèr video, I realized that the gendèr part can be much more exciting than what we played in our gamelan workshops. For [the pieces played in class], the gendèr played the central [balungan] melody. In contrast, the video on iGamelan shows the gendèr playing around the central melody, adding a really cool ornamentation element to the piece.

The videos also allowed students to use innovative to encourage self-learning. One student learned a new part for the *saron demung*, which we had not provided the notation for, simply by listening and watching Susilo's video:

The most rewarding aspect during the workshop today was successfully transcribing and playing a portion of the saron demung part in one of the videos. I decided to challenge myself to learn a new ghending on the saron by listening to the piece and watching the video.

Aside from the video gallery, the mediatized nature of the iGamelan meant that we could offer a function of allowing the user to play-along, record and play-back their musical efforts , as noted above. During the initial evaluation stage, several students responded in connection with their learning ability and the tool's value:

I could explore and play what I wanted to play. This allowed me to play one of the songs that I tried to memorise from our actual gamelan workshops. At first I could not memorise it but this virtual gamelan instrument helped me remember. It allowed me to experiment with the notes on the instrument until I got them correct.

Students saw the 'play-along' function as particularly useful in helping them to learn the correct way of playing the *saron barung*. The metal keys of the instrument lit up when the students clicked on it, allowing them to see a visual correlation between the key itself and the sound it makes. This enabled a faster process of learning:

It was really helpful to see the keys light up, so I could identify exactly what I had done correctly, and what had gone wrong. Not only could I hear the mistake, I could also see it.

In addition, the accompanying audio helped students to see how their own part could fit in with the rest of the ensemble. This facilitated an important process that shifted away from segregated individual learning, and instead encouraged musicality within a broader sphere of ensemble playing. As one student astutely noted, the accompanying musical parts—all played by Susilo—were ‘correctly’ played by an experienced cultural authority, and provided a point of comparison for their own musical performance as an amateur:

This was very helpful because unlike us inexperienced students, this gamelan ensemble does not play incorrectly (in terms of the keys, timing, and rhythm), so if something sounded incorrect it was easy to pinpoint where I was going wrong in accordance with what the rest of the ensembles was paying.

During the initial evaluation stage of the project when students were offered the opportunity of using the resource and providing critical feedback, one theme that emerged was the dichotomy between using a computer-generated gamelan and the real instruments during hands-on workshops (see Figure 4 for an example of the digital environment in which students engage with the iGamelan). It is this juncture that on the one hand takes the gamelan out of context, yet at the same time provide a setting that can actually contribute to its sustainability, albeit in an environment that utilizes contemporary technology and recognizes the dynamic global flows that are often inherent in many world musics, including Central Javanese gamelan. On a purely practical level, in terms of time management some students commented on the value of the resource in the sphere of flexible learning:

Often you do not get much time to think during practice and coming to a rehearsal equipped with this sort of knowledge would be incredibly useful to someone who actually plays in a gamelan ensemble.



Figure 4: Students at the University of Otago trialing the iGamelan

Another useful facet in the flexible learning context of a digital instrument is that students have the time to experiment.⁶ During practical workshops, students are usually under the guidance of the instructor, so individual self-study and experimentation is not always possible. As this student noted, the iGamelan allowed another complementary dimension to gamelan creative play, and benefitted the student in terms of their accumulation of knowledge:

It was rewarding to be able to experiment on the iGamelan with an instrument I had played in the gamelan sessions with Joko. Therefore, I did not struggle with finding the keys and this saved a lot of time.

The iGamelan also offers flexibility in terms of learning time. Students who learn using the gamelan instruments in hands-on workshops may focus on other aspects (such as notation, holding the beater for the instrument, or keeping in time) when faced with a group learning environment. With the iGamelan, however, they play on their own and at their own leisure:

Because we were so focussed on learning the songs on the instruments in front of us [in the workshops], I felt I hardly had time to look around and appreciate the other [instruments in the ensemble].

⁶ At December 2011, only the *saron barung* is operational on the iGamelan, but it is intended that others are to be added at a future development stage.

It should also be noted that access to the real instruments, which are housed in a discrete gamelan room, is not always easy for some students. Moreover, the size and weight of the heavy instruments do not allow for portability—students can only play the instruments in the dedicated location. It was observed that:

This programme would be an excellent tool for practicing saron, especially since the gamelan is not very portable instrument but also because being able to listen to your self makes you take notice of everything that you are doing making yourself [a more] aware player.

Overall, we can see a variety of responses about the benefits and hindrances of this mediatized iGamelan. The digital format allows for individual creative play and expression, as well as the time to learn at a student's own pace. The online virtual environment means it can be accessed at any time of the day by students—a far cry from the restricted access that is usually required for instruments housed on University property. The iGamelan also permits a degree of playing authenticity, in that particular notes are sounded when a key is 'hit' on the computer keyboard, but does not attempt to replicate the playing experience on an actual *saron barung*. However, when the explore function is used in conjunction with the videos from the audio-video gallery, we can see students expand their knowledge about the function of the *saron barung* within the greater ensemble, and imagine the full possibilities of musical creativity for gamelan more broadly.

4. Education

The educational aim for developing the iGamelan was primarily for use in several Department courses (papers) at the University of Otago, including MUSI 104 (Music in World Cultures), 140 (Performance Studies 1), 226 (Music in Asian Cultures), 240 (Performance Studies 2), 326 (Music in Asian Cultures [Advanced]). The total number of students likely to be taught in the project in any one year would be between 100 and 150. The project had two main outcomes. The first was to provide flexible learning in order to enhance the teaching context and quality of student learning outcomes through effective integration of learning, teaching and ICT. This

e-learning tool is used to help attain a flexible learning environment where students go online to utilize the resource before, during and after practical classes on the instruments themselves. Students are initially introduced to gamelan through the e-learning environment so that when they come to use the actual instruments they already have substantial knowledge of how to play, what the instrument sound like, and how the music is structured. This greatly enhances the teaching context, and allows all students to begin the practical classes at a comparable proficiency level. Through the interactive gamelan, they consolidate knowledge learned during classes, extend that knowledge within an interactive e-learning context, and prepare original creative study in preparation for further hands-on time with the instruments.

The second outcome is to provide a resource that will capture the intricacies of gamelan performance for lifelong learning. Overall, the project aims to promote and encourage teamwork, collegiality and collaboration between teaching staff and students. One of the key aims of building an e-learning environment has been to capture the intricacies of performance practice for select instruments that are essential for understanding gamelan music structures. Students are able to extend their experience on gamelan in their own time and explore the sounds of the instruments in ways that may not always be possible during class due to time restrictions or a lack of one-on-one access to certain instruments. Students have time to learn existing music and be motivated to create new music within the e-learning environment. The resource enables students to develop international awareness and understanding of the diverse music cultures of Indonesia through in-depth knowledge of gamelan performance, comprehension of music form, and interaction through 'hands-on' experiential learning and musical creativity. With a knowledge of gamelan music structures, students are able to consolidate their knowledge of Indonesian music, experiment with their own music structures, and generate a context that encourages lifelong learning, as well as appreciation and understanding of music in its cultural context.

As well as some of the ways the iGamelan offers a context of self-learning and exploration, as

mentioned earlier in this discussion, in terms of the broader educational implications of the resource, during the evaluation stage students offered various comments that show evidence of helping them to learn in this setting. The one theme that was especially evident in student responses was the value of the tool in terms of flexible on-line learning—a point we have touched upon in the previous section, but one that is worth further exploration and elaboration here within an educational context. It was interesting to note that the students themselves were aware of the different learning processes between the instructor-led practical workshops and the student-led iGamelan classes, noting the benefits of the latter:

In the previous gamelan workshops, the class practices together as an ensemble; there was no time for individual practice. [But in the iGamelan workshops] I found the individual work useful as I could explore the sounds of the instrument and play my own melodies.

This process [of independent learning on the iGamelan] would have been less rewarding if I had a tutor guiding me and teaching me the steps of learning a new part. I believe that there is a greater sense of achievement through self-learning and exploration.

To me, the most rewarding aspect of the iGamelan in the workshop today is gaining achievement through self-learning. Given the freedom to explore the interactive gamelan website, I gained information and knowledge by exploring the features on the website, experimenting [with] music from the saron, learning a new piece through the observation of a video, etc.

In this context, the iGamelan helps facilitate flexible learning and encourages greater independence. Several students observed a sense of self-worth from figuring out how to play challenging parts on the iGamelan:

The fact that I managed to self-learn a difficult piece of music for an instrument which is unfamiliar to me, brings about a sense of accomplishment and gratification.

Others brought the knowledge they had acquired from the practical workshops into the iGamelan learning environment. This was extremely pleasing to see—an example of how the resource can be used to complement the existing classes:

I watched the video on the [iGamelan] a few times and transcribed the notes using the notation we learnt during the [hands-on] gamelan

workshop. I was quite excited that I managed to figure out about 6 'bars' of music before the end of the [iGamelan] workshop.

Some students noted some other benefits of the iGamelan in connection with their learning, especially how the resource can be used as a personal training tool with a view to perfect their playing within a 'real' gamelan ensemble:

It allows the user to familiarise themselves with a piece of music, so that when they attend gamelan rehearsal they will already know how their part goes, and there they can focus on their technique.

These student comments help to show the value of the iGamelan as a resource for nurturing learning by utilizing such an online interactive resource. What is evident from the feedback noted above is the value of the resource as a way of speeding up learning on the actual instruments themselves. Students do not use the iGamelan to replace the real instruments, but, rather, as a tool to supplement their learning, which necessarily includes not only physical and cultural parameters, but also a creative sphere too.

In the tertiary education setting, gamelan is being sustained in several ways, including the physical transmission of Central Javanese gamelan to the City of Dunedin, the teaching of traditional and contemporary repertoires by culture bearer Dr. Joko Susilo, the adaptability of the music by Indonesian and non-Indonesian performers to suit their musical ability in Indonesian music and the hybrid context in which they are being used, and by producing such resources as the iGamelan as a way of extending knowledge and experience of understanding and playing gamelan to other spheres of cultural production.

At the University of Otago, gamelan is learned in both its real form and in a mediated way through the iGamelan. This has many implications for sustainability. First, the iGamelan extends knowledge of gamelan and experience in playing it virtually so that learners can gain some ability before they play the real instruments. This helps move cultural knowledge into contemporary digital and interactive media with the aim of capturing student attention by inspiring them through learning tools of which they usually have more knowledge than the

culture itself. Second, the iGamelan offers a way of contributing to gamelan sustainability by not only mediatizing its instruments and music for archival and education purposes, but also by extending gamelan to new players who may physically and culturally be far removed from the actual and symbolic home of the instruments in the first place. It is here that sustainability moves into social and cultural spheres of musical production that one the one hand seem almost contradictory in the context of many ways of interpreting traditional musics, yet on the other realize some of the dynamic ways in which musical futures are generated by a tension between a desire to sustain traditions at the same time as realizing the hybrid nature of many traditional musics in the first place.

Conclusions

The iGamelan simultaneously helps construct and deconstruct notions of cultural authenticity in that its staged or framed performance media provide data from a cultural insider yet, at the same time, it offers that knowledge through contemporary interactive technology and learning context that are not usually associated with learning gamelan. Indeed, the iGamelan contributes to helping engage students from one culture with the music of another—it challenges notions of authenticity and inauthenticity; and it provides a context for nurturing musical sustainability through a process of recontextualization and mediatization.

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