



MUSIC – A CATALYST FOR TECHNOLOGY HUBS AND INNOVATIVE TALENT

The Information and Communications Technology Council (ICTC) is a leading not-for-profit national centre of expertise conducting research, policy development, and creating talent solutions for the digital economy. To discuss your organization's requirements, contact Jeff Leiper at (613) 868-2375 or visit www.ictc-ctic.ca (@ICTC_CTIC on Twitter).



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Introduction

Music is a fundamentally human experience. From the time we are born, we respond to music and rely on it to stimulate our creativity, provide us with solace, distract us or unite us. The structure of music can be experienced emotionally and spiritually, or studied mathematically. Music is hard-wired into us in ways that we can both understand easily, but also marvel at.

Many of the staff of the Information and Communication Technologies Council (ICTC) are musicians themselves, are proud of their children's music studies, or simply fans. It was with pleasure that we undertook this examination of how the study of music, and its prevalence in our cities, can contribute to our quality of life and prosperity.

ICTC's mandate is to research and support the development of a Canadian workforce with the necessary skills to work in the information and communications technology sector. Training, attracting and retaining talent is a critical consideration for educators, industry and policy-makers in Canada. This paper explores how music education and strong music scenes can contribute toward training a world-class digital workforce and then retain it in Canada to work for enterprises based here. Music is not necessarily top-of-mind when considering the digital workforce, and we hope this paper will be a key contribution to the important national digital economy discussion.

In a global economy, the emergence of the Internet and related technologies has hastened a transformation in the labour force. More than ever, the greatest economic potential is associated with jobs that require innovative thinking and strong digital competencies. Multiple jurisdictions globally compete for these jobs and for the companies that provide them. As manufacturing declines and work becomes more creative, it is critical that Canada foster the conditions to attract innovation-based companies, in order to compete at the level of innovation and productivity. Just as importantly, it is essential that workers in Canada are prepared to take on these jobs with a combination of the right training and the best educational foundation for success.

In the context of this paper, ICT workers or technology professionals are those in technology jobs such as computer programmers, software designers, video game programmers, network engineers and other technology-focused and digital media jobs.

As will be demonstrated by a review of current literature, early music education has the potential to enhance skills necessary for technology professionals. ICTC interviewed a number of technology professionals in various occupations who provided anecdotal evidence that their music education played a significant role in their professional development and current work experiences. Managers may not look for a music background when hiring, but interviews demonstrated that they do appreciate how music experience and training can contribute to a technology professional's success.

We have also done a comparison of the specific competencies enhanced by music training and those required by technology work. Our findings should put to rest any misperception that music studies are frivolous or a luxury in a digital economy.

While out-of-scope to this study, the author's do assert that, based on our findings, what is true for technology professionals is likely true for all workers. We stress the importance of several competencies developed by music studies and required by all ICT workers. But, it is important to note, many of these same competencies are broadly required of all workers in the digital, knowledge economy.

This paper defines a music "scene" as an urban location where there is active production and consumption of music through live music, festivals and recorded music production. There appears to be a strong correlation between vibrant music scenes and technology clusters around the world and in Canada. Jurisdictions around North America including Kitchener in Ontario and Austin in Texas make vibrant music scenes an explicit part of their economic development pitches to tech companies. These forward-looking centres know that the knowledge economy is resilient in the face of downturns and well-placed to adapt to changes in industry, technology and business models. Stimulating a knowledge economy will help Canada prosper as global markets shift and change. Music can help.

Canadian technology, innovation and productivity rankings have been falling in recent years. The technology industry focused on telecommunications hardware has fallen on challenging times as jurisdictions in Asia and elsewhere have established competitive advantages in technology manufacturing and some software development jobs are outsourced. Canada's way forward is likely to pursue higher-value activities such as interface design, analytics, digital content and similar, creative,

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activities. Our recommendations in favour of support for music education and scenes are intended to help secure our position in a global digital economy.

There is a key role to be played by policy-makers and other key stakeholders in ensuring that music supports Canadian prosperity. Parents and school boards make choices about how to allocate scarce resources with respect to hiring teachers and setting curricula. The promotion of music scenes in municipalities is a conscious choice that can be made by city councils. Stemming from our research, ICTC considers that several steps can and should be taken by policy-makers and others to capitalize on our findings:

1. Provincial governments need to make a conscious and significant investment in music education that supports 21st century curriculum and provides properly trained teachers with appropriate equipment and in optimal learning environments;
2. Curriculum should identify the connections between music education and technology careers to encourage a diversity of career choices for those studying music and to encourage technology students to pursue their music education;
3. Parents should be provided with resources on the benefits of music education and supported in advocacy efforts with levels of government and school administration;
4. Given the impact that music scenes have on the attraction and retention of top-notch talent and quality ICT employers, governments are well-advised to focus on the quality and diversity of their cultural industries as a tool for economic development. This requires support at all levels of government;
5. A national organization to collect and centralize information on the benefits of music education and participation to the careers of technology professionals, to assist them in ongoing professional development. Present information at workshops and conferences directed at technology professionals or crossover conferences such as NXNE Interactive and Digital Summit.

These measures, we consider, would be of enormous benefit to ensuring the Canadian workforce in the 21st century is fully prepared to compete in a digital, global market.



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Music and the development of technology professionals

Music and ICT Workers Professional Development

The study of music in school has long been a cornerstone of a well-rounded education. Countless generations of young people have had the opportunity to learn to play an instrument, learn music appreciation, and study reading music. Early education has always included music education in the curriculum in order to both foster an appreciation that enriches everyday life and also to spark creativity and nurture future artists. To quote the Ontario Elementary School Arts Curriculum:

Participation in the arts contributes in important ways to students' lives and learning – it involves intense engagement, development of motivation and confidence, and the use of creative and dynamic ways of thinking and knowing. It is well documented that the intellectual and emotional development of children is enhanced through study of the arts. Through the study of dance, drama, music, and visual arts, students develop the ability to think creatively and critically. The arts nourish and stimulate the imagination, and provide students with an expanded range of tools, techniques, and skills to help them gain insights into the world around them and to represent their understandings in various ways.¹

Music is an important component of civic life, helping Canadians to connect with each other and discover shared values and goals. As the Department of Canadian Heritage learned in a recent study, 89% of Canadians feel that music contributes to their quality of life and 92% agree or strongly agree that it is important that Canadians have access to music by Canadian artists.² Government support for music education helps to build a sustainable Canadian music industry that will foster participation of musicians and audiences and meet the needs of Canadians. However, there are other benefits to music education that suggest that it should have an even higher priority within government planning than it often has.

Music Education and Brain Development

Current thinking in neuroscience and psychology suggest that music has a variety of effects on the brains of children. There have been many studies that have explored the benefits of learning to play a musical instrument, and the effects of music on critical thinking, spatial reasoning and cognitive development.

It has been found that students in high-quality school music education programs score higher on standardized tests compared to students in schools with deficient music education programs.³ Students at schools with excellent music programs had higher English test scores than students in schools with low-quality music programs.⁴ Another study measuring brain development discovered that young children who take music lessons show different brain development and improved memory over the course of a year, compared to children who do not receive musical training.⁵ Musically trained children also performed better in general intelligence skills such as literacy, verbal memory, mathematics, and IQ.⁶ Further, learning in the arts encourages motivation, active engagement, disciplined and sustained attention, persistence and risk-taking. It also increases attendance and the desire to succeed at school.⁷

“It is well documented that the intellectual and emotional development of children is enhanced through study of the arts.”

A Concordia University study⁸ demonstrated strong evidence that between the ages of six and eight, music training can produce long-lasting changes in motor abilities and brain structure. This study was able to distinguish aspects of brain development between musicians with early musical training as compared to musicians who had started later in life. Not only did those with early musical training have enhanced skills, but also brain scans showed specific additional connectivity within their brains not present in scans of those with later musical training.

At a conference recently hosted by Groupe Média TFO, Dr. Jonathon Bolduc of the Faculty of Education at the University of Ottawa reported that 82% of students who participate in structured music programs finished high school, compared to 68% of those who have not. TFO had already surmised that there was a correlation between music education and scholastic success and as a result consciously offers their television audience a wide range of music programming to maximize the success of their educational mandate for all ages.⁹

There are also studies exploring the impact of music education on the development of 'soft skills'. The Coalition for Music Education undertook a survey of Canadian school principals in 2010¹⁰ to map out the musical landscape in schools across the



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country, but also looked at the benefits of music education on children. According to this study, music really does help to bring out the best in young people. It nourishes self-esteem, keeps them engaged and helps to create a respectful community. As the now Premier of Ontario, Kathleen Wynne, stated when Minister of Education:

“Arts education also fosters important skills, such as creativity and innovation. There is evidence to demonstrate a link between mathematical reasoning and expression, and music.”¹¹

The above sampling of research on the impact of formal and informal music education on children and adults demonstrates that it has a positive effect on academic achievement. Improved academic achievement increases the likelihood that students will continue on to post-secondary education which is increasingly important for career success in the knowledge economy. Early music education can enhance the hard skills that are particularly important to technology professionals such as mathematical reasoning, but also the soft skills like self-esteem and respect that are important to all Canadians.

“Music listening and performance impacts the brain as a whole”

Music education goes beyond the study of vocal and instrumental lessons. It cuts across multiple disciplines and encompasses the teaching of history, the mechanics of music, and the science of sound. A comprehensive scan of the relevant literature demonstrates that music education strengthens students’ academic abilities and social skills.¹² Integrating music within the regular school curriculum provides students with an array of opportunities to explore, create, innovate and help nourish their self-esteem.

Neuroscientific study has shown the profound impact music learning has on brain development. In a study published in the *Journal of Neuroscience* (January 2013), researchers have indicated that children who start music learning at a young age experience long-lasting changes in motor abilities and brain structure. According to one of the authors, Penhune, “Learning to play an instrument requires coordination between hands and with visual or auditory stimuli. Practicing an instrument before age seven likely boosts the normal maturation of connections between motor and sensory regions of the brain, creating a framework upon which ongoing training can build.”¹³

Individuals with a few to several years of music training develop strong communication skills and improve performance on everyday tasks.¹⁴ The benefits of music learning include the development of strong communication skills, increased computational abilities, and overall heightened performance and intelligence.

Another researcher, Yoon elaborates – “Music listening and performance impacts the brain as a whole, stimulating both halves – the analytical brain and the subjective-artistic brain, affecting a child’s overall cognitive development and possibly increasing a child’s overall intellectual capacity more than any other activity affecting the brain’s bilaterism”.¹⁵ Music’s enhancing impact on an individual’s intellectual and motor skills corresponds very strongly with the competencies desired of an ICT professional.

Even just listening to music can help. In another study, researchers from the University of Windsor in Canada studied the impact of music on the work performance of software developers. The study assessed the performance of the designers’ work quality in the absence and presence of background music. In the absence of background music, the designers’ quality of work was lowest and it took them more time to complete tasks. With background music, participants reported positive mood change and enhanced perception while working. Plus, the researchers noted that this positive change in mood correlated with increased curiosity — an excellent thing to have when doing creative work.

Music and ICT Competencies

ICTC has, since 1998, undertaken research to identify the competencies that the ICT industry acknowledges as vital for the rapidly evolving sector.¹⁶

The ICT industry requires a talent supply that can undertake independent and analytical thinking, demonstrate leadership, teamwork and plan their work assignments. Music education cultivates these skills that the ICT industry recognizes as critical for developing a well-rounded professional to work and perform in the marketplace. A synthesis of research studies from around the world suggests “learning a musical instrument at a primary school can boost a child’s confidence, which leads to more positive attitudes toward learning. Musical training also promotes social skills, such as teamwork and collaboration, and appears to improve student concentration”.¹⁷ Music education empowers an individual with an array of competencies that



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vary from creativity, innovation, independent thinking, analytical thinking, adaptability, decision-making, initiative, leadership, planning and organizing, teamwork and relationship building.

How does music education help build these competencies?

Creativity & innovation

Music students embody the art of thinking creatively and exploring alternative solutions to generate a range of possibilities. Students use their imagination to compose, arrange and perform music which strengthens their ability to be creative. Students are encouraged to listen to various kinds of music, analyze compositions and provide interpretations. These steps promote creativity, critical thinking and independent understanding. Students are challenged on a regular basis to apply themselves to forming new concepts and compositions. The same competencies translate into desirable skills in the workplace. The ICT sector seeks a creative and innovative workforce to test new ideas and find innovative solutions to create a strong and competitive technology industry that can drive economy-wide productivity growth and underpin innovation across all sectors of the economy. For example, **a digital media content writer** must generate new ideas, solutions or approaches to ongoing challenges and solve complex problems by developing new explanations and applications.

Independent and analytical thinking

The analytical thinking competency is developed when students use their music knowledge and listening skills to reflect upon and refine the pieces they are working with, incorporate new ideas and approaches, and then to reconstruct music using their own interpretation. They deconstruct assumptions and embrace analytical thinking. The ability to think independently and analytically, according to ICTC's competency framework, is one of the critical requirements for an **ICT architect** who develops conceptual frameworks that guide analysis by describing patterns of complex relationships among elements and events in the operating environment. They also integrate information from diverse sources, often involving large amounts of information and have to think several steps ahead in deciding on best course of action, anticipating likely outcomes.

Computational skills

A large number of studies¹⁸ conducted on music education emphasize the enhanced mathematical abilities of the learners. A number of studies conducted by neuroscience and psychology researchers or proponents of music education have identified that the nature of music education and learning brings out a number of efficiencies and competences in individuals, one of which is computational skill. This is a huge asset for ICT professionals as they are required to work extensively with technology, conduct numerical analysis and support scientific innovation. In recent years, ICTC's ongoing labour market research has demonstrated that a majority of ICT professionals are required to have blended qualifications that draw upon the sciences, technology, engineering, mathematics (STEM) and creative fields such as fine arts and performing arts.

Adaptability

Music comes in many forms – jazz, hip-hop, rock, opera, and many more. There are nearly limitless potential combinations of notes, chords, rhythms, instruments, sounds and more in the palette leading to the creation and invention of new compositions. Music also helps build adaptability. Studies indicate that studying music strengthens right and left brain pathways, leading to higher special reasoning, concentration, memory and adaptability. The development of these transferable skills supports lifelong learning and directly aligns with the skill profiles of successful ICT workers. The competency profile for an **ICT analytics specialist** includes the ability to adapt to organizational or project plans to meet new demands and priorities. An ICT analytics specialist is required to revise project goals when circumstances demand, or respond quickly to shifting opportunities and risks.

Decision-making

Complex workplace situations require that ICT professionals make critical decisions to help resolve issues and achieve positive outcomes in their work environment. Music provides the opportunity to bolster a suite of brain functions that improve social development and help people be better team players and develop higher self-esteem. The ability to make aesthetic decisions about music as listeners, performers or composers helps develop a sense of independent decision-making. The decision-making competency is crucial for ICT professionals to perform effectively and generate economic benefits for their organizations. With the advent of technology in the healthcare



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sector, an **eHealth project manager** is required to make complex decisions for which there is no set procedure and balance competing priorities in reaching those decisions. The person in charge is also expected to consider a multiplicity of interrelated factors for which there is incomplete and contradictory information.

Initiative

The study of music teaches initiative as students practice, stretch themselves and take risks with established forms. ICT professionals are required to demonstrate the same in their workplace. ICTC's research indicates that employees overseeing the **decision support** role are required to demonstrate initiative and take action to capitalize on opportunities and overcome challenges, and persevere in seeking opportunities to advance organizational objectives in the near term. Initiative, such a fundamental part of moving beyond rote to truly creative work, is key to building innovative, creative companies.

Leadership

In the 21st century workforce, leadership is a critical skill required of individuals in all organizations and at all levels, from entry to executive. The study of music encourages students to lead in individual or group performances. The ability to balance the many elements involved helps build students' leadership skills and enhance their confidence. This quality enables ICT professionals to deal with change management arising from technological evolutions or human resources. An **ICT quality engineer** is required to assume a leadership role in work groups, valuing team members' input and helping others achieve excellent results.

Planning and organizing

The delivery of a complex musical composition requires extensive planning and organizational skills. Music study enhances this quality from the time a person engages in learning music and playing with others. The same skill sets are required of all professionals in any organization including ICT professionals. Music education enhances organizational and planning skills, supporting ICT professionals in the design of project plans and achieving successful outcomes. Similar to a musician, an **ICT project manager** must develop, implement, evaluate and adjust plans to reach goals, while ensuring the optimal use of resources.

Teamwork and relationship-building

As discussed earlier, music learning can happen as an individual experience but more often requires collaboration. This calls for strong and positive relationship-building skills. ICT professionals require the same competency if they hope to achieve innovative and creative output. Within the various ICT occupational profiles, the workforce responsible for **data administration** must work with a team and actively nurture existing contacts. ICT staff are required to share information, best practices, and maintain knowledge networks and communities of interest.

"...Playing music in a group adds a real sensitivity in identifying bandmates' strengths and weaknesses and how to use these to get the best results from the group. Managing a team of software developers is no different."

Cross-sectoral implications

Music students and ICT professionals share an array of competencies that, if nurtured, help create an efficient and productive workforce. In the current global context, it is important to understand that economic success is deeply intertwined with the fusion of creativity and technology. The combination of the two elements is paving the path for productivity and innovation. To continually generate cutting-edge ideas and concepts, a creative ICT workforce that draws upon many of the same key competencies developed in the study of music is essential. In recognition of this, support for music education will be a key enhancement of the overall curriculum. The study of music improves cognitive thinking and skills and enhances an individual's ability to think, express themselves and create. While these are not uniquely traits required of ICT workers, but of the workforce as a whole, we consider that these competencies are of particular value in a digital economy.

Impact of Music Education on ICT Professionals

To validate the findings in this study, ICTC interviewed a number of technology professionals. The workers contacted for this research had varying degrees of music education ranging from self-taught (i.e. picking up the guitar as a teen or adult) to years of music study. The common themes were their perception that music education and participation in music enhanced their



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creative thinking, taught them how to work collaboratively, improved their ability to problem solve and taught them how to work with and manipulate content.

While none of the technology managers interviewed look for a music background when hiring, they did appreciate what music brought to the skills of their staff. Steve Szigeti, Postdoctoral Research Fellow at OCAD, finds that staff with a music background think differently and come up with different solutions to problems than those without. Music also helps with social connections that contribute to team-building and professional development.

Lisa Robertson, Manager of Enterprise Documentation, said that years of choral and musical theatre work helped her to learn how to work in a team and to remember that the 'show must go on' even if things are going wrong. She values ongoing participation in music because it allows her mind to work in a different way for that period of time, giving the rest of the brain a chance to rest and rejuvenate.

Patrick Lee, a Senior Software Designer, has no formal music education but has played in a band since he was a teenager. He found similarities between playing in a band and being part of a software design team. In the band he learned to identify the strengths and weaknesses of his band mates and learned how to work together to get the best results. That skill was useful in working with his software design team.

Chris Derry, a Senior Web Architect has no formal music education but plays in a band. His participation in regular musical activity, including music nights at RIM, helped him build a network that helped him with his career including landing his present position. He, and others interviewed, found that his music friends often had technology careers.

Judith Beauregard, Executive Producer at Toboggan Studios, has found that a music background is particularly valuable for those positions dealing with game design, game integration and game programming.

Music in the Workplace

Music has great benefits for adults in their work performance. A UK study¹⁹ demonstrated that music improves workplace productivity. Almost 77% of surveyed businesses indicated that playing music in the workplace increased staff morale and created a better working environment for staff and customers.

Dr. Teresa Lesiuk, currently a professor of music therapy at the University of Miami, is studying how music affects work performance. In a study involving information technology specialists she found that those who listened to music when working completed their tasks more quickly and came up with better ideas than those who didn't. Quality of work was in fact lowest when there was no music.²⁰

Of those interviewed for this paper, the management at Google Canada most appreciated the role that music could play in the work environment. Not only have they created music rooms in both their Montreal and Toronto offices to promote creativity, but staff from each office participate in virtual jam sessions together through Google Hangouts, thereby promoting collaboration between the two offices. At Google, music is seen as way for staff to unwind and recharge so that they can return to their work with increased creativity. The music room was created at the request of musically inclined staff but has and been actively supported by management.

According to these technology professionals and managers, there are clear benefits in the workplace to both a music education and continued participation in music.

Music Education in Canada

While studies clearly demonstrate that students benefit when schools teach music well, there are challenges facing music education in Canada – largely stemming from insufficient funding.

One challenge to quality music education in elementary school is that music specialists are not required at that level. When the Coalition for Music Education²¹ asked "Who teaches music in your school", 38% of responding elementary schools across the country indicated that they have a classroom teacher with no music background in that role. However, there is a wide variety of experience across the country. In the Atlantic Provinces, four out of five responding schools have a music specialist delivering the curriculum while in Ontario 58% of those teaching elementary music have no music background.

The Coalition for Music Education study also points out that for most of the past decade student participation in music has been rising while overall funding for music education has been falling.²² The lack of music specialists in the classroom is closely related to funding constraints. Funding deficiencies also result in lack of sufficient resources such as music rooms with well-



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maintained instruments, allocated class time, and a variety of performance opportunities.

Private sector-led efforts, including MusiCounts, the music education charity of the Canadian Academy of Recording Arts and Sciences (CARAS), and Sistema Toronto, are injecting resources into schools. MusiCounts, with a significant donation from Music Canada and other donors, provides musical instruments to schools across the country while Sistema Toronto supplies instruments and instruction, albeit at just two schools in Toronto at the present time. However, given the size of the deficit, these efforts will not be sufficient to address the problems.

Resources are necessary if music education is to be the 'minds-on, hands-on' music-making that creation-and-performance-type learning can provide. Without it, students are limited to passive 'listening' music education. Parental support was also identified as a key factor in successful music education programs since that support often translates into funding and school and board priorities.

Recommendations were put forward in the Coalition for Music Education study, which included the retention of qualified teachers and better professional development for teachers without a music background and continued advocacy by parents, teachers and the community.

It should be noted that according to a University of Northampton study, while there is concern here in Canada regarding generalist teachers delivering the music curriculum, in the UK, while some non-music specialists are uncomfortable teaching music, there are others who feel confident teaching primary music education provided that they have support from a music consultant and continued training.²³ It appears therefore that a less-expensive solution to insufficient music specialists is funding for training for general teachers.

Correcting these deficiencies will involve new government funding commitments. It also requires a will and a belief that music can change young lives.²⁴

Professor Richard Florida has noted:

"What we really need in order to prepare our children for the creative economy is a comprehensive education, something that takes them from aesthetics to algebra without pretending that the two are mutually exclusive.

We need to see to it that, from an early age, our entire population is encouraged to develop its people skills with its multiplication tables and its creative and entrepreneurial potential with its reading abilities"²⁵

Music education has a key role to play in this approach.

Music Education In School Curriculum

"The music curriculum is intended to help students develop an understanding and appreciation of music, as well as the ability to create and perform it, so that they will be able to find in music a lifelong source of enjoyment and personal satisfaction."²⁶

In addition to the lack of specialist music teachers, the curriculum can also be the source of challenges. In Ontario, as in other jurisdictions, there have been many revisions to the arts curriculum in the past few years. Some of the revisions have created expectations that are considered too difficult for non-music specialists to meet. In 2009, a new curriculum for the elementary level was released and soon resulted in studies into the challenges that the curriculum posed. One of the studies²⁷ revealed that the music curriculum was too challenging for generalist teachers to deliver and required the expert knowledge of a music specialist for effective instruction. However, only a handful of school boards across the province employed music consultants to assist teachers in delivering the curriculum. The conclusion was that while music specialists were pleased with the new curriculum, pre-service training of non-specialists should be improved.

Studies identified the following cycle resulting in poor music education in some schools:

- few success stories
- school administration sees no reason to hire a certified music specialist;
- no good news stories to share with school administration;
- school administration has non-musicians teaching music because they are more concerned with literacy and numeracy and increasing scores in standardized tests.
- These teachers cannot use the 2009 curriculum due to their lack of musical training, so they don't really teach music.
- students do not receive valuable musical experiences.

The Fraser Institute has an annual report card that compares

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elementary and secondary schools across the country to help parents make schooling decisions.²⁸ They only rank the schools based on performance in math and literacy tests. Provincial governments have instituted standardized testing in math and literacy to set standards and identify improvements. This focus on math and literacy success only results in schools prioritizing funding where it can have the greatest impact on their scores: math and literacy programs rather than music or any other kind of arts education. The problem of insufficient funding or training for music education will not be solved until music education is made more of a priority by both governments and school administrations.

The Role of Information and Communications Technology in Music Education

Information and communications technologies provide a range of tools that can significantly extend and enrich teachers' instructional strategies and support students' learning in the arts. The integration of technology into the arts curriculum represents a natural extension of the learning expectations associated with each art form.

Music education includes the use of analog and digital technology. Many music activities engage researchers and students in the use of current technologies both as research tools and as creative media. In Montreal, Matralab at Concordia University is a unique example of a laboratory for interdisciplinary music and sound research facility where artists "jam" to conduct research and experimentation on music. ICT tools are also useful for teachers in their teaching practice, both for class instruction and for the design of curriculum units that contain varied approaches to learning to meet diverse student needs.

Although there is an acknowledgement of the importance of the ICT technologies in the Ontario curriculum²⁹, many schools are further challenged by the fact that teachers are not sufficiently trained on how to fully exploit innovative technology to deliver curriculum. In order to address the gap in technological understanding, and the resource gaps previously identified in this paper, the government needs to make a conscious and significant investment in music education. As explained, there is a strong correlation between music education and the creation of a skilled technically savvy work force: the workforce that Canada will need to ensure its place on the international innovation stage.





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Music scenes in the tech ecosystem

Canada's music scenes

For the vast majority of people in the world, work is inextricably tied to geography. Some of the most important life choices, in fact, are tied to geography. Where you live even at the neighbourhood level still largely determines what employment you can take, what recreation opportunities will be afforded you, how long it will take you to travel to work and to see friends and family. It is increasingly understood that where you live – your city, your 'hood, even your street can affect your health and success.

Multi-national enterprises are global and are mobile. Supply chain logistics have been revolutionized in the past decades, and cities are increasingly competing with each other to attract companies that offer high-paying jobs that sustain municipalities' revenue bases.

Cities need a competitive advantage. After reviewing the relevant literature, interviewing ICT workers, and researching the role that music plays in the policies and programs of two forward-looking jurisdictions, ICTC asserts that music scenes should be considered an important tool in the kit to attract ICT companies, and to attract and retain the skilled workers those companies seek.

What is a music scene? First, there is the presence of a community of musicians and bands that support each other, and who often create a recognizable sound associated with their location (think of Seattle in the late 80s and first half of the 90s). Another characteristic of a music scene is the presence of successful and well recognized record labels and highly regarded radio stations. There are places to play music including both permanent venues and music festivals. There is usually a forward thinking municipal government that makes it easy for venues, festivals and bands to thrive. It is also important to have access to capital and loans or grants for emerging music businesses.

The role of the music industry in the economy

Creative industries, music included, now represent a significant proportion of many countries' GDPs. Supporting the development of creative industries at the local, provincial/regional and national levels is therefore part of many government's economic growth strategies.

There is a growing understanding of the connection between the arts and the economy and a significant body of statistics has been published regarding the economic impact of Canada's creative industries. For instance, during the first decade of this millennium, the creative cluster, music included, has emerged as a major and growing source of GDP for Ontario. The creative industries in Ontario generate \$12.2 billion in GDP for Ontario's economy annually and are number one in Canada by GDP. The creative cluster not only contributes to Ontario's economic, social and cultural wellbeing today, but it has the potential to grow at a significant pace in the near future.³⁰

There is strong evidence of the substantial economic impact of the sound recording industry in Canada and specifically Ontario. In a report prepared by PricewaterhouseCoopers LLP for Music Canada by, the economic impact in terms of direct and indirect expenditures in Canada for 2010 was estimated at approximately \$400 million. More than 80% of the music activities took place in Ontario with Toronto accounting for the majority of that. The report also looked at other economic indicators such as GDP, wages, government revenue and number of jobs to demonstrate the economic impact that the sound recording industry has across Canada. It is worth noting that the average salary in the music industries in Canada, at \$58,400 is substantially above the average of all industries at \$42,700.³¹

The new economic competitiveness

More and more people are building a lifestyle around their creative experiences. As creativity plays a larger role in our day-to-day lives, creative experiences become more valued.³² The economic benefits of the arts go far beyond traditional factors. The ability to maintain creativity and innovation across all sectors requires access to a vibrant cultural environment. There have been many studies that established the benefits on workers of exposure to different forms of arts.

As the City of Austin, discussed in a later case study has noted, "People cannot create when they work and live in a culturally sterile environment".³³

Communities that offer a wide variety of cultural amenities are more likely to attract quality workers. Businesses, too, are starting to recognize the importance of investment in the arts. As mentioned above, Google Canada is an example of a business



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that invests in arts, and more specifically in music in order to improve the work environment for its employees. As Richard Florida notes, the benefits of culture in cities translate to greater success across a range of cultural activities:

“Successful communities are those that are multidimensional and diverse; in addition to offering employment, they offer a wide range of lifestyle amenities and a climate that encourages and cultivates creative expression. Cultural offerings such as music, are a strong draw for creative workers . . . a flourishing arts scene seems to suggest a region values and supports creativity in all its forms – technological and economic as well as artistic and cultural.”³⁴

As another researcher, Meric Gertler, writing with Florida, has noted: “Places with flourishing music scenes have underlying economic and cultural systems that are open to new ideas and that enable technology entrepreneurs, as well as musicians and artists, to mobilize the resources they need to realize their dreams and visions.”³⁵

“People cannot create when they work and live in a culturally sterile environment”

Toronto, Montreal, Vancouver: Music Scenes and Technology Hubs

According to research studies conducted by Florida and his team, Toronto, Montreal and Vancouver have become music industry centres rivaling New York, Los Angeles and Nashville.³⁶ They arrived at this conclusion by measuring the concentration of music business establishments—including record labels, distributors, recording studios and music publishers—in American and Canadian urban centres with populations over 500,000. A trio of Canadian cities—Montreal, Toronto, and Vancouver—took third, fourth and fifth place.

It is generally considered that Toronto, Montreal and Vancouver have the largest music scenes in Canada due to their high concentrations of music business establishments, associations, venues, festivals and similar factors which contribute to the development of a music scene. Toronto is considered one of the greatest music cities in the world and there appears to be a connection between that hotbed of creativity and Toronto’s position as a major tech hub in Canada. The city and its metropolitan area have by far the largest music scene, but that

is partially in relation to it being the largest city in Canada. Toronto is also home to a number of historic concert venues, such as Massey Hall, that are as famous as the acts that have performed there. While the mainstream music scene is found at major venues in central downtown, there are other smaller concert venues throughout the city, which host up and coming musical and indie artists.

Toronto’s festival scene is also robust, both for music festivals and other festivals that feature music as part of the celebration. Canadian Music Week (CMW) is recognized as one of the premier entertainment events in North America. There are performances, awards and several conferences, including the Digital Media Summit, a social media and interactive marketing conference. The North by NorthEast (NXNE) festival is ‘the’ Canadian festival destination for emerging artists and major-label headliners while the concurrent NXNE Interactive conference for digital interactive innovators aims to bridge the gap between technology and the arts. The TD Toronto Jazz Festival has become known as one of North America’s premier jazz festivals produced annually by Toronto Downtown Jazz. It attracts in excess of 500,000 loyal patrons annually over 10 days. Attractions include more than 350 performances with over 1,500 musicians performing at approximately 40 locations around Toronto.

In addition to these major festivals, there are many other smaller festivals that take place each year in Toronto. Toronto has a wide diversity of people due to the large number of immigrants who choose to settle there.³⁷ According to the last census, 46.9 per cent of its citizens are visible minorities, and nearly half the population is foreign-born. By welcoming people from all imaginable cultures, Toronto has fostered an environment where ethnicities mingle, and as a result, many of the festivals in the city showcase diverse cultures with festivals such as the Scotiabank Toronto Caribbean Carnival and Masala! Mehndi! Masti! Festival being only two examples.³⁸

Toronto is also home to major Canadian music associations that aim to sustain, promote and improve the awareness of Canada’s music locally and worldwide. The financial support that comes from grants and loans, through local government or TV and radio broadcasters, makes it much easier for a music scene to thrive in a specific region. According to a press release³⁹ issued January 2013, the City of Toronto committed in its 2013 Capital and Operating Budgets to increase funding to the broad spectrum of arts in Toronto, including the city’s diverse music cluster. This commitment of additional funding at a time when other sectors



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are being cut back clearly acknowledges the importance of the music business to the economy in Toronto.

Toronto boasts the fourth largest ICT workforce in North America. There are more than 161,000 ICT professionals employed in the Toronto region in over 11,000 high-tech firms.⁴⁰ Moreover, there is a steady pipeline of talent from the region's multitude of academic institutions, regional and national migrants and global network. The Toronto region hosts a world-class teaching and research base, comprised of over 470 university faculty directly involved in ICT research. Institutions such as OCAD University and the University of Ontario Institute of Technology add to the region's rich education sector, joining the University of Toronto, York University, Ryerson University and several colleges of applied arts and technology. Together they link organizations to almost 200,000 students who will be tomorrow's workforce. Toronto also attracts one-third of total recent immigrants to Canada, including over 25,000 international students enrolled in colleges and universities.⁴¹

“Cultural offerings such as music, are a strong draw for creative workers . . . a flourishing arts scene seems to suggest a region values and supports creativity in all its forms – technological and economic as well as artistic and cultural.”

Another significant music scene in Canada is unquestionably Montreal's. Known as one of Canada's biggest cultural centres, Montreal hosts a vibrant arts community, including an active and influential music scene, with many bands and artists playing in venues large and small throughout the area. The city is considered the third in North America in concentration of music-industry businesses, according to an analysis from the University of Toronto's Martin Prosperity Institute.

For a city to be capable of attracting, keeping and integrating talented people working in the new knowledge economy, it needs to offer more than a high concentration of scientific and technological activity; it requires a climate conducive to the production and dissemination of ideas.⁴² The knowledge explosion in Montreal is encouraging a strong culture of creativity.

As is the case with Toronto, Montreal is also host to some major concert venues and is known worldwide for the quality of its

festivals, such as the Montreal International Jazz Festival and Osheaga, which have generated huge cultural, economic and tourist benefits. In recognition of the ongoing needs of the Montreal music scene, a number of world-class recording studios are located in the city as well as various music associations.⁴³

Access to funds (loans, grants or tax credits) for the music businesses is highly important to maintain a region's music scene. According to the literature review, businesses in Montreal have access to a variety of financial supports. Funding on the provincial level, through agencies like SODEC⁴⁴, has been immeasurably beneficial to the music scene in Montreal, and specifically, the Francophone scene. Another significant financial contribution for the music business in Quebec, and Montreal in particular, is that of MusicAction⁴⁵, a non-profit organization created to foster the development of Francophone vocal music by supporting the production, marketing and promotion of sound recordings. Based on the organization's annual report, in 2011-2012, a total of 113 album projects received production funding, of which 90 were for francophone vocal music and 23 for other genres, for a total amount of \$2.2 million.

In addition, commitment from local governments plays an important role for a music scene to thrive. Montreal has this commitment as demonstrated by the development of the Cultural Development Policy for the Ville de Montreal 2005-2015. The City is committed to ensuring that Montreal maintains its high standing as a creative and innovative cultural metropolis.⁴⁶

Montreal's music industry businesses get a further boost from the rapidly emerging and expanding technologies that include multimedia, audiovisual and digital sound. Each of these sub-sectors is contributing to a rich cultural and creative ecosystem that helps attract, retain and integrate dynamic tech talent in the new innovative knowledge based economy.⁴⁷

Montreal boasts nearly 120,000 ICT workers working in manufacturing, software, electronic data processing services, telecommunications, interactive digital media, audiovisual/digital sound, and digital arts. Montreal has become known as a hub for videogame companies in particular (e.g. Ubisoft, EA, Eidos) with over 8,000 employed in that sector alone. Thousands more are enrolled in ICT studies at the post-secondary level. As in Toronto with its Digital Media Zone at Ryerson University and MARS Innovation Centre, incubators and innovation centres such as the CentreNAD or the Notman House in Montreal bridge academic studies in technology with ICT industry leaders and the cultural sector.



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Vancouver also has the components that are required for the development of a music scene in a region – great venues, festivals, and the home of music associations, such as a branch of the American Federation of Musicians, the west coast office of the Canadian Music Centre, Coastal Jazz & Blues Society, the well-known Society of Composers, Authors and Music Publishers of Canada (SOCAN), and The Pacific Bluegrass & Heritage Society. Considering these factors, there is no question that the Vancouver music scene is considered a hot spot on the North American music industry market map. The ICT sector in Vancouver is also booming with more than 6,000 companies and over 64,000 employees.⁴⁸

There is a clear overlap between Canadian cities that are home to music scenes and those that are technology hubs. These major Canadian cities have a wide availability of cultural offerings, including music, that when combined with expanding economic opportunities, make these centres extremely appealing for a creative and innovative workforce. The music scenes serve as an important factor in attracting and retaining talented people. The technology professionals interviewed for this paper were generally unsure if a music scene had attracted them to their location but did consider that the music scene was an important element of their environment.

Said Todd Willison, one of our interviewees: “A strong music scene can be indicative that a creative technology group is already in place in an area, so it can be a factor in measuring the general attractiveness of the region for creative professionals.”⁴⁹

An in-depth large-scale study in these major Canadian cities could shed more light though into what technology professionals in particular find appealing in a place and to confirm that music is one of the offerings that is important to them when selecting a location. This present study is only a first step in identifying a favourable environment for technology professionals.

Technological changes: New opportunities and challenges for the music industry

Recent work by Andrew Leyshon⁵⁰ suggests that technology shifts and especially the introduction of recording and mixing software have had a strong effect on recording industry location patterns, embedding the music industry further into established urban centres.

The rise of more affordable digital recording rigs and easier

programming protocols represents a democratization of technology, making available a process that was once accessible only through the facilities and skills provided by a formal recording studio. Good quality music recording can now take place in the home after minimal investment in technology and software. Software and code have lowered the bar for creating recorded music, which is having significant impacts on the organization of the musical economy. As well, new technology has presented a whole range of new, innovative methods for accessing music that have enhanced the music experience, increased the diversity of services offered and provide consumers with more flexibility and control over how they access and listen to music.⁵¹

“A strong music scene can be indicative that a creative technology group is already in place in an area, so it can be a factor in measuring the general attractiveness of the region for creative professionals.”

Music fans are increasingly living in a world of choice and ease-of-use. They are and continue to be, the driving force for the digital music revolution by embracing digital media, using new devices and changing the way they access entertainment. While business models have been transformed, consumer demand is still high. With government support, the Canadian music industry would be better positioned to take advantage of these opportunities and be able to continue to meet consumer demands.



Austin – A Case Study

Austin, Texas is a great example of a community that leverages cultural amenities in order to attract knowledge and creativity to generate value. The city has a very diverse scene that appreciates creativity in a variety of forms. Live music is everywhere in Austin. Home to over 21 annual music festivals, Austin is a hub for fans of music from around the globe.

Austin is a mid-size city with a population of around 820,000 within its city limits, and approximately 1.8 million in its metropolitan area. It is perhaps best known worldwide as host to the annual South by Southwest (SXSW). Started in 1987, SXSW is an inter-related series of music, film, and interactive festivals and conferences which occur over roughly a two week period in the spring of each year. SXSW continues to grow and in 2013 SXSW ECO (a conference about sustainability) and SXSWEDU (a conference about innovation and education) were added. SXSW Music 2013 featured 2,278 acts on 118 stages and over 25,000 registered participants. SXSW Film 2013 had over 16,000 registered participants. For the purposes of this study, it is particularly interesting to note that SXSW Interactive (featuring digital works, video games, and tech talks from many of the world's largest and most innovative digital companies), has grown to nearly 31,000 registrants.⁵²

Nowhere in North America is the intersection between music and technology more evident than in Austin's SXSW Conference and Festival. The ten-day event showcases independent music, film and interactive media through screenings, shows, panels and workshops and is the highest revenue-producing event for the Austin economy, with an estimated direct and indirect economic impact of approximately \$190 million in 2012.⁵³ SXSW inspired NXNE in Toronto.

City officials have consciously fostered the music scene in Austin. The city bills itself the "Live Music Capital of the World," and municipal leaders with whom ICTC spoke stressed that live music is not a once-a-year festival happening, but an all-year, around-the-clock experience.

Municipal involvement in the music scene has not required a massive investment of financial support. Rather, the way in which the City itself operates has been geared to incent and support the scene through such measures as devoting a division at the city to liaise between performers, promoters, residents and the municipal government to reduce frictions associated with music performance. This supportive culture within the City has helped SXSW to evolve as the centrepiece of the city's music scene, though as Adriana Cruz, VP of Global Corporate Recruitment at the Austin Chamber of Commerce told ICTC researchers, "nobody set out to create SXSW. The City just let it, and worked with them. From a citizen's perspective, you never saw any kind of battle." She notes to ICTC that the City's role was largely to "get out of the way"

The city's supportive role has helped foster a culture of music in which performance permeates the city at multiple venues.

As a mid-sized city, some are surprised that it boasts not only a vibrant bar and club scene, but it is one of the few cities in the US with a resident ballet, opera and symphony.

While impossible to prove a correlation, Austin's reputation and reality as a live music mecca has played a positive role in the development of the city's economy.

Jim Butler is Austin's Creative Industries Development Manager. According to Butler, there are several reasons why a company might locate in one jurisdiction or another. As he told ICTC, "Always, without any exception, quality of life comes up, and music is often a part of that discussion."

Both Cruz and Butler note that in their roles to attract enterprises to locate in Austin, the role that the vibrant music scene plays in convincing companies that employees will enjoy an excellent quality of life is difficult to quantify. But, in the tours and municipal pitch sessions, it has become apparent that many tech workers, as in other sectors, are often musicians themselves. And, the young people attracted to Austin seeking fame and fortune in its clubs are anecdotally a rich source of talent as they rely on "day jobs" at one of the city's many tech companies.

In fact, the SXSW festival features prominently in the Austin Chamber of Commerce's pitch to prospective enterprises re-locating, alongside such traditional factors as technology infrastructure, state and local support, and educated and talented workforce, entrepreneurial education, research institutions and access to capital.⁵⁴

In a challenging US economy, likely as a result of the City's aggressive marketing that includes touting the quality of life advantage provided by its cultural amenities and scene, technology companies have grown impressively.

On the technology side, Austin is a growing community with the nickname "Silicon Hills". Incubators, notably the Austin Technology Incubator, and Capital Factory, nourish young companies.

The high-tech industry, not including high-tech manufacturing, has grown impressively versus other industries in Austin since 2005. The number of jobs overall in Austin increase by 17.3% from 2005 to 2012. By contrast, high-tech jobs (not including manufacturing) grew by 26% over the same period, led by high-tech information/IT jobs which grew by 32.7% in the period (on growth in the number of firms of 52.4%, and with a corresponding 56.9% increase in payroll – an indication of a competitive market for creative talent).⁵⁵

As the Live Music Capital of the World™, it is not surprising, that the economic impact of the cultural sector is most evident in tourism, which draws thousands of visitors and musicians from all around the globe. Austin has capitalized on music tourism, which contributes 20 percent more to the economy than all other categories of tourism combined.⁵⁶

Kitchener – A Case Study

Kitchener Ontario is a mid-sized city of just over 200,000 residents, and is part of the Kitchener-Waterloo Census Metropolitan Area (CMA) that includes Waterloo and Cambridge. The CMA has a combined population of 550,000. The tightly-knit region is one of Canada's hot spots for technology in Canada, home to among others Blackberry, the University of Waterloo, Communitech and other world-leading IT centres.

Reliant to a large extent on manufacturing, its traditional strength, Kitchener has recently begun to explore diversification of its economy. This has been spurred in part by the economic downturn and long term trends in manufacturing. Like this paper's other case study city, Austin, Texas, the municipality has approached this in a remarkably holistic fashion. To an even greater degree than in Austin, music has played an explicit role in the city's economic development plans.

The city's approach to economic development rests on five pillars:

- nurture entrepreneurs with facilities, programs and community support for start-ups;
- foster internationally competitive clusters;
- become a talent magnet;
- establish "downtown Kitchener as one of the coolest downtowns in North America"; and,
- invest in light rail and public transit to re-brand and foster the Warehouse district as one of Ontario's premier multidisciplinary centres of innovation.⁵⁷

Music is key to the plan. In September 2012, City staff responsible for arts and culture initiatives presented City Council with a music cluster update. In that report, staff drew the clear link between measures to support the music scene in Kitchener with key planks in its economic development strategy:

"Music was identified as a key element in the arts and cluster initiative, confirmed by council in 2011 as part of the Kitchener Economic Development Strategy 2011...It also outlines the importance of networking relationships between clusters, where, for example, digital media connects with content creators (artists) in the community to strengthen both clusters. The music cluster initiative is aligned with many parts of the Economic Development Strategy, including 'Cross-Cluster Building,' 'Talent Magnet' and 'Dynamic Downtown.'"⁵⁸

Like Austin, discussed above, a key plank in establishing a strong music scene has been redevelopment of the downtown core, and a commitment to facilitating music

festivals and incenting live music venues. In addition, Kitchener is exploring support for live music venues through local industry and student partnerships for state-of-the-art sound systems. It recently convened a Music Works conference to consult with the music industry and business cluster in Kitchener about how to encourage even more live music.

The benefits, staff hope, will extend to Kitchener's broader economic diversification efforts.

In a section of the same report, staff write:

In arts and culture and music in particular, the impact is threefold: to enhance community experience, to attract talent necessary for continued innovation, all helping to drive the regional economy.

The music cluster moves beyond primary and secondary economic impact, such as employment, ticket sales, event retail spending, tourism, service and restaurant activity. It enhances the quality of life and provides an opportunity for diversified community expression. As a cluster, music activities create natural opportunities for networking, the primary success factor in building strong economic clusters. As confirmed by the Martin Prosperity Institute, the music cluster success provides a multiplier effect that ignites innovation across every economic sector and enhances community quality of life...

...In addition to economic, community and talent attraction, artists are recognized as 'content creators' needed for a diversified, innovative digital media sector. The effect is multiplied into areas as diverse as product design and innovation.

The same report lists 28 potential action items being explored by arts and culture staff for potential follow-up. One hope is that the city can leverage the clear ties between content creation and technology. As traditionally strong tech sectors are challenged with commoditization in global value chains, digital content creation can help jurisdictions maintain a leading position in the highest-value-added spots in technology value chains.

As was the case with Austin, an ICTC interview with city economic development personnel⁵⁹ made clear the extent to which the city considers music an attraction that cuts across demographics and occupations. Executives and programmers in the technology sectors love music. A vibrant music scene is identified to a degree not even present in Austin as a critical talent and attraction tool as part of Kitchener's overall quality of life.



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Conclusion

ICTC's research demonstrates the benefits of both music education and of the presence of music scenes as drivers of important competitive advantages for Canada as it seeks to maintain its role at the highest levels of global value chains in ICT. Technology professionals who have been trained in music as youth are more creative, better problem-solvers, more collaborative and possess soft-skills that are critical in the digital economy. Their continued participation in music as adults enhances their professional and personal lives. Canadian cities that have vibrant music scenes attract and retain these workers. Policy measures that encourage and support both music education and sustainable urban music scenes are, in ICTC's estimation, a critical component to maintaining Canada's digital advantage. All levels of government must be encouraged to make this investment. Governments and organizations that support rich cultural environments are better positioned to attract employers in the high-tech sector, providing high-paying, skill-driven jobs for their citizens.

We believe there is the opportunity for further research in this area to support policy development. In particular there should be further research on the specific impact of music education and music participation on technology professionals. While this paper interviewed 14 technology professionals from various sectors and cities, a more thorough quantitative survey of technology professionals across the country would help to identify job categories where music education can have the greatest impact, those aspects of music education which most need to be enhanced and where music scenes in Canada need support in order to attract and retain technology professionals.

Recommendations:

Recommendation #1

Provincial governments need to make a conscious and significant investment in music education that supports 21st century curriculum and provides properly trained teachers with appropriate equipment and in optimal learning environments;

Recommendation #2

Curriculum should identify the connections between music education and technology careers to encourage a diversity of career choices for those studying music and to encourage technology students to pursue their music education.

Recommendation #3

Parents should be provided with resources on the benefits of music education and supported in advocacy efforts with levels of government and school administration.

Recommendation #4

Given the impact that cultural scenes have on the attraction and retention of top-notch talent and quality ICT employers, governments are well advised to focus on the quality and diversity of their cultural industries as a tool for economic development. This requires support at all levels of government.

Recommendation #5

A national organization to collect and centralize information on the benefits of music education and participation to the careers of technology professionals, to assist them in ongoing professional development. Present information at workshops and conferences directed at technology professionals or crossover conferences such as NXNE Interactive and Digital Summit.



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⁵⁵ Ibid, p. 9.

⁵⁶ op. cit. note 46.

⁵⁷ KEDS.11, Kitchener Economic Development Strategy 2011-2015. City of Kitchener. <http://kitchener.ca/en/businessinkitchener/EconomicDevelopmentStrategy.asp> .

⁵⁸ 17 September 2012. Report to Planning & Strategic Initiatives Committee, City of Kitchener. Report CAO-12-034. “Music Cluster Update”. <http://kitchener.ca/en/livinginkitchener/resources/CAO-12-034-MusicWorksTheActionPlan.pdf>

⁵⁹ Interview with Silivai Di Donato, City of Kitchener, 30 May 2013.



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