Technology adoption and gender-inclusive entrepreneurship education and training

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Abstract

Purpose – Drawing on social feminist theory, this paper aims to close gaps between knowledge about gender-related barriers to information, communication and technology (ICT) adoption and the provision of entrepreneurship education and training (EET) programs.

Design/methodology/approach – Empirical findings are drawn from 21 semi-structured interviews (22 informants) possessing differing training expertise regarding digital technology among women entrepreneurs. An open-coding technique was adopted where descriptive codes were first assigned to meaningful statements. Interpretive and pattern codes were then assigned to indicate common themes and patterns, which were reduced to higher-order categories to inform the research questions.

Findings – The findings specify and validate further gender influences in the digital economy. Digital skills are identified, and strategies to close gender barriers to ICT adoption with EET are described. The findings are discussed in reference to a large-scale, Canadian ICT adoption program.

Research limitations/implications – Perceptual data may be idiosyncratic to the sample. The work did not control for type of technology. Gender influences may differ by type of technology.

Practical implications – Findings can be used to construct gender-inclusive ICT supports and inform ICT adoption policies. This includes program eligibility and evaluation criteria to measure the socio-economic impacts.

Originality/value – The study is among the first to examine the intersection between knowledge about gender-related barriers to ICT adoption and EET. The findings can be adopted to ICT support programs targeted at small business owners and entrepreneurs.

Keywords Women, Entrepreneur, Entrepreneurship education and training, Gender-based analysis, Information communication technology

Paper type Research paper

1. Introduction

This study focuses on two research questions: what strategies can be employed to create gender-inclusive information, communication and technology (ICT) entrepreneurship education and programs (EET)?[1]; and How can intermediaries better support the adoption of ICT among women entrepreneurs? Drawing on social feminist theory, the work seeks to close gaps between knowledge about gender-related barriers to ICT adoption, and the provision of EET programs. The relevance of these contributions to the literature is established in several other ways.

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First, the need for business owners to adopt ICT is compelling. Digital technologies are key enablers of small firm performance (Benitez-Amado *et al.*, 2010). ICT facilitates improved access to information, employee collaboration, product quality, and task efficiencies (Benitez-Amado, *et al.*, 2010; Chen and Tsou, 2007). With the advent of ever more powerful collaboration and productivity tools, adoption of ICT is critical for competitiveness, growth and survival (Alegre *et al.*, 2011; Herman and Williams, 2013; Lucchetti and Sterlacchini, 2004; Martin and Milway, 2007; Orser *et al.*, 2007; Benitez-Amado *et al.*, 2010)[2].

Second, previous research has documented that gender of firm ownership is a factor in the technology adoption processes (MacGregor and Vrazalic, 2008; Oly Ndubisi and Cengiz, 2005)[3]. Scholars have called for research about gender and technology adoption in the context of EET (Dy *et al.*, 2016; Kuschel and Lepeley, 2016). Similarly, Byrne and Fayolle (2010, p. 95) conclude there remains the need for research and "analysis of educational issues in women's entrepreneurship" with respect to the "how," "what" "for which results" and "for who?" Multi-lateral women's forums have also called for meaningful responses to gender-inclusive ICT policies and programs (UN Women, 2014). This study seeks to close the gender divide by identifying strategies to inform EET that support the adoption of ICT among women entrepreneurs[4].

Third, governments have introduced policies and programs to encourage adoption of technologies among entrepreneurs[5]. Scholars argue that most technology and innovation interventions are gender-blind (Walker and Joyner, 1999; Henry *et al.*, 2017), and hence, accentuate the activities of men, often unconsciously excluding women entrepreneurs (Kvidal and Ljunggren, 2014; Rowe, 2016). This infers a loss of entrepreneurial possibilities (Dy *et al.*, 2016).

Masculinisation of EET is also linked to weaker program outcomes for women compared to men within entrepreneurship programs (The World Bank Group, 2014)[12]. In response, economic forums such as the G20 have called for technology adoption programs that recognise the needs of women entrepreneurs (Sorgner *et al.*, 2017; UN Women, 2014; World Bank Group, 2014; and UNCTAD, 2014a). National taskforces have also reported on the need for interventions to enhance women entrepreneurs' employment of digital technology[6]. This study seeks to inform these programs by examining the associations among gender, ICT and EET.

Finally, in designing gender-inclusive EET programs, leaders seek guidance about gender-inclusive program design and content (Valerio *et al.*, 2014; OECD, 2017). According to Martin and Milway (2007, p. 16), "Future research needs to deepen the understanding of the precise management and technical skills required for successful ICT adoption by SME owners and managers." This study presents insights about ICT skills and competencies associated with EET.

In summary, the study reports ICT adoption, gender and EET. The findings inform gender-inclusive ICT programming, and practices to help women entrepreneurs scale their enterprises. This is important given women are considered an under-represented group. The findings may assist policymakers, education and training agencies in increasing the engagement of under-represented groups, and ensuring programs are responsive to client needs.

The next section presents an overview of the literature, including studies that report on gender biases within ICT EET programs, and gender influences in ICT adoption. The qualitative methodology is then described. Discussion of findings follows. Recommendations are drawn and directions for future research advanced. The implications of the study findings are then discussed in the context of reframing the Digital Technology

Adoption Pilot Program' (DTAPP). The program was chosen as it is the largest such program in Canadian history, and serves to illustrate how ICT adoption programs can benefit from research-informed gender-based assessment.

2. Review of literature

2.1 Digital divide

The literature suggests the presence of gender influences among entrepreneurs with respect to the adoption of ICT or the digital divide. ICT resources include physical infrastructure (such as hardware), human resources (such as technical and managerial IT skills), and intangible resources (such as knowledge assets and customer orientation) (Bharadwaj, 2000).

Graham (2011) offers an account of the *evolutionary* nature of gender and the digital divide, citing longstanding concerns about proximal and socio-economic influences associated with access to tools and content of the information revolution—including gender differences that relate to social polarisation. From telegraphs, telephones and computers to the Internet and contemporary ICT software, technological dualism has shifted from a focus on *access* to physical IT infrastructure to *accessing ICT knowledge* (defined as human and intangible IT resources) (Graham, 2011). This includes "the application of technological tools that support the process of starting and running a new venture" (Keyhani and Jonsson, 2017, p. 316). Gender differences in ICT adoption reduce resources available to women-owned SMEs, which may weaken competitive advantage through lower resource capabilities (Benitez-Amado *et al.*, 2010).

Table I provides a summary of previous research regarding gender influences in ICT adoption at both the individual and firm levels. The emergent view suggests that social norms and context play critical roles in awareness, access, and adoption of ICTs. The literature also suggests that gender-related barriers are systemic to the extent that women-owned SMEs are smaller, less likely to retain the financial capital needed to purchase ICTs, and less likely to access ICT knowledge or training. Ironically, the adoption of ICT and specifically, low cost Internet-enabled entrepreneurship technologies, serve to offset relatively smaller amounts of inaugural financial and human resources among SMEs.

At the same time, the ICT landscape is evolving quickly. The lines separating adoption and production of digital technology are blurring. User-friendly technologies are changing the ways in which business owners, suppliers and investors interface. Among larger SMEs, the digital divide may be closing. Statistics Canada, for example, reports no gender differences between 2014 and 2017 in the share of employer SMEs that have adopted at least one type of digital technology (such as cloud computing, data analytics or having an Internet website) (Liu, 2019). It is not clear to what extent these observations are artefacts of larger enterprises. What is evident is that ICT adoption occurs in a gendered context.

Scholars have also observed a directional change in policy in addressing the digital divide, from that of an initial focus on access and connectivity, to interventions focussed on an increased understanding and interpretation of ICT information—that is, policies and programs to utilise ICTs (Ferroa *et al.*, 2011). To inform ICT programs, the next section draws on social feminist theory to critique entrepreneurship education and training (EET).

2.2 Critique of entrepreneurship education and training

Employing a social feminist lens to examine EET, Byrne and Fayolle (2010, p. 77) argue this theoretical perspective serves to unearth gendered assumptions with respect to:

Individual-level		
Confidence	Women entrepreneurs rank themselves as less computer competent compared to men	Mack *et al.*, 2017
Expertise, time	Women retain less technological expertise to adopt ICT and have less time to gain required knowledge	Costin, 2012; Erumi-Esin and Heeks, 2015
Knowledge about ICT capabilities	Among Internet retail businesses, women founders were less familiar with ICT capabilities	Jome *et al.*, 2006
Online activity	Women entrepreneurs are less likely to share information online. Once Internet skills were controlled for, men and women were equally likely to post materials on the Web	Hargittai and Walejko, 2008
PovertyAccess to training	Women are more likely to live in poverty, experience time constraints, have limited access to ICTs and access to EET	UNCTAD, 2014b; Ameen and Wills, 2016; Erumi-Esin and Heeks, 2015
Founder age	Younger business owners are more likely to adopt technology. On average, women start businesses at older ages	Kumar *et al.*, 2008; Kusumaningtyasa and Suwartob, 2014
Perceptions about technical issues in adopting ICT	Compared to men, women entrepreneurs were more concerned with *technical issues* (e.g., E-commerce is too complicated; 'We do not have time to implement E–commerce'; 'It is difficult to choose the most suitable E-commerce standard with so many different options')	MacGregor and Vrazalic, 2008
Firm-level		
Firm size/scaleRisk taking	Firm size and scale are associated with the ability of small firms to hire staff to support ICT adoption.[13] Growth orientation and risk propensity influence rate of IT adoption. Women-owned firms are, on average, smaller than firms owned by men. Gender differences in risk-taking behaviours are reported	Martin and Milway, 2007; Oly Ndubisi and Cengiz, 2005; UNCTAD, 2014a
Financial capital	Gender differences in access to and use of capital, the fiscal resources needed to purchase technology	Coleman and Robb, 2009, 2012, 2016
Lending relationships	Preferential credit conditions are associated with more extensive use of ICT among SMEs: "[. . .] investment in ICT is likely to improve the quality of information that firms transmit to banks, as their financial and accounting cycle can largely be influenced by ICT through better-organized data entry and more efficient data processing and classification (Attom, 2013)." Women are more likely to report credit constraints	Pellegrina *et al.*, 2017

Table I.
Gender influences in ICT adoption

> [. . .] educational-level questions as why (programme objectives and goals), for whom (key targets and audiences), for which results (evaluation and assessment), what (course contents) and how (what methods and pedagogies are used)

Social feminism also "seeks change" (Byrne and Fayolle, 2010, p. 84), given EET supports are positioned within gendered institutional structures that concern entrepreneurship. In this study context, these include government-funded technology adoption, innovation support systems, and EET programs.

Most EET programs fail to consider the importance of ICT adoption, while ICT support programs targeted at entrepreneurs fail to consider the gendered nature of technology.

Governments seek to promote technology adoption through the funding of entrepreneurial, technology, and innovation support programs. Rationales for investment reflect fiscal merits of technology adoption and enhanced productivity. The first rationale posits that government (hence, taxpayers) benefit by ICT adoption among business owners, including: monetary benefits of SME adoption of electronic payment and procurement systems; reduced tax evasion and increased tax revenue; reduced activity in the underground economy; reduced corruption; and improvements in the ease and efficiency of doing business (Hejazi, 2014). The rationales do not consider women's economic empowerment.

Within EETs, program outcomes are moderated by the profile of participants, including gender, age, education (literacy, numeracy), work and entrepreneurial experiences, interests and intentions, and structural factors (such as economic conditions, political stability of entrepreneurship promotion, and culture) (Valerio *et al.*, 2014). Program outcomes reflect systemic biases in program eligibility, client assessment processes, and funding preferences that support industries in which male-owned enterprises are over-represented (Amezcua, and McKelvie, 2011; Menzies and Tatroff, 2006; Peterson and Limbu, 2010; Rowe, 2016). As a result, across economies, women appear to have greater difficulty acquiring entrepreneurship skills. For example, the OECD (2017) has reported that women are less likely than men in nearly all EU Member States to report that they have access to entrepreneurship training programmes. Gender biases are evidenced in the country context of this study.

A large-scale review of Canadian (Ontario) small business programs found that program funding favoured established and larger companies "the companies least likely to be in need of support" (Dalziel *et al.*, 2014, p. 7). The practice effectively excludes many women entrepreneurs who are more likely to operate less established and smaller enterprises (Kussun-Mutch and Orser, 2011). The Institute for Competitiveness and Prosperity (2019) has concluded that the 2017 federal Innovation Superclusters Initiative (CDN) $950 million in funding focussed on supporting advantaged technology) had few mechanisms to hold funded projects accountable for gender equity. This conclusion is consistent with a multi-country study of women's enterprise policies, reporting that most programs do not report on client engagement or outcomes using sex disaggregated data (Rowe, 2016; Henry *et al.*, 2017; Coleman *et al.*, 2018).

To illustrate further the context of gender-blind ICT programming, in 2011 The Government of Canada launched *The Digital Economy Strategy*. The strategy entailed (CDN$) $77 million in funding to: accelerate the adoption of digital technologies, build digital skills, and to showcase Canadian technologies through National Research Council of Canada (NRC) support (Goss Gilroy Inc., 2017). The pilot program was executed under the *Digital Technology Adoption Pilot Program* (DTAPP) with the objective of accelerating adoption of digital technologies among Canadian SMEs in order to boost productivity and create economic growth. Delivered by the NRC between 2011 and 2014, the program[19] provided funding support to SMEs in the form of advisement and non-repayable financial contributions for ICT adoption (e.g. labour, costs and materials excluding computer hardware, travel, feasibility and other studies or training). Neither the federal strategy nor DTAPP mentioned "gender" or "women," including identifying the gender of beneficiaries (clients) within the program evaluation or strategies to mitigate gender influences in ICT adoption. These illustrative outcomes occurred despite Canadian legislation that mandates gender audits of all federal policies and programming.

It is not surprising therefore that economic agencies recommend that governments develop targets and indicators or benchmarks to track the progress of women's access to the benefits of ICT. The UN has stressed the importance of identifying and promoting good

practises and lessons learned about the ways in which women and girls employ ICT (UN Women, 2017). This infers systemic assessment and reporting on the use of ICT programs among women business owners (UNCTAD, 2014a, 2014b). Such insights inform the rationale for the study questions, questions that seek to inform gender-inclusive ICT EET programs. Such findings also inform calls for gender-inclusive EET, and provision for targeted and women-only programs (Tillmar, 2007).

2.3 Gender-inclusive entrepreneurship education and training programs

The literature review found few studies on emerging good practices to increase the number of women in government-funded EET programs. This outcome is consistent with a literature review by the Editors of a recent *Small Business Economics* Special Issue on "A gendered look at entrepreneurship ecosystems" (Brush *et al.*, 2018): "Our review of recent articles finds that even though cultural and social attributes (e.g. networks, mentors, role models) are included, no mention of possible gender influences is considered (Acs *et al.*, 2017). [. . .] the presumption is that all actors have the same access to support systems and resources within the ecosystem." The Editors describe gendered social structures within the entrepreneurship ecosystem, including an estimated 7000 accelerators (1250 in the USA) and other types of support organisations (e.g. incubators, co-working spaces, start-up garages). The suggest the majority are male dominated, with the percentage of women being around 22 per cent, and that there are emerging trends of female-focussed accelerators (Brush and Greene, 2016).

By exception, Knowlton *et al.* (2015) examined strategies to strengthen small business support for women entrepreneurs among St. Louis-based (U.S.) small business support organisations. The researchers identified three challenges or "gender blind spots": perceptions about entrepreneurial identity; lack of awareness of support and programs for entrepreneurs in the region (based on a mismatch between outreach efforts and intended beneficiaries); and persistent gendered occupational norms, perceptions and roles, which impact levels of engagement in entrepreneurship activities. Despite good intentions and outreach by the case organisations to promote programs to women, the researchers reported countervailing forces, including: childcare responsibility for women compared to men, absence of women leaders and role models, failure to consider how existing programs and approaches might need to change, creation of "separate" programming for women entrepreneurs that redirected the focus away from making the mainstream entrepreneurial ecosystem more inclusive, and diversity "only for special events highlighting diversity."

In a similar assessment of Canadian intermediaries, inclusion was a top-of-mind issue for most leaders (Orser *et al.*, 2019). Yet, less than half (44.4 per cent) of the intermediaries consider gender and diversity in recruiting clients, while a third (27.4 per cent) considered gender and diversity in selecting clients. Institutional level challenges included: limited knowledge among the organisations' leaders about equity, diversity and inclusion (EDI) practices, diversity assessment of the organisation, and gender-inclusive EET. Institutional challenges reflected limited executive commitment to gender inclusion, absence of measurement and tracking, funding agency performance criteria that emphasised economic outcomes (potential high growth SMEs) rather than balance of social and economic outcomes, and assumption that inclusion is a women's issue rather than a leadership issue. Similar to other studies, gender-inclusive or women-focussed programs were seen to be *ad hoc*, in development, add-on or pilot initiatives (Coleman *et al.*, 2018).

Research is needed to inform EET program design, development and curricula (Cochran, 2017), to ensure that content reflects the needs and experiences of women entrepreneurs. The research questions posed, and selection of interview participants inform the literature and

EET practice with respect to ICT adoption. The following section describes the research approach taken to inform gender-inclusive ICT EETs.

3. Data and methodology

The purpose of this study is to examine strategies with a view to learning how intermediaries can better support the adoption of ICT among women entrepreneurs in order to close the gender gap in ICT adoption. Given the lack of empirically-grounded theoretical suggestions for gender-inclusive ICT EET, an inductive rather than a deductive research approach was warranted (Spector *et al.*, 2014). In contrast to deductive research, inductive research begins with data collection and then looks for patterns among data as a basis for generating insights (Creswell, 2013). To do so, qualitative research methods, specifically semi-structured interviews, were employed (Miles and Huberman, 1994). This allowed us to collect as much information and detail as possible surrounding the research questions. Each interview was analysed in-depth and patterns were highlighted in order to describe the common experience. In addition, this methodology is particularly useful when the objective is to understand common or shared experiences of a phenomenon in order to develop practises or policies (Creswell, 2013). Using qualitative methods, we sought to provide evidence for future intervention research and policies on the development of effective gender-inclusive ICT EET.

3.1 Data

Twenty-two individuals from Canada (twenty-one interviews) were recruited for this study and data saturation (i.e. when no new themes emerged from the data collected; Creswell, 2013) was achieved. To ensure that participants had sufficient experience and expertise in ICT adoption and gender influence in venture creation, we followed best practice recommendations and relied on a purposeful sampling technique, wherein participants were chosen for their relevance to the research questions (Creswell, 2013; Schwandt, 2001).

Interviews were conducted with informants from the following five groups (see Table II):

(1) Seven directors of regional centres with mandates focussed on supporting women business owners with respect to enterprise start-up and growth.

(2) Six senior executives of women's business organisations whose mandates related to advocating on behalf of and mentoring women business owners.

(3) Four senior managers of organisations that focussed on mentoring business owners with respect to enterprise start-up and growth.

	Gender expertise (high)	Gender expertise (low)
IT expertise (high) SME expertise (low)	Gendered IT practitioners (Cohort 1) $N = 5$	Mainstream IT practitioners (Cohort 2) $N = 2$
IT expertise (low) SME expertise (high)	Gendered SME practitioners (Cohort 3) $N = 11$	Mainstream SME Practitioners (Cohort 4) $N = 3$

Note: Total number of interviews = 21. IT: information technology; SME: small- and medium-sized enterprises

Table II. Respondent cohorts

(4) Three women leaders who are active in supporting women entrepreneurs (for example, board members of enterprise centres, associations).

(5) Two senior managers of ICT-related industry associations.

Collectively, informants reflected a diversity of experiences related to the technology adoption challenges confronting business owners. This selection provided richness to the data by including information provided by participants from diverse backgrounds and differing perspectives. Semi-structured telephone interviews were conducted by the first and second authors to collect data. Participants were asked two sets of standardised open-ended questions about ICT adoption and gender influences in venture creation with some pre-determined follow-up questions to probe for further details if needed. The semi-structured nature of the interviews allowed the researchers to ask standardised questions across participants while having the flexibility to use unscripted questions when new ideas or themes emerged (Creswell, 2013). The standardised questions were as follows:

- (1). What barriers do small business owners encounter in adopting and using digital technology? What, if any, gender-related barriers do women business owners encounter in identifying, selecting, or operationalising digital technology?
- (2). What types of programs or policies can help women business owners to better utilise digital technology?

Interviews were audio-recorded and transcribed verbatim for analysis. Verbatim transcription captures "information in participants" own words, phrases and expressions, allowing researchers to uncover [. . .] meanings" and reflecting "participants' emphasis [. . .] relating to the issues discussed" (Hennink *et al.*, 2011, p. 211).

3.2 Data analysis

Interview transcripts underwent interpretive analysis conducted by the third author with the aid of the qualitative data analysis tool, N'Vivo 11. The analytic process of this study was based on immersion in the data including repeated reading of the transcripts, coding and re-coding, and constant comparisons. We employed an open-coding technique where descriptive codes were given to meaningful statements. Descriptive codes were attributions of a class of phenomena using a segment of text (Miles and Huberman, 1994). After the descriptive coding process was completed, interpretive and pattern codes, indicating the inferred themes or patterns, were assigned to the data. As we pursued our analysis of the data, additional codes were created and existing ones were refined to better reflect the data. Any ambiguities were discussed among all members of the research team until consensus was reached. Further data reduction was achieved by grouping similar codes into higher order categories (i.e. clusters of meaning; Creswell, 2013) established based on reviews of previous studies. Some codes did not fit into categories derived from the literature and thus new categories were created. After data reduction, the data were then summarised in a series of matrices, and then displayed and discussed with all members of the research team. This allowed for further analysis and identification of anomalies, commonalities and patterns as was found in the research of Miles and Huberman (1994). The results of these analyses are presented and discussed below.

4. Findings

The initial set of questions queried informants about perceived gender barriers to ICT adoption: what barriers do small business owners encounter in adopting and using digital

technology? and, What, if any, gender-related barriers do women business owners encounter in identifying, selecting or operationalising digital technology? Tables III and IV present an inventory of responses. The findings are consistent with gender-related barriers to ICT adoption identified in the literature, specifying and validating the findings in the Canadian context.

At the individual and firm levels, gender-related barriers were associated with effort expectancy, facilitating conditions, and performance expectations. Respondent's statements with respect to these three themes are outlined in Table III.

4.1 Expectancy factors

Expectancy factors refer to knowledge, perceived ease of use, and perceived usefulness (Davis, 1989a; Davis *et al.*, 1989b). Informants described knowledge gaps about ICT that

1st order barriers	2nd order themes	Antecedents of adoption
Women are less knowledgeable about technology	Knowledge gap	Effort expectancy
Women don't know where to start when it comes to IT adoption due to lack of knowledge		
Women are less exposed to tech compared to men starting from early age		
Women's lack financial literacy		
Women are less comfortable with technologies	Comfort level	
Women entrepreneurs are older and thus less tech savvy		
Women are less comfortable with finances		
Misconception that to adopt IT you need to know technical details (e.g. "how to code")	Misconception	
Women often purchase software but don't learn to use it (e.g. "too busy to learn")	Time	
Women lack time due to family responsibilities		
Lack of funds to adopt technologies	Financial resources	Facilitating conditions
Women find seeking professional advice on new technologies pricey		
Technologies are not compatible with the way women like to work	Compatibility	
Lack of access to workshops and courses	Courses and programs	
Tech programs are gendered (pro men)		
Lack of knowledge about existing tech advisory support programs		
Lack of access to tech networks for women	Support network	
Women lack connections to get started		
Women entrepreneurs are afraid and embarrassed to ask for help		
Women might feel uncomfortable asking men in tech for advice		
Women unable to link technologies to business opportunities		Performance expectancy
Women unable to link technologies to performance improvement		
Women unable to identify what technologies can help their businesses		
Women don't consider tech skills priorities		

Table III.
Gender barriers to ICT adoption

1st order barriers	2nd order themes	Systemic influences
Lack of women role models	Role models	Social
Lack of women in senior leadership roles in the tech industry		
Lack of women in the STEM disciplines		
Conversations within women's networks do not emphasise IT	Lack of emphasis	
Not enough talk about IT adoption in women associations and organisations		
Women rely on others to make business decisions (often spouses/partners, friends)	Traditional gender role	
Women are under-represented in STEM programs	Credentials	Education
Women entrepreneurs are older and thus less tech savvy	Age	Owner characteristics
Younger women entrepreneurs have less barriers		
Older entrepreneurs tend to delegate their need for tech to another member of the firm		
It's more of a generational issue than gender issue		
Women's lack confidence	Confidence	
Women lack abilities to analyse and understand data	Abilities, skills, experience	
Women rely on others for digital skills		
Women lack experience and background in tech		
Women are less inclined to take risks	Risk aversion	
Women are less open to new technologies		
Lack of growth intention	Business orientation	
Women tend to under capitalise their firms and thus have less money for IT adoption		
Men and women approach technology differently		
Women-led businesses tend to be smaller and thus have fewer resources for IT adoption	Firm size	Firm characteristics
Micro-businesses have hard time seeing results brought by tech adoption		
Women-owned firms are more likely to be service focussed, less likely to adopt tech	Sector	
Women are more likely to adopt technologies if other women in their sector do so		

Table IV.
Systemic gender barriers to ICT adoption

occur prior to business start-up, where men are more likely to be exposed to technology from an early age compared to women (e.g. video, gaming). Lack of knowledge was then associated with level of comfort securing ICT resources, and mis/perceptions about skills required to adopt ICT: "Female entrepreneurs often do not know where to start when it comes to IT adoption".

Limited time further hinders ICT adoption. Informants suggested that it is difficult for women entrepreneurs to find time to learn about ICT as they juggle personal and occupational roles. Limited financial knowledge was linked to the inability to fully deploy the capabilities of ICT software (e.g. understanding how Excel output can inform financial planning). With respect to performance expectancy, informants suggested women business owners were less likely to understand how ICT bolsters business performance, such as increasing business opportunities (e.g. strategic customer relationship management). Being less aware of the benefits of digital technologies, women were perceived to rate technology adoption lower on their priority lists.

4.2 Facilitating conditions

Informants referred to lack of facilitating conditions, defined as the degree to which a business owner believes that infrastructure exists to support technology adoption. Facilitating conditions were associated with inaugural and ongoing organisational resources. Lack of financial capital limited the ability to purchase/lease ICT-related resources. Resourcing was also associated with technical compatibility of new versus existing (legacy) ICTs, limited access to expert ICT technicians and support networks (versus friends and family), and limited awareness about salient ICT courses and programs. Concerns were raised about ICT programs that favour men. Informants mentioned that, when it comes to support, some women are "afraid and, in some instances, [. . .] almost embarrassed to ask for help." These observations suggest multiplier effects of gender differences in ICT adoption, insights that challenge funding agencies, educators and trainers to recognise the need to address individual and firm level challenges within EET.

At the structural level, informants talked about the rooted societal issues that led to the gendered barriers to ICT adoption. These included lack of attention from governments regarding the issue of ICT adoption among women business owners, lack of role models, and shortages of women in leadership roles in the ICT sector. Informants referred to the lack of emphasis on digital technology in conversations among women business owners. Critically, it was noted that women tend to underscore this weakness instead of "taking a step where needed." Lack of confidence and risk aversion were associated with willingness to adopt technologies. Again, these barriers are consistent with those previously identified in the literature.

4.3 Performance expectations

Within the interviews, there were a number of references that within Western societies, men tend to specialise in technology to a greater extent than women. Gaming among men and social networking among women are exemplars of the gender divide. Managing technology is seen as an agentic trait in Western societies, and implies the relevance of role incongruity theory, such that when a woman is in an incongruent role (user of technology; technology decision maker) she will be as seen less favourably in an observer's mind and she will be aware of that perspective. Thus, the gender gap in ICT adoption is consistent with role incongruity.

These initial findings suggest a range of opinions about the influence of gender on the adoption of ICT, that multiple response strategies are needed, and that there is value in probing EET participants about their views on gender-related obstacles to ICT adoption. The inventory of statements provides content from which to begin to construct gender-inclusive EET curricula.

4.4 Gender-inclusive information, communication and technology programs and policies

Informants were then asked: what types of programs or policies can help women business owners to better utilise digital technology? Informants advanced insights about the ways in which ICT programs can address gendered related barriers of ICT adoption, enhance access to resources, and inform program design, development and delivery (Table V).

4.4.1 Access to resources. This response category captured strategies to facilitate access to resources (such as funding programs, fiscal incentives, easing application processes, bridging industry support organisations (e.g. collaboration between mainstream and women-focussed small business/sector support organisations). Government and industry funding were suggested, given the cost of developing and executing ICT support programs. Resourcing was also associated with promotion to increase awareness and take-up of EET among women entrepreneurs.

1st order themes	2nd order themes	Response strategies
Access to resources	Fiscal incentives	Offer fiscal incentives for ICT adoption (such as, tax credits to purchase ICT)
		Provide financial support to intermediaries for IT curriculum development
	Promotion	Engage women to leverage their networks/contacts to increase participation in programmes
		Ease the administrative burden and processes of applying for ICT support programs
	Collaboration	Promote ICT adoption programs and availability of ICT resources
	Mentoring	Collaborative to maximise resource availability, including with ICT experts to update program content. Include men and women as resources, not just women
	Role models	Develop mentorship programs. Different mentors for different needs, such as emotional versus technology adoption needs. Identify and promote entrepreneurial women role models who utilise IT
Program design	Good practices	Identify and showcase good practises
	Firm/owner characteristics	Content should be firm-stage and age-group specific
		Programs should be personalised, and reflect owner intentions
		Learning objectives should focus on increasing confidence in technology
	Culture	Prioritise support of firms operating in the services sectors. Create a comfortable learning environment
Program delivery	Interactive	Provide hands-on, interactive learning experiences
	Just-in-time	Given time scarcity, utilise online programs, social media, short course formats
	Women 2 women	Employ women's association to educate about the impact of IT on firm performance

Table V.
Response strategies to inform EET

4.4.2 Program design. Response strategies associated with program design reflected the gendered nature of ICT adoption, including gendered learning objectives, such as knowledge to anticipate (pre-empt) and respond proactively to gender-related individual, firm, industry and institutional level constraints (e.g. increasing confidence in technology, increasing ease of application of ICT within the firm, promoting the use of ICT among women entrepreneur networks). Given that EET funding and auxiliary supports tend to emphasise goods producers and advanced technologies (Coleman *et al.*, 2018), informants advised that additional ICT support should target the services sectors in which the majority of women-owned businesses are situated. Collaboration between the ICT industry and women-focussed technology support programs was suggested as a way to ensure that curriculum is up-to-date. Collaboration between technology programs and women's entrepreneur associations was thought to build and retain trust between women business owners and service providers, and to increase program participation rates:

> The women that are business owners and are members of [name of association], they are comfortable with [name of association]. It's cozy like a sweater, so if they brought in technology experts that could assist these women, I think those women would embrace that, because then they'll have that relationship established with them. [. . .] we should not be limited to only local, provincial, or national resources.

Access to experienced business owners and role models were two related themes. Matching protégés with mentors who had adopted technologies in their businesses was perceived as a particularly helpful means of providing guidance. One informant, for example, shared her experience as a mentor to another women, and suggested that training programs should reflect two discrete aspects of mentorship: technical and emotional support. She noted that in terms of IT adoption, "[. . .] there is a need for specific kinds of mentoring," the kind where technical advice can be given:

> I know with one of the women that I mentored, I was the emotional support person, but technically, I couldn't help her. She actually wanted to move on and get someone who could give her the technical support

Perceptions about the merit of women-only trainers were mixed. Some informants argued about the merits of women-only programs while others felt the exclusion of men leads to a loss of important knowledge and experience:

> I firmly believe, and I say it all the time, that the advancement of women in technology will never come from the exclusion of men. [. . .] They (men) are there, they want to help, they want to be engaged, but unfortunately the way our provincial associations around the advancement of women are set up, they're geared to the exclusion of that.

4.4.3 Program delivery. Program delivery involved comments associated with EET formats and delivery mechanisms. Strategies included the need to leverage social media, and to personalise content through flexible (e.g. online digital training), just-in-time delivery. Informants raised the importance of creating "comfortable" learning environments, and need to showcase and share good practices to inform program development and delivery.

4.4.4 Digital skills and competencies. This analysis enabled the researchers to isolate the digital skills and competencies identified by the informants as being needed to start and scale a business, and enhance businesses' performance. These are summarised in Table VI. Digital skills to be incorporated into the EET programs included: basic SME literacy skills that include software capabilities associated with: marketing and customer relationship; research and data analysis, productivity and efficiency; and knowledge of existing technology (such as how to select suitable technologies for the business's needs and available technology).

5. Discussion of findings

5.1 Overview

The study findings converge with research that reports on gendered perceptions about ICT acumen among business owners (MacGregor and Vrazalic, 2008; Mack *et al.*, 2017; Oly Ndubisi and Cengiz, 2005). Building on the importance of institutional and social contexts for business ownership (Welter, 2011, p. 165), the findings further specify and validate gender influences in the digital economy to guide EET personnel in recognising opportunities and "set[ting] boundaries for their actions." The findings also inform supporting capabilities of gender-inclusive EET interventions. Digital skills were identified, and strategies to close gender barriers to ICT adoption were described. These include the provision of resources (such as tax credits for ICT training), ICT skills support, and awareness of social and cultural issues associated with ICT.

Barba-Sánchez *et al.* (2007) have suggested that a lack of awareness of the benefits of ICT, coupled with little or no specific training, are systemic barriers associated with SMEs' lack of ICT adoption. These observations reflect how small business owners acquire

Category	Skills and competencies	Illustrative quotes
Marketing, customer relationship	Website design skills	Website development, content and graphic design for brand creation and value proposition creation are important
	Internet, social media	. . . a basic introduction to the major platforms that most people are using because a lot of them don't. Let's face it, that's the way of the world. . . . that's where we're going with some of the things that we're doing. I'm talking mostly about social media apps and those kinds of things
Research and data analysis	Ability to conduct online research to identify and analyse potential opportunities and markets	The ability to research and understand marketplace and to do online research, the ability to organise and analyse potential opportunities in the digital world. . . . I think a lot is related to understanding and qualifying opportunities as it relates to businesses . . . Those who are able to do that quickly and efficiently tend to be much more successful than others
	Database management skills, ability to use basic data analysis tools for business decision-making	Sometimes even the simplest systems like Excel. There's a lot of stuff that you can do with Excel to store information and to capture information and to just keep track of documents, do some kind of longitudinal analysis of all kinds of things, and to sort zip codes. You can use it for marketing. You can use it for finance. I think it's absolutely essential if you go into business that you know how to use that kind of data management, at the very least
	Ability to conduct research online	You have to be able to deal with different currencies, even across Canada, the different taxes, and the languages. It's a willingness to do research through the Internet. . . . Just the whole singularity of getting product license and doing all the stuff that needs to be done, navigating that whole electronic filing system for exporting and importing . . .
Productivity and efficiency	Ability to use programmes/software to increase productivity and efficiency	Accounting and financing software/Basic office software skills/Project management software (for example, for office scheduling)/Inventory management software/Enterprise Resource Planning System/working in the Cloud/ Electronic communication
Knowledge of existing technologies	Knowledge of available technologies	. . . I think an understanding of all of the technologies that are out there, and how they work, and which ones you want to use for your business
	Ability to select suitable technologies for the business needs	. . . a lot of people spend a lot of time and effort on that and it's not sustainable. . . . how do you make your technology plan relevant to your business and then sustain your business growth?

Table VI.
Entrepreneurial digital skills and competencies

knowledge about ICT. Startup Canada (2017), for example, indicates that: 94 per cent of women business owners were self-taught; 46 per cent received education through formal courses and certificates; and 20 per cent learned to use digital tools through the engagement of mentors. Similarly, key informants described how women business owners often lack time to acquire ICT knowledge, an observation consistent with women-owned SMEs lacking scale relative to those owned by men. Informants noted that mainstream ICT support programs can be viewed as male-centric and thus serve to widen the gender gap in ICT adoption among business owners as they fail to recognise the unique experiences and entrapreneurial capabilities of women business owners.

The practical implications of the findings for ICT adoption programs are demonstrated in the Appendix to this research paper. The Appendix presents a critical review of the evaluation, conducted by Goss Gilroy Associates, of the *Canadian Digital Technology Adoption Pilot Program* (DTAPP). The critical review considers gendered aspects of the reporting on program design and outcomes of the Canadian Digital Technology Adoption Pilot Program (DTAPP) (Goss Gilroy Inc., 2013). The evaluation presents a useful example with which to juxtapose the findings reported here as a lost opportunity.

5.2 Broader implications for policy and programs

Policies and ICT programs should identify, establish, and promote women role models and support networks for women business owners (e.g. develop mentorship programs). Given that there are relatively few women role models or ICT experts, ICT programs should include men as critical resources, as suggested by the informants. In terms of mentoring, same-gender matches increase interpersonal comfort, facilitate the development of trust, reduce social distance, and thus improve the quality of the mentorship relationship. Formal mentorship facilitated by government or ICT programs can provide third-party matchmaking as women business owners often report that such mentors can be hard to find (Orser and Elliott, 2015).

A lead recommendation of the informants was to enhance collaboration among ICT organisations and women's industry organisations in order to solve resourcing and communication issues. This recommendation aligns with the literature on organisational learning that reports that *resource sharing* and *strategic alliances* facilitate intra-organisational learning and thereby enhance curricula. Organisations need to learn to focus and exploit specific knowledge domains through the processes of exploration, experimenting, innovating and taking risks (Holmqvist, 2003). This could be facilitated through a clearinghouse of best practises, in order to improve efficiencies and dissuade mainstream intermediaries from continuing to replicate and evaluate training and curricula exclusively from a masculine perspective.

Increasing awareness about the value of ICTs is another step to change ICT adoption behaviour. For example, gender-inclusive, user-friendly diagnostics and curricula may motivate women to investigate ICTs that align with their business expectations. Gender-inclusive entrepreneurship training for trainers, clients and policymakers may help to reflect on gendered assumptions about ICTs. Additional response strategies shared by key informants to close the gender digital divide are identified in Table AI.

The findings suggested a tension between mainstream and women-focussed organisations, where women-focussed organisations were perceived to lack technical capacity to support advanced ICT training. Conversely, mainstream small business support organisations were perceived to lack sensitivity about the needs of women entrepreneurs. These needs include strategies to address lack of confidence, capacity to respond to differing entry-level knowledge about ICT and awareness about the gendered nature of technology. Recommendations to enhance collaboration between mainstream and women-focussed organisations would help resolve these tensions.

With respect to the cross-cultural relevance of the findings, the literature finds that adoption of technology among SMEs reflect country-level differences in culture and institutional influences (European Commission, ICT Task-Force, 2006; UNCTAD, 2014b). Kartiwi and MacGregor (2007), for example, attribute organisational level barriers to differences in knowledge, skills and competencies, income levels, credit card penetration rates and culture. OECD (2008) has reported that differences in ICT adoption among SMEs are associated with the: ratio of large to small firms; concentration of technologically

advanced businesses; presence of academic research institutions; and geographic location. The World Economic Forum (WEF, 2009) reports on country differences associated with rates of social inclusion and poverty. Rates of ICT adoption within developing economies is associated with accelerating use of mobile phones that enable micro-transactions, personal computers, voice activated systems, electronic banking that facilitates payroll support, ATMs that facilitate local payments, radio, television and the Internet, and affordable ICT infrastructure. As gaps in access to digital technologies close, the findings inform what Graham (2011) has referred to as accessing ICT knowledge or the human and intangible IT resources. ETT must ensure that program design, content and curricula are relevant to all entrepreneurs. This study provides an initial inventory of factors to consider.

5.3 Implications for future research

This study lends validity to further examinations of gender influences in ICT adoption processes among SMEs, and to the value of gender-based analysis of ICT support policies and programming. This includes comparing perspectives about ICT among EET personnel and policymakers. Evaluation criteria have been advanced. A second potential research focus is cross-cultural examination of the incidence of gender influences among SME owners, given observations about the spatial context of gender and ICT adoption among SMEs. Canada appears to be a particularly suitable study context for three reasons. First, in 2017 the Government of Canada mandated inclusive innovation and entrepreneurship policy (Morneau, 2017). Second, given the substantive public investment in ICT program support for SMEs (evidenced in the Digital Technology Adoption Pilot Program, DTAPP), and the study findings, there is evidence about opportunities to improve the program design and delivery. Third, Canada is ranked first with respect to workforce diversity (World Economic Forum, 2018), yet with low population density. Accordingly, the need for communications and collaboration tools are, perhaps, greater than among economies with higher population densities. In this regard, Canada is at somewhat of a disadvantage compared to nations in which human resources might be found relatively nearby.

5.4 Study limitations

This study advances gender-specific assessment criteria to construct and evaluate policy and programs to close the gendered digital divide among business owners. It should be noted, however, that the study has several limitations. First, perceptual data may be idiosyncratic to the sample (21 interviews; 22 interviewees). For example, eight informants lead women-focussed SME support services. While it can be argued that these individuals are particularly knowledgeable about gender-related barriers to IT adoption among business owners, it might also be argued that they may have vested interests in exaggerating gender differences.

Second, this work did not control for type of technology or for gender influences that may differ by type of technology. For example, informants indicated that, compared to men, women business owners are relatively adept at social media. However, the relative strength of negative and positive antecedents of attitudes towards particular ICTs is not yet clear.

6. Conclusions

From a theoretical perspective, the findings provide further evidence that adopting ICT resources is a gendered process. The findings also provide insights to enhance the capabilities of business owners, and implications with respect to increasing ICT resources. Specifically, the study has documented strategies to support the adoption of digital technologies within gender-inclusive ICT programs. Based on 21 key informant interviews

(22 interviewees), respondents from different backgrounds and expertise concerning digital technology, business ownership, and women's enterprise advanced recommendations to inform EETs as means of mitigating the digital divide. Recommendations to inform curricula were reported. Foundational digital skills and competencies were identified, including the ability to develop a "technology plan" that aligns with the owner's expectations and business plan, and the ability to lever software capabilities in financial analysis and reporting. Finally, gender implications for ICT programming in facilitating access to resources, and within program design, development and delivery in the digital economy were identified.

Notes

1. Entrepreneurship education, "EE programs tend to focus on building knowledge and skills about or for the purpose of entrepreneurship. Entrepreneurship training (ET) programs, by contrast, tend to focus on building knowledge and skills, explicitly in preparation for starting or operating an enterprise." (Valerio *et al.*, 2014, p. 2).
2. Martin and Milway (2007, p. 6) report that small firms with high levels of Web connectivity experience revenue growth 2.25 times faster than firms with no Web connectivity.
3. As examples: Start-up Canada (2017) has reported that compared to the overall population of SMEs, women entrepreneurs are 20 percent less likely to adopt ICT. Likewise, the UN (2016) and OECD (2017) report that women entrepreneurs are more likely to be excluded from the opportunities offered by ICT, and to perceive themselves as retaining less digital acumen compared to men (Wu *et al.*, 2011).
4. The OECD defines the "digital divide" as "the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies and to their use of the Internet for a wide variety of activities." (2001, p. 5)
5. In 2016, the Government of Canada, for example, has mandated that "all Canadians, no matter where they live, have access to high-speed Internet services at the most affordable prices [. . .] including rural and remote regions." (Accessed on 16 January 2017 at: http://www.ic.gc.ca/eic/site/028.nsf/eng/home)
6. For example: EU Evaluation on Policy: Promotion of Women Innovators and Entrepreneurship (2008); UK Enterprise Strategy (2008, 2009); Adema *et al.* (2014); Women's Enterprise Scotland (Carter *et al.*, 2014); and Canadian Taskforce for Women's Business Growth (2011).

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Appendix: Evaluation of the *Canadian digital technology adoption pilot program* (DTAPP): a missed opportunity

The program evaluation presented both a review of the literature and assessment of program outcomes. Similar to many studies about ICT adoption, the literature review failed to consider gender-influences in ICT adoption and potential gender biases in program design and delivery. The evaluation advanced the implicit assumption that gender is not a factor.

Table AI adopts the program evaluation framework advanced by Goss Gilroy Inc. (2013) to consider a gender-based view of program design and content, documented challenges and the potential implications for women business owners.

Eligibility criteria: the evaluation suggests the possibility of favouring, or cherry-picking, high potential productivity clients, a practise that disadvantages women business owners in several ways, including gender stereotyping of intentions, skills, and competencies. Criteria for firm incorporation failed to acknowledge that women-owned firms are smaller, less likely to be incorporated, and less likely to fit "high growth" profile associated with firms owned by men. Gender biases in the interview processes and data collection were not considered within program design or delivery. Lack of equity, diversity and inclusion (or gender-inclusive) training of industrial technology advisors (ITAs) is associated with unconscious gender biases of clients (for example, interviewers unaware of systemic gender influences in ICT knowledge or ICT utilisation).

Table AI.
DTAPP Programme evaluation, gendered implications and response strategies[a]

Stage	DTAPP characteristics, challenges and issues[a]	Gendered implications	Response strategies
Stage 1: Awareness	Awareness raising conducted by NRC Canada focussed on *existing* networks of clients and organisations: 'This contributed to fairly targeted awareness-raising activities.' Once DTAPP industrial technical advisors (ITAs) were hired, they selected specific industry associations to communicate beyond NRC clients. DTAPP technical assistants also worked with colleges to coordinate outreach	Given NRC focus on Engineering/STEM networks and clients are less likely to be women business owners. Programme outreach/ awareness may systematically preclude women given that women business owners are less likely to be engaged in mainstream ('old boy') industry networks. Narrowly targeted outreach and the failure to proactively seek out women's enterprise networks affords advantage to men-centric associations and hence, men business owners	Mandate sex disaggregated reporting. Conduct gender-based audits, introducing gender-inclusive assessment criteria within programme design. Establish quotas for women founders, at all stages of ICT programming. Identify/ promote women role models who utilise ICT within ICT communications. Leverage women's associations/women founders to increase outreach and awareness about IT of programme and programme impacts
Stage 2: Eligibility	Delivery agencies follow prescriptive eligibility criteria (e.g., incorporated firms, fewer than 500 employees, interest in increasing their productivity): 'A few ITAs [Industrial Technology Advisor] and internal stakeholders noted that the Eligibility stage could benefit from additional "sifting" of projects to identify programmes with the highest potential for improved productivity.' Determination of eligibility was undertaken through trainer' (ITAs) interviews with a project lead from the SME or senior management representative	Cherry-picking 'high productivity clients' disadvantages women in multiple ways. Gender stereotyping of founders' intentions, skills, and competencies infers women are less likely to be viewed as high productivity candidates. Criteria of incorporation fail to acknowledge women-owned firms are smaller, less likely to incorporate and fit 'high growth' profile. Gender biases in interview processes and data collection were not considered. Lack of gender-inclusive training of ITAs could be associated with unconscious gender biases of clients (e.g., interviewers not aware of systemic gender influences in ICT confidence, awareness, technical acumen, utilization)	Expand eligibility criteria to non-incorporated firms, given size profile of women-founded firms. Mandate gender-sensitivity training for ITAs. Creative welcoming, inclusive learning environments. Monitor programme culture

(*continued*)

Table AI.

Stage	DTAPP characteristics, challenges and issues[a]	Gendered implications	Response strategies
Stage 3: Analysis	The stage entails analysis of 'firm readiness' using diagnostics and collecting/recording firm information (for example, stage of existing adoption process, financial and productivity assessment). Some ITAs estimated 'value added per employee.' 'The expedited process reportedly took place for two reasons: pressure on ITAs to support eligible projects rather than optimal ones; and the fact that some SMEs had already completed their own analysis and had decided on a preferred technology adoption programme.'	Statistics Canada has reported on gender differences in revenue per employee, after accounting for firm and owner level differences (Rosa and Sylla, 2016). Women-owned firms could be viewed as less productive or 'ready.' Conversely, these firms may benefit most from financial and technical support. Productivity criteria fail to reflect social and non-pecuniary outcomes that are particularly valued by women. Given comparatively limited information about ICTs, self-assessment by women founders may negatively impact intervention outcomes	Acknowledge/address gender biases in 'firm readiness' and productivity criteria. Hire experts on gender analysis to advise on ICT analysis processes and to identify/lever lessons learned over the course of programme evolution. Include technologies appropriate to women-dominated sectors (for example, creative, healthcare, professional services)
Stage 4: Execution	DTAPP* and firm work to identify barriers to ICT adoption and response strategies. Tasks and milestones are identified. Advice/referrals to other services and experts are given. *'Advice [. . .] was often operational and technical, however, at times was financial in nature (for example, advice on financial systems, referrals financial support, etc.).'* Locating objective consultants was a challenge	Focus on technical and operational support fails to address influences such as limited confidence, risk propensity, network density and quality, technical competencies, etc. Given limited ICT knowledge, women founders are particularly vulnerable to vendor exploitation	Provision of online programs to address time constraints. Central repository of knowledge, ranking of industrial technology advisors (ITAs), summary of best in class technologies with women role models and referrals. Include gender-based barriers to ICT adoption within curricula
Stage 5: Outcomes	Record outcomes and lessons learned by all parties, record productivity, post-engagement for up to three years after end of program	Ongoing engagement that has precluded women at program outset reinforces masculine privilege	Examine socio-economic impacts of ICT program support, not merely job creation and 'productivity.' Criteria should include soft outcomes such as psychosocial factors (e.g. confidence) as well as tacit (e.g. operational, technical) knowledge

Notes: [a]Adopted from the *Evaluation of the Digital Technology Adoption Pilot Program (DTAPP) Final Report* (Goss Gilroy Inc., 2013, pp. 32-33). ITA: industrial technology advisors; NRC: National Research Council of Canada; SME: small- and medium-sized businesses; STEM: science, technology, engineering, mathematics

Suggested response strategies include gender-inclusive training for trainers (e.g. ITAs), expansion of eligibility criteria to non-incorporated firms (including micro-enterprises and self-employed workers, given the prototypical profile of women-founded firms), explicit efforts to create inclusive and welcoming learning environments, monitoring of client experience and program culture, and examination of the socio-economic impacts of ICT program support, not only job creation and productivity. The evaluation might have also offered an opportunity for gender-based client assessment. As noted above, ironically, it is women-owned firms that might benefit most from financial and technical support. Productivity criteria, defined by job creation, also fail to reflect social and non-pecuniary outcomes that may be particularly valued by women business owners.

Programme focus on technical and operational support finds that such emphasis fails to consider "softer" influences associated with ICT adoption, such as confidence, risk propensity, network composition (density and quality), and basic technical competencies. Yet, social cognitive studies, for example, have long recognised the importance of self-efficacy (i.e. confidence that he or she can successfully accomplish a given task) and confidence on subsequent behaviour, including self-confidence and performance expectancy on technology training outcomes (Tang and Sampson, 2017). In the context of ICT skills, the literature suggests that computer self-efficacy impacts training outcomes through greater motivation and effort to learn, regardless of the accuracy of the judgment of ability (Compeau and Higgins, 1995; Gist and Mitchell, 1992). Conversely, individuals who lack confidence in their abilities to use computers report lower expectations of training outcomes and scored lower on measures of performance post-training than those who had higher levels of computer confidence (Compeau and Higgins, 1995). Thus, failure to take actions to increase confidence among women business owners puts the effectiveness of curricula in question. These observations align with the value of technology-focussed coaches and mentors who are aware of gender influences in technology adoption and hence, able to facilitate confidence building among women business owners (Khan, 2017).

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