Digital Ecodynamics in Small Firms: Using Information Technology to Compete

Completed Research Paper

Introduction

Today, digital technologies and content are integrated into almost all aspects of business and society. However, the Internet and related digital technologies continuously evolve, and businesses are hard pressed to fully utilize technology-related opportunities. The technologies in themselves do not necessarily provide business advantages but must be combined and coordinated with other firm resources to address business problems in innovative ways (Bharadwaj 2000; Mata et al. 1995). Used imaginatively, digital technology can “rapidly create new sources of competitive advantage, and concatenate a series of temporary advantages over time” (Tanriverdi et al. 2010, p. 822). Technology investments can spur innovation and increase competitiveness. Some firms use digital technologies (in particular, information technology or IT) to drive their business strategies, facilitating innovation and creating business value. As business activities are digitized or performed electronically, firms can share information with, and respond flexibly to, suppliers and customers; they can reduce cycle times, control quality, and improve customer satisfaction (Barua et al. 2004). Digital technology, along with other management, organizational, and environmental resources, can create business value (Barua et al. 2004; Bharadwaj 2000; Mata et al. 1995). It enables complementary strategic, operational and tactical initiatives (Sambamurthy and Zmud 2000).

In this article, we describe the co-evolution of business and digital technology strategies, investments in technology, the digitization of business processes, and related performance impacts. We focus on small firms that are critical to the prosperity of most economies (Pickernell et al. 2013; Storey 1994; Storey and Greene 2010). Our article responds to the call to study emerging trends in digital business strategy (Bharadwaj et al. 2013). First, we recognize that the scope of digital business strategy has evolved and IT and business strategies are increasingly fused together (Bharadwaj et al. 2013). Second, we emphasize the embedded nature of IT across the business value chain and the dependencies of dynamic capabilities on lower order competencies and resources. Third, we acknowledge that the speed of digital business strategy is rapid and firms must develop capabilities to respond to fast-changing market conditions. Therefore, we emphasize the use of asset-light and flexible IT systems and services. Last, new sources of business value creation are highlighted. We describe digital business strategies that facilitate new business models and serve new markets. In these ways, we address the call for new research in the area of IT-enabled innovation.

Furthermore, our examination of IT-enabled innovation in small firms focuses attention on entrepreneurship in a new context of digital innovation (Shane and Venkataraman 2000). Previous studies in entrepreneurship suggest moving towards understanding the nature, richness, and dynamics of entrepreneurship by moving beyond the individual entrepreneur (Welter 2011; Zahra 2007). We emphasize the transformational role that IT plays in entrepreneurship today (Lucas et al. 2013). We explore “ecosystems” of small firms, revealing new insights from a joint perspective of digital strategy, IT capabilities and entrepreneurial activity. The novelty of our findings lies at the intersection of these research domains, where emphasis is given to both the role of digital entrepreneurs (Rosenbaum and Cronin 1993) and newer, enabling technology capabilities that transcend traditionally established boundaries of firms, markets, and social environments (Bharadwaj et al. 2013; Licht and Siegel 2006; Lucas et al. 2013). We describe the internal strategies and technologies of small firms, while also demonstrating the influence of their external ecosystems. We show how, by participating in ecosystems, firms accrue benefits through spillover effects and shared knowledge. We also show how digital entrepreneurs make conscious efforts to return value to their ecosystems. In this way, we highlight both internal and external aspects of small firms.

Methodology

Canada has over one million small businesses, and 98% of all Canadian businesses have fewer than 100 employees (Industry Canada 2011). These firms employ about 48% of Canada’s labour force (Industry Canada 2011). In our study, we closely examine seven small firms in southern Ontario, Canada. Yin (2003) argues that case studies are appropriate when researchers describe phenomena, explore processes, and
investigate why and how phenomena interrelate. We use a case study approach to explore the research issues and create the framework presented in Figure 1. To obtain expert input, we conducted a total of 19 in-depth interviews with founders, owners and managers of small, technology-intensive Ontario firms. To enhance the validity of our findings, a case study database was created. Interview questions were pilot tested and all interviews were audiotaped and transcribed. Initial codes were created using the interview guidelines and new codes added as the research progressed. All transcripts were coded by the researchers and high inter-rater agreement was ensured. Company websites were examined and company documents filed. In this way, multiple sources of evidence were used (Yin 2003; Ravishankar et al. 2011). We used NVivo 9 software (www.qsrinternational.com) and MAXQDA 10 software (www.maxqda.com) to assist with data analysis, and employed principles of “analytical generalizability” (Yin 2003) to assist with theorizing.

We selected seven recently launched firms that faced significant resource challenges, operated in difficult business environments, and had technology platforms as core components of their business models. They varied widely in their histories, capabilities, resources, digital technologies, and ecosystems. Our intent was to understand their business models, technology solutions, digitized processes, products, services, and firm performance. Most of the firms had links to a regional business incubator or innovation center. In the business incubator, space could be leased, and access to technology and human capital resources (e.g., mentors) was provided, at a low cost. In this way, critical resources and capabilities could be rapidly acquired (Tamásy 2007; Verma 2004). We conducted interviews with knowledgeable incubator managers, business mentors, and technical staff. In this paper, we highlight four contrasting small businesses; three had received assistance from the innovation center. (Space constraints prevent an elaboration of all seven firms.) We call the firms eProductions, eTireCo, eMedCo and eCourseCo and describe them below.

Snapshots of the Firms Studied

eProductions: disrupting the media industry with leanness and IT agility

eProductions produces television (TV) shows for larger media clients that need high quality TV content in the Home and Living genre. After working for several years in the media industry, seeking a better work-life balance, Dave moved from the city to a small town and founded the business. TV, camera, storage, and production technology and related business processes were changing. It was a generally turbulent time for the industry. Dave knew that in a small town he would incur lower operating costs, taxes, and employee salaries. This would enable him to run his business more efficiently and help him compete with bigger, more established production studios. Dave planned to disrupt the business of the larger production houses by introducing a boutique model of production, offering fast, cheap, and excellent customer service. To achieve this, today he deploys the latest technology in an affordable manner by amortizing the costs of bulky IT infrastructure. eProductions uses communication and collaboration technologies to work with externally contracted production units, camera staff, editors, and executive producers. These technologies include VOIP, FTP for file transfer, conference calling through Skype, social media tools, virtual delivery systems for transmitting television shows via the Internet, and high-definition cameras and other cutting edge digital equipment. The business has positioned itself as a micro-TV show content production company with quicker reaction times to customer demands than any of its larger competitors. It focuses on agility by responding to all requests within 12 hours and working as an extension of its clients. Furthermore, it has developed business and IT capabilities by hiring highly skilled staff and keeping its internal business processes loosely structured and flexible. It is an early adopter of technology and upgrades technology based on the recommendations of its staff and new hires who possess the latest skills. These technology capabilities help eProductions remain agile and innovative with an evolving business model, and fluid internal and external workflows. eProductions strategically exploits the co-evolution of technology, content, and talent for competitive advantage. The informal knowledge sharing between its limited full-time staff and externally-hired contract workers drives continuous improvement and the co-creation of superior, client-specific content. eProductions keeps costs low by using its technology capabilities and remaining flexible with respect to its operations. It has very competitive pricing and revenue models.

eTireCo: establishing a new digital platform for tire sales

Chris’ father owned one of the largest car dealerships in Canada, and Chris had repeatedly seen him go through the long process of selling a tire - taking the distributor price, then doing the mark up, and then
checking for availability with suppliers by phone calls. On average, the dealership, using this process, took 15-20 minutes to provide a price quote to a customer. One day his father offered, “if you can make an application that would make it easier for me to sell tires, then I will present it to GM.” This inspired Chris to develop TireApp, an application for car dealers that makes it easier for them to sell tires. He created a subscription-based company, eTireCo, that provides the SaaS-based TireApp product to its customers. Customers using TireApp reported, on average, an increase of 10% to 30% in tire sales. When TireApp was being rolled out, GM was closing down 200 dealerships and it was a difficult period for the automobile industry. In addition, eTireCo personnel had no business development experience. To receive mentorship, Chris moved the company operations to an incubator in southern Ontario. The incubator provided IT and business expertise as well as help in developing connections with dealerships across Canada. This was a key factor in the success of eTireCo. The goal was to develop a digital shelf-space for tires, similar to aisle shelf-space in Walmart, and to permit dealerships to browse on their tablets or smartphones in order to respond to a customer request for a quote. The time to respond to a customer request could be reduced to just 1-2 minutes. The strategy was to partner with a tire distributor and develop the software for inventory while allowing the distributor to promote the software to clients (e.g., car dealerships). eTireCo would also partner with independent dealerships, providing the software to them for a subscription fee. This ecosystem strategy proved to be so successful that in three years TireApp was installed in about 300 car dealerships across North America. eTireCo’s path to success is more fully described next.

First, TireApp was developed by following an iterative methodology with prototypes provided to customers regularly. These prototypes were improved in the next version or iteration, based on the customers’ feedback. This co-creation strategy ensured that the product was not only compatible with the design and functional requirements of customers but also provided additional, highly valued capabilities. Customers saw themselves as stakeholders in product development and became actively engaged in the development process. Second, eTireCo could not afford to hire expensive software engineers in Canada and decided to outsource the design and development of TireApp to software developers in India. Once its revenues increased, eTireCo also hired an in-house software architect to improve and scale the code, so that it could be expanded to support customer growth. Finally, eTireCo put together a top management team that was focused on business development. Although eTireCo was moving into the automobile industry, which is very competitive and turbulent, it wanted to have a strategic approach that was difficult to mimic, even if its future competitors could replicate its technology capabilities. Therefore, it built a network of customers who were stakeholders in the design of the product. It also built solid customer relationships by providing free user training to staff at the car dealerships and tire distributors. It focused on keeping its operating costs low; moving its operations from a big city to a semi-urban location with an incubator was part of this strategy. The salaries it paid to its 11 employees were much lower and its overhead expenses were much lower. As a result, it could focus its limited funds on improving the quality of its core product. Currently, eTireCo is focused on diversifying its business by partnering with national-level dealerships and signing on additional tire distributors. It is also focused on improving its profitability. Overall, eTireCo attributes its success to its innovative use of a value co-creation strategy with customers, and its capability to understand what customer requirements are and then to leverage its technical capabilities to go beyond these requirements.

**eMedCo: establishing a digital ecosystem for medical forms**

Dr. Smith, a tech savvy physician, sought to reduce the usage of paper at his clinic. He found using paper forms and prescriptions very inefficient and error prone. By using his technology skills and purchasing commercial off-the-shelf software, he started eliminating paper-based processes at his clinic and began digitization. First, he replaced his appointment system with web and email-based systems. Being an early adopter of electronic medical records (EMR), he also began to collect patient data using electronic forms. In addition, he replaced his prescription forms with an electronic form that he could e-sign using a special tablet and pen. After introducing internet fax, he began to wonder if he could help other doctors migrate to a paperless environment. Dr. Smith moved his clinic to a facility owned by a regional innovation center in order to reduce rental and leasing costs; gain mentoring, technology and business services; and obtain venture capital. He wished to create a system where physicians (who often were not tech savvy) could access paperless workflow software without having to install anything. The firm would be called eMedCo.

The regional hospital in the area was also struggling with updating and standardizing paper forms. These forms were distributed to all clinics and medical offices associated with the hospital. With hundreds of offices in the region, version management was expensive and inefficient. Dr. Smith also wished to address
this issue. There were two advantages to this business strategy. First, it would provide eMedCo with credibility within the regional healthcare system and it would enable the development of an ecosystem where it would be easier to sell value-added products and services. eMedCo offered the e-forms service free of cost to the regional hospital and then followed up this service with a premium subscription service with add-on features to offices and clinics. Second, using the Microsoft Azure Cloud Platform and Microsoft Silverlight, eMedCo developed a SaaS-based offering. The front-end forms were simple PDF forms that reduced storage requirements in the cloud. eMedCo’s technology strategy allowed it to leverage the power of the cloud for easy scalability and universal access. The firm ultimately wished to digitally mimic the workflow of the regional hospital, eventually adding electronic medical record connectivity to its forms. It was working on HL7 compatibility. With Silverlight, it was working on making the front-end user interface interactive so hospital workers could be smoothly transitioned to a digital environment. Using a SaaS-based platform, updates could be pushed seamlessly across client systems, with no downtime. This was essential in a healthcare environment. All data flowing within the system was 256-bit AES encrypted and met governmental security and privacy regulatory requirements. However, hosting data in the cloud presented challenges because the servers might be hosted in another country (e.g., the US) and therefore might fall under the jurisdiction of laws of other countries; but if all the medical data had to be stored within Canada, storage costs would increase. Despite these and other challenges, eMedCo kept building the digital ecosystem due to its impact – improved healthcare services and reduced healthcare costs.

eMedCo had no current competition. Dr. Smith envisioned that, by the time the EMR vendors revamped their systems to include similar capabilities, eMedCo would have an established user base. It would also be ahead of the curve as it offered standardization across regional and even provincial levels. In addition, EMR vendors rarely got involved in the workflow processes of their clients as these activities were not very profitable, and supporting a back-end function was not a very visible service. eMedCo’s strategy was to exploit its current advantage, expanding its offering of products and services, and scaling up. Dr. Smith acknowledged the role of the local innovation center in the firm’s success. He benefited from technical and business skills of its staff as he developed his initial concept into an actual product/service. Working with the center, he had access to C-level executives at the regional hospital. He used the technical expertise of staff at the center to identify the required technology infrastructure and strategy. Having access to government grants through the center was also helpful. The eMedCo team was motivated and well supported.

eCourseCo: creating a platform for digitization of college courseware

Simon was finishing university, buying “course packs” from the bookstore that included printed chapters and supplementary material. He thought it was a lot of paper to manage, especially if all your courses used course packs. This motivated Simon to start working on digitizing the course packs and making content available online. He started eCourseCo, a firm that digitizes course materials and enables information sharing and social media integration. It focuses on mobility: in addition to providing desktop software, it has an app for mobile devices. Simon was passionate about creating software for the education industry. His initial strategy was to quickly develop a product for the iPhone and iPad and partner with a university or college. Simon sought the help of a business incubator in the region in order to be able to access his potential market. The incubator successfully helped eCourseCo obtain its first client. The firm began to further develop the product based on the feedback it received from this first customer. However, instead of quickly putting the product on the market and taking it through version iterations, eCourseCo kept adding requested features in the hope that it would satisfy the university client. eCourseCo invested heavily in the product and added capabilities such as HTML5 compatibility, integrated video and audio, and calendar functionality. This caused a severe cash flow shortage, as the client was not yet a paying customer and no revenue was being generated. Simon soon realized his mistake and readjusted his strategy, deciding that only minimal development of the technology would take place until eCourseCo had a paying client relationship in place. eCourseCo broadened its target market by reaching out to private K-12 schools in the area. This was done to provide more flexibility with respect to maintaining a dual (university and schools) revenue stream, and the software requirements were not very different. Therefore, minimum rework was required. eCourseCo learned the hard way that large public universities in the higher education industry involve massive bureaucracies where RFP processes take a long time. For a startup like eCourseCo, this was an unsustainable option. Furthermore, most universities had not matured in their in-class high-tech requirements. In a way, the technology was ahead of the requirements of the target market.
Nevertheless, this futuristic technology also provided a competitive advantage for eCourseCo. The firm had used an innovative technology platform, HTML5, which none of its competitors, such as Learning Management Systems and Education Content Delivery Systems, was then using. Furthermore, its strong IT capabilities and technology’s ease of use made it very useful within an educational environment. Instructors and students could literally drag content into the course system and the technology would synchronize the content for everyone. The calendar layout was an especially useful part of course planning and delivery. The social media interaction elements supported out-of-class engagement between the instructors and students. The product was customer-centric and flexible, able to be adapted to almost any educational environment. The technical strengths of the eCourseCo product were leveraged as the company marketed its product and services. The firm was focused on establishing and nurturing its business relationship with its primary target client – a large university – before advancing to the next stage of development. It was also serving private K-12 schools as a way to augment its revenues. Simon also recognized the importance of the business incubator in helping him access his market and in bypassing several layers of bureaucratic structures. For instance, incubator mentors showed eCourseCo how to avoid future RFP processes while selling its product to universities. Simon also realized that for eCourseCo to be successful, it needed to be part of a network or ecosystem, with participants that were not only interested in its current product/service, but were also stakeholders in the longer term success of the firm.

Lessons Learned

These companies illustrate a number of important principles. Below, we summarize key observations on drivers of firm investment in digital technology, the co-evolution – and even fusion – of business and technology strategies, the creation of digital ecosystems, and firm and ecosystem performance. To show how we arrived at our conclusions, first we highlight important aspects of each company’s experience. Then we summarize our key takeaways.

**What drives firm investment in digital technology?: IT is a business priority and opportunity generator**

Let us begin by examining eProductions. How did it afford and why did it obtain its digital technology? Interestingly, the cost of its technology had decreased significantly since the inception of the firm. The equipment for video processing, the hardware, and some software applications had become much more affordable. For example, the laptops and Apple desktops for video processing as well as video storage devices and video editing equipment cost only a fraction of what they used to. In addition, the firm’s business model relied on worker mobility. The flexibility of having only a few full-time staff and hiring additional contract staff as needed on a project-by-project basis helped eProductions repurpose its investment in HR to invest in core digital technologies such as the HD cameras and other broadcasting equipment that were still expensive. It reduced its overhead operational expenses by moving to a rural location, and freed up capital for technology investments. The overhead expenses of the firm were a third of that of its competitors in larger cities. The firm also differentiated itself as being agile, able to respond to client needs quickly and effectively. The capabilities and structures that supported these sensing and responding competencies required, and helped justify, the investments in digital technologies.

Let us now look at eTireCo. In a market driven by low profit margins and intense competition, eTireCo had developed a digital platform and fostered an ecosystem where both tire distributors and car dealerships required the TireApp to compete in their respective markets. eTireCo sold subscription services to both tire distributors and car dealerships. It maintained high levels of service and support and iteratively developed the platform with inputs from users. It developed a capability to use its technology platform to drive sales in the market. Its value proposition was that it tailored its technology product to the needs of its customers and provided exceptional service and support. eTireCo depended on its established business relationships to drive the adoption of its technology platform. It focused on both ends of its value chain – the dealerships/independents and the tire distributors. This gave its digital platform a source-to-market view of the industry. Being the first mover in this space, it was able to capture a large market share. It developed a SaaS product that was mobile device friendly. For eTireCo, the technology was the business. Investments in software development were simply viewed as business investments.

At eMedCo, Dr. Smith invested in technology to digitize his own workflow and then sought to replicate the process of digitizing clinical workflows for other doctors. He also invested in technology to develop the
regional healthcare ecosystem, and to facilitate partnering with regional healthcare organizations. eMedCo digitized forms and then linked these forms and digital data to hospitals, clinics and medical offices. Technology investments were simply required to achieve business goals, e.g., linking forms to EMRs.

eCourseCo was an early adopter of HTML5. It organized the delivery of entire courses around a digital calendar, and provided related apps and desktop support. Digitization of content was necessary for ease of information storage and retrieval. eCourseCo focused on customer needs, enabling professors and students to see, design, and configure course content according to their preferences. It seized the opportunity to change a paper-based “course packs” culture in higher education in the region. eCourseCo used outsourcing to develop its software products. As the founder stated, “we built the technology and invested heavily in it at the beginning, and now we have a great horse. Now we just need to find a bunch of people to ride it.” At eCourseCo, the technology was ahead of, and drove, the business opportunities.

In summary, digital technology investments were driven by evolving business needs and opportunities. At eProductions, falling technology prices, the prioritization of digital technology investments, and the use of technology to differentiate the firm made technology investments necessary and feasible. At eTireCo, the digital technology was the business product/service provided. Technology investments were simply business investments. At eMedCo, the digital platform and digitization services also were the business. The same applied at eCourseCo where technology was used to digitize, package and deliver course content. Technology decisions were business decisions. For all four firms, and especially the last three, the business model and technology investments were inseparable.

**How are firms using digital technology to create new sources of competitive advantage?: Early adoption of emerging IT coupled with new business models**

At eProductions, early adoption of new Hi-Def technology created business opportunities and competitive advantage. Although this was perhaps risky, as making the investments did not automatically result in new opportunities, it was the combination of the technology strategy with a business strategy that seized business opportunities that resulted in firm success. The firm had to be able to sense business opportunities that existed and strategize to create these opportunities by leveraging its technology and business capabilities. eProductions invested in emerging technology before its competitors, developed internal technology capabilities, and accessed competencies of external contractors to exploit sources of competitive advantage. Despite its rural location, eProductions exploited Internet-based technologies for communication and collaboration in order to engage its ecosystem, and create and maintain superior customer relationships.

eTireCo built a digital platform to co-create TireApp with its customers, and so was able to refine its sensing and responding capabilities to a greater extent than any of its competitors. As the founder stated, “it’s almost like the customer is programming for you. The closer you can get to that, especially for a B2B product, the higher your chances of success.” At eTireCo, the digital technology enabled the firm to continuously hear from customers and incorporate feedback into TireApp. There was continual innovation and continual growth in market penetration and business success.

eMedCo marketed a “Freemium-to-Premium” suite of products. Access to a cloud-based software solution for medical forms was provided free of cost to regional healthcare providers, but a subscription fee was charged for an advanced version with value-add features. eMedCo relied on a subscription-based SaaS product and hosted its data in the cloud. As a result, scalability and elasticity were no longer challenges. The founder claimed, “we could support a million users next week”. Cloud technology allowed eMedCo to start small but scale as needed. The technology also allowed it to develop its ecosystem, that is to get significant uptake from form issuers that provided medical forms, to form users, e.g., physicians. The technology also resulted in a significant reduction of paper and form maintenance costs. It smoothed the workflow and lowered the operational costs for regional healthcare clients. Although eMedCo did not address a “sexy” problem, workflow issues presented real problems for firms that gladly paid for its services. Its potential competitors (e.g., EMR vendors) were not immediate threats as they seemed disinclined to compete in this back office niche. In this way, eMedCo used technology to create a digital ecosystem for medical forms, and maintain important first mover competitive advantages.

At eCourseCo, the “software was literally the first in Canada that was helping executive education institutions deliver their courses or their content online like that.” The company strategy was to find one or more big clients (e.g., universities) that they could penetrate. It wanted to build strong, deep client
relations, one customer at a time, tailoring the software as it went, and making it easy for clients to adopt its products. eCourseCo was willing to be flexible and to innovate continuously in order to lead in its market. As the founder stated, “On the iPad we built an app, which basically could take content in a course pack and organize it all together and you could make notes on the course pack. Really the platform and the capabilities of the platform that we employed, that's made the technology hard to copy.” Because the software ran on Android, iPad, and web browsers, it was device independent. The product was “first out the gate” and would be difficult to match or beat. eCourseCo’s use of SaaS and its mobile-first strategy meant that no other content management system or learning management system had similar capabilities. In this way, eCourseCo led the way using its technology. It also survived because of its technical agility. After an unsuccessful round of targeting universities, eCourse rapidly modified its software to serve other markets such as private high schools. These markets were more profitable and easier to penetrate. Using its technical agility, eCourseCo created new competitive opportunities.

In summary then, all four firms studied relied heavily on digital technologies, with several focusing on maximizing cost efficiencies and the ability to scale rapidly and effectively using cloud-based platforms. Their early adoption of digital technology, and technical agility, created business opportunities and competitive advantages. eProductions invested heavily in advanced Hi-Def technology and used Internet-based content distribution. eTireCo used IT to provide learning opportunities and support value co-creation with customers. eTireCo, eMedCo and eCourseCo used technology to iterate versions of their products and services. There was continuous learning, business model adjustment, business product development and innovation. These firms kept changing their business/technology offerings to address new customer needs and to provide services that none of their competitors could provide. By using the technology to drive non-stop product enhancements and nimbleness, they not only “stayed in the game” but led the pack.

How are firms’ digital technology strategy and business strategy co-evolving?: The business, IT, and ecosystem are increasingly fused

At eProductions, the digital technology strategy had three components – the IT infrastructure and equipment required for company operations, the HR skills required to creatively leverage the IT systems, and the underlying processes and capabilities that supported both the technology and the staff. As the founder stated, “It is a combination of the content (which is our business), the technology or the Internet and our people that allows you to collaborate and manage. That experience is only going to continue to get richer and richer.” The business strategy was dependent on effective operations, competitive tactics – such as sensing and responding to changing customer demands – and strategically co-evolving the business and IT to remain dynamic and flexible in a turbulent market. Although the business and technology strategy were not explicitly documented, they were very integrated. Without a flexible strategy for hiring contractual staff and supporting them with appropriate technology and systems, eProductions could not achieve its high performance levels.

The founder at eTireCo claimed that the business and technology strategy were inseparable. The technology was the product/service. It also supported an ecosystem, facilitating the intensive involvement of customers in the product design process that resulted in major value co-creation. Training to customers was also provided through webinars, Skype, GoTo Meeting, etc. Technology helped customers “adopt [TireApp] and put it in their organization, and once it’s in and it’s stuck, they can’t get rid of it.” As the founder indicated, “we actually end up getting more feedback and constructive feedback from our customer support people, who actually work with the shoppers and the people every day. So [our customers define] the technology strategy. It’s nice to bring a solid vision to the whole organization … Without the business end of it, without the actual business connections, the customers, everything I’ve built over two years, I mean, there’s nothing [TireApp] can really do, and [we] don’t want to do that.” Outsourcing some of the system development was necessary because of limited company resources. However, eTireCo was switching to an in-house approach (via hiring a software architect) to scale the application. The decision-making involved continuous inter-twinning of business and technology choices.

eMedCo’s technology strategy was to create a simple system where the back end was invisible to end users and they could seamlessly transition from paper-based workflows to digital workflows. Dr. Smith could see that eMedCo’s technology could standardize processes in the regional healthcare organization, and that this would in turn influence the adoption of the technology by affiliated hospitals, clinics and offices. The business strategy was influenced by this plan, and eMedCo provided a free version of its forms application
to the regional organization. With feedback from this large regional client, products and processes were further refined. Eventually, an ecosystem was created with eMedCo’s technology platform at the center, and the technology was used by the regional healthcare organization and the other hospitals and clinics. With feedback and communication within the technology-enabled ecosystem, eMedCo became profitable. The business and technology strategy were inseparable or fused.

The platform that eCourseCo designed and its capabilities were hard to copy. The platform was unique and addressed a niche market but also supported flexibility and customization. The technology and its products were interdependent. When looking for feedback to evolve its platform, eCourseCo likely should have taken small iterations, but initially decided to wait to release its primary product until it had met all major needs of its first university client. This negatively impacted the firm’s cash reserves. It had to rapidly modify its products and look for new markets (private schools) where these products would be well-received. It was a classic case of how intertwined the technology and business strategies needed to be, and how things could go badly wrong if there was misalignment.

In summary, we see that at eProductions, the business strategy was shaped by, and dependent on, the digital technology and the Internet which enabled the firm to sense and respond to changing customer opportunities in a dynamic market. At eTireCo, eMedCo and eCourseCo, the technology was the product, delivery platform, service channel, communication mechanism and ecosystem foundation. Changes in the business automatically meant adjustments in the technology and vice versa.

**What outcomes matter to small IT-enabled firms?: Performance metrics for the ecosystem, business, technology, and individuals**

eProductions measured its performance by the efficiency of its operational and delivery processes. It measured success by the growth of the number of shows it produced every year. “We have had enormous growth, and again this year we went up another 100%. The plan is to just keep growing the business.” eProductions also aimed to keep its staff satisfied and experiencing only reasonable amounts of stress. Quality of life, happiness and a sense of achievement among its staff were key goals. As the founder stated, “You could be making a crap load of money but if every night you are going to be feeling sick to your stomach because you are stressing, that is not success.”

eTireCo measured its performance by the number of customers using its software platform and by the job satisfaction of its employees. It focused on internal system performance and paid constant attention to improving customer-centric applications in cost effective ways. System performance drove customer satisfaction. eTireCo monitored customer engagement, customer relationship management (CRM) levels, TireApp usage, TireApp change requests, employee satisfaction and profitability.

At eMedCo, internal performance was also emphasized. Saved time translated to saved dollars. Digitized processes resulted in fewer medical errors. Technology metrics included the number of successful logins, time spent on the system, number of downloads, requests for specific forms, number of documents opened, success of web services, etc. External performance was measured by system adoption and profitability. eMedCo wanted to achieve a significant regional user base. It wanted to develop the best system it could offer its customers and focus on market penetration. The founder was ultimately seeking “better healthcare.”

eCourseCo measured its performance by monitoring the number of contracts with educational institutions in the region. eCourseCo tracked product adoption, user growth, client relationships, costs and profitability.

In summary, as the four businesses evolved, they paid attention to a range of measures of success, including individual employee quality of life, technology/system quality, customer satisfaction, profitability and the health of the ecosystem.

**Our Research Framework**

We used the case data inductively to create a framework (Figure 1) to inform research and practice. Key framework elements include: founder characteristics, firm capabilities, IT resources and capabilities, incubator capabilities, risk mitigation mechanisms, and firm performance. These are described below.
Founder/CEO Characteristics

The research framework highlights the background and experiences of the founder. In the small firms we studied, most company founders were still the CEOs (even with eProductions, founded in 1998). Most of the founders either had several years of work experience in the industry or had gained knowledge about the industry through family members, prior to starting their firms. Their backgrounds and experience provided the founders with valuable insights and insider perspectives about their industries. For instance, they knew of problems plaguing their industries and opportunities that could be exploited. Furthermore, most founders made the decision to launch their small firms based on trigger events or conditions. These triggers ranged from personal considerations such as seeking a better quality of life for their families or better work-life balance, to basic cost considerations for operating a business such as the need to move to a rural/semi-urban location to reduce operating costs. Additionally, they understood industry turbulence, saw technology opportunities, and sensed the changing demands of customers, looking for customized service offerings at lower prices. The founders could conceptualize new, different business models.

Firm Capabilities

We saw common themes regarding strategic firm capabilities required to successfully establish and operate small firms. Some of these capabilities involved both firm operations and culture. First, the firms readily adopted emerging digital technologies, recognizing that the technologies provided them with the potential to distinguish themselves from larger, incumbent competitors with legacy technologies and architectures. Second, these small firms did not follow formal, documented business and technology strategies. The founders used their day-to-day experiences to guide key decisions regarding business and technology, and they paid close attention to the requirements and suggestions of customers and employees. In this way, they did not lock their firms into fixed strategic mindsets but allowed for flexibility to deal with changing business and technological environments and opportunities. Third, the firms recognized that with their limited size, experience, and resources, they could not launch and refresh their products and service offerings in single, “big bang” cycles. As a result, they generally adopted incremental innovation approaches, with short evolution cycles for products/services, which helped them manage customer requirement changes more economically (Furr and Dyer 2015). These firms recognized the importance of involving their customers directly as stakeholders in product/service development. With this value co-creation, they were able to meet changing customer needs in a timely fashion as well as update their knowledge of evolving market demands. Finally, the founders fully embraced the changing natures of their business environments, recognizing the existence of co-evolutionary forces that were shaping their industry, and intertwining – even fusing – social, business, and technology changes. A crucial role of the founders was to build innovation into the culture of their firms and have the culture – embracing the interconnectedness of evolving business, technology and environment factors – be a firm strength.
**IT Resources and Capabilities**

The IT resources and capabilities of these firms were interdependent and tightly integrated. The interaction between IT resources and IT capabilities has been depicted in the framework with two-way dotted arrows. The IT resources included the following: 1) SMACIT infrastructure, which represents emerging IT such as Social media, Mobile apps, Analytics, Cloud computing, and the Internet of Things (Ross 2014). Instead of investing in expensive infrastructures, the firms relied on modular, nimble, scalable and ubiquitous systems that allowed them to remain flexible and to adapt to changing requirements. These systems and technologies ranged from Amazon’s Web Services (AWS) and Microsoft’s Azure Cloud platform all the way to using open source development languages, Google Apps platform for email, and Skype for communications. 2) IT-enabled communications that involved the use of mobile chat apps, Skype, and other applications to stay in touch with team members and clients. 3) Skilled IT employees: The firms depended on the skills and expertise of new IT employees/contract staff to develop evolving systems. Employees who understand how IT could be leveraged for business success were especially valuable. 4) IT-enabled intangibles (Bharadwaj 2000) which are complementary (Grover and Kohli 2012) and ancillary benefits that the firm can take advantage of while it deploys its core IT resources (Clemons and Row 1992; Sambamurthy and Zmud 2000). For example, social interaction among vendors, IT employees and customers was supported by using electronic communications media. This social interaction improved internal project management and communications.

IT capabilities were strategically developed by the firms and played a crucial role in exploiting the available resources for competitive advantage. Several IT capabilities were developed for this purpose. 1) In order to take advantage of the SMACIT technologies, the firms developed an IT leveraging capability (Pavlou and El Sawy 2010), which enabled them to leverage emerging technologies for specific purposes. For example, one firm might use the cloud to build an online transaction platform, while another might use it to store data files. 2) Two of the firms focused on data digitization and invested resources in building a digitization capability. As a result, they designed digital platforms that were at the leading edge of current technologies and had no competing platforms in their industries. 3) The firms also knew when to outsource key activities. With changing technology and business needs, it was impossible for firms to possess all skills and technical knowledge in-house, especially with limited budgets and tight deadlines. As a result, some firms maintained a superior outsourcing/contract management capability as they augmented their internal staffing needs with contract workers with the right skills and expertise. Using the right IT hiring platforms (online platforms such as Taleo, Kenexa, Freelancer, and LinkedIn) and partnering with the right contract firms for skilled workers was important for developing this capability. 4) The firms demonstrated high business process adaptability (Papazoglou et al. 2000). They were responsive to changing customer requirements and offered customizable solutions in order to remain competitive. As a result, these firms remained flexible and adaptable, and altered their business processes as business needs changed. None of the firms used resource-intensive or inflexible project management systems or business process management systems. They relied on the decision-making skills of the founder and key employees to adapt to various business situations. 5) IT-enabled support and training for key customers allowed customer assistance to be delivered remotely, without the need to travel to customer locations. This helped lower costs and provided customers with instant access to support when technical issues emerged. 6) The firms took advantage of emerging technologies such as mobile and cloud computing, and developed capabilities to design products and services for ubiquitous use across mobile and web platforms. For this, a right fit among IT skills, technology architecture, and business strategy was required. However, these capabilities could not be tightly coupled as the firms needed to maneuver to adjust to changing and dynamic environments. In this way, firms developed impressive dynamic capabilities.

**Dynamic Capabilities**

Dynamic capabilities are higher order capabilities supported by IT capabilities and IT resources (Teece 2009; Winter 2003; Zollo and Winter 2002). Dynamic capabilities allowed the firms to be flexible in changing business conditions and operated at strategic and tactical levels. This is why, in the framework, dynamic capabilities are shown as being dependent on core IT capabilities and IT resources, but supporting or influencing firm-level capabilities. Dynamic capabilities can be developed by reconfiguration and recombination of IT capabilities and IT resources. The interactions are complex and difficult to separate. The firms we studied displayed at least three distinct dynamic capabilities. 1) Agility, which is the
ability to sense changes in the business environment, respond effectively to such changes, and make rapid
decisions to ensure that competitive advantage is maintained (Park and El Sawy 2013; Sambamurthy et al.
2003), helped the firms respond to changing customer, business, and technological demands. It was an
important capability from a strategic standpoint because it directly related to the founders’ goals to keep
their firms nimble and responsive to customer demands, ensuring they could compete against larger firms.

2) The firms had dynamic knowledge management capabilities or the capacity to quickly acquire, exploit,
and assimilate knowledge related to projects, customers, and technological changes from both internal
and external sources and use it to improve future products/services as well as interactions with customers
(Leonard-Barton 1995; Zollo and Winter 2002). 3) Dynamic human resource (HR) capabilities (Ho et al.
2013) were also visible. With the growing complexity of technology and business, it was difficult for small
firms with limited resources to hire skilled employees in-house. In order to address this challenge, firms
established a dynamic HR capability where they relied on a trusted HR partner for outsourcing. Firms
followed the current trend of “upsourcing”, which involves hiring the right people, with the right skills, at
the right time (Pillsbury 2015). This process was complex. Therefore, establishing relationships in the
market with firms and people who understood the firm's contractual and project requirements was
extremely important. Although the small firms addressed the development of IT capabilities and dynamic
capabilities based on resource availability well, they did not wish to outlay a lot of resources on important
but standard operational issues such as ensuring legal compliance, accounting, and tax filing. Here,
eTireCo, eMedCo, and eCourseCo sought assistance from a regional incubator. Next, we discuss the
incubator’s capabilities.

Incubator Capabilities

The incubator in the region where these firms are located provided low-cost business support services. A
key service – founder mentorship – was provided by seasoned business development experts and venture
capitalists. The founders of the firms acknowledged the role of the mentors in helping overcome various
business challenges. The incubator also leased physical space to firms, and provided access to services
such as legal advising, accounting, marketing, HR management, and business executive coaching. The
incubator also partnered with a technical institute/college in the region where they recruited IT and other
employees for the firms. They also recruited from call centers and IT development offices of larger firms in
the region. Their semi-urban location helped them access IT and managerial talent at lower costs than in
big cities. Furthermore, the incubator also provided small firms with access to government grants that
provided rebates for hiring young, local employees. This helped keep HR costs low, and translated into
lower prices of products and services for customers. Finally, eTireCo, eMedCo, and eCourseCo benefited
from accessing the business networks of the mentors. This helped them establish themselves and their
firms as “known brands” in the region. This was an important incubator service because it provided
visibility across business circles and helped firms get some of their first paying customers. As a founder stated,
“An institution like the Innovation Center that has the resources ... and the support with the community ...
makes it a huge motivator for an entrepreneur like myself to continue to develop our company there.”

Business Risks and Mitigation Mechanisms

Once the firms began to aggressively pursue growth, profitability, and other performance-oriented aspects
of the business, they faced a challenge common to small firms – limited resources and constraints that
restricted their ability to scale at will. It became important to maintain a balance between pursuing growth
opportunities and maintaining the existing level of business, revenues, and relationships that had been
carefully built during earlier phases. The firms faced pressures from both internal and external sources.
First, firms faced risks due to ongoing changes in the industry and shifts in technology, including the
evolution of more sophisticated systems and processes disrupting current generation technologies. This
was even more applicable for firms at the leading edge of IT that were dependent on emerging IT for their
success. The firms also faced challenges from competitors who could copy their technological capabilities
and leapfrog them to the market, especially when they were larger, incumbent firms. Second, as they
diversified and pursued new customers, the firms faced challenges with respect to managing internal costs
of operations, employee wages, etc. There were also some concerns regarding lack of adoption of certain
products/services, e.g., due to the introduction of competing products/services, which added to the
pressure to tread carefully by balancing growth plans in new areas with the reality of resource constraints.
Third, despite the rapid growth at times, the founders and employees wished to keep work-life balance as a priority and maintain a cordial working atmosphere.

In order to manage these constraints and risks, the firms adopted various strategies and mechanisms. Interviewees discussed how they constantly endeavored to lower operational costs and find resources such as funding, skilled employees, and management guidance. They sought to adopt low-cost approaches to ensuring financial and business sustainability. For example, they did not invest in the most cutting-edge technology for non-mission critical needs. They might use the incubator resources instead. Furthermore, even the acquisition strategy for new, required technology was based on affordability and amortization of costs over a reasonable period of time. Next, the firms were consciously engaged in building barriers for entry for new competitors. The firms were aware that rapidly evolving technology was subject to imitation, substitution, and acquisition by competitors. Therefore, they engaged in building embedded ecosystems or networks of trust and loyalty with current customers. By providing anytime training and support free of cost, they aimed to win over the trust of current customers and expand their footprint in the industry through word of mouth. As a result, they created non-technological barriers of entry which were difficult to imitate and even more difficult to substitute. Without a network of customers, any new competitor would find it difficult to sell even a better technological product/service. The firms were actively engaged in not just the technical and profitability sides of their businesses, but also paid attention to social and human aspects. This was reflected in our framework from the trigger events, to the risks and mitigation mechanisms, and in the performance criteria that these firms used.

**Firm Performance**

We detected four different levels of firm performance. 1) At the industry level, for firms using digital platforms, it was important to gain acceptance from, and have their technology adopted by, their customers. They also sought active partnerships and alliances with other firms to further increase the usefulness of the ecosystem and their customer base. The firms sought to make positive ecosystem impacts. 2) At the firm level, business performance was tracked using traditional measures such as growth, profitability, low costs, and customer satisfaction, but also ecosystem-related measures such as customer well-being, employee well-being, and across-the-board innovation (Clifton 2015). 3) At the technology level, firms wanted to ensure that their IT was robust, accessible, and scalable. In addition, they monitored technical metrics such as time spent using the system, customer interaction, paying customer conversion, and IT-driven innovation. From a broader ecosystem perspective, the firms displayed a keen sense of wanting to use technology to provide better experiences for their customers, ensure security and privacy, reduce errors, and save customer time and costs. 4) At a personal level, firms monitored work-life balance as a measure of individual success and were deeply interested in providing positive working environments for their employees. They were also concerned about employee health and welfare. They also were concerned about the well-being of individuals within their ecosystems, e.g., focusing on developing and strengthening relationships with suppliers and customers, even if it led to increased time, effort and costs.

**Conclusion**

Our study draws together leading academic research on business strategy, IT and temporary competitive advantages (El Sawy et al. 2010; Tanriverdi et al. 2010) with important, practical research on small firms, business development, and innovation (Bhargava et al. 2002; Saunders and Chan 2002; Tamásy 2007; Verma 2004). Studies on digital ecodynamics provide “an energizing vision for IS strategy research” and have the potential to reshape “strategic management research and practice in a turbulent and digitized world” (El Sawy et al. 2010, p. 835). We have examined the co-evolution of business and technology strategies (Bharadwaj et al. 2013) and their execution, as well as technology-enabled small firm innovation.

In almost all countries, the Internet is changing the ways in which firms compete, and providing very new business opportunities. The only end to business opportunity is our imagination. Similarly, in most countries, small firms are the backbone of the economy (Pickernell et al. 2013; Storey 1994; Storey and Greene 2010). Assisting these organizations in increasing their competitiveness is critical. Although our study is limited by its exploratory nature and focus on Canadian firms, our findings are potentially useful to managers of small firms, wherever they may be geographically located. We invite practitioners to use the framework when launching or repositioning small digital technology-enabled firms.
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