IT’s Role in a Culture of Experimentation

By

Heather A. Smith
James D. McKeen

The IT Forum ...
Is a focus group of senior IT managers from a variety of different industries convened regularly by the authors to address key management issues in IT. This report highlights a recent discussion.

— See back page for details of the IT Forum and other reports.
Introduction

One of the newest buzzwords in the world of IT is "experimentation". According to many, the "old" ways of working in IT are not sustainable given the changing face of business and technology complete with new competitive forces, new business models, digital strategies, big data, and emerging technologies. These are all converging to pressure companies, and by extension, IT, to work faster, smarter, and more effectively (Kane 2016, Blosch et al. 2016). In recent years, a majority of IT functions have begun to use Agile methods to become more flexible and responsive to business needs and when this has not proven fast enough, to introduce DevOps as well (Smith and McKeen 2015, McKeen and Smith 2015). But with the growing need for companies to become more digital, while keeping up with, and even anticipating, evolving customer demands, the concept of experimentation has been promoted as a way to test potential responses to market changes without making large risky investments (Schulte and Potter 2014).

However, as with so many other new trends in IT, adopting experimentation requires a host of other changes to be effective. At present, "many companies lack the capabilities for rapid change management and experimentation… and this inability will exacerbate dramatically" and IT leaders are therefore struggling to better understand where, how, and whether, experimentation can be used in their functions (Schulte and Potter 2014). Culture plays a huge role in this area. "Experimentation is toxic to our conservative organization," said one manager. "IT usually focuses on THE solution so changing is tough," said another. "We've never really defined the difference between innovation and experimentation, so this is a confusing concept," said a third.

These comments highlight several issues related to experimentation and IT. First, experimentation is not being introduced in a vacuum. It is part of a whole host of new ways of working that are being introduced, or recommended, in IT including: Agile methods, DevOps, innovation, digital strategy, thought leadership, management of emerging technologies, and data strategy. These are designed to address a number of industry, business, and technology changes, such as mobility, improving the customer experience, the Internet of Things, big data, cloud services and new sources of value. Experimentation can thus be an appropriate response to some changes and not to others. Second, experimentation involves risk-taking, which is exactly the opposite of how IT staff have been trained to work. Third, experimentation is not a panacea, but a tool to be used wisely. And fourth, adopting experimentation means dramatically changing how people in IT think and work, and this means adapting many IT processes and indeed, the whole organization's culture to facilitate it.

This paper begins by discussing what is meant by experimentation and why an organization would choose to experiment. Next, it explores a variety of ways that experimentation fits into the IT organization. Then it looks at the experimentation lifecycle and how it connects with more traditional IT delivery mechanisms. Finally, it makes some recommendations for how IT managers can get started with experimentation in their own organizations.
What is Experimentation?

Experimentation in business is a strategy to reduce uncertainty and deal with disruption (Berman and Marshall 2014). Or as one focus group manager stated, "it's a tool to explore the art of the possible". There are a variety of definitions of this term. Some are more scientific, such as:

“A process conducted under controlled conditions to … prove a cause-and-effect relationship [and] support the validity of a hypothesis, theory, principle, supposition, procedure, business case or… something previously untried with technology." (Schulte and Potter 2014).

Others are more generic:

"Experimentation in a business context is the systematic approach to gaining fundamental insight into the underlying issues of a business opportunity or challenge. Its goal is to reduce the amount of uncertainty associated with a complex, multi-variable problem. The outcome is insight into what might work… and what might not." (Potter et al. 2016)

Although some experiments are straightforward, such as online A/B testing, where one variable in a website is changed and the response gauged, the vast majority of business problems are much more complex (Thomke and Manzi 2014). This is particularly true when a business is a mix of online and bricks-and-mortar.

Experimentation is also a tool for innovation in IT and is often a prerequisite for introducing a disruptive product, service, or business model (Blosch et al. 2016). As such, it must be used appropriately. There are several reasons for undertaking an experiment, including: testing hypotheses; validating assumptions; and reducing uncertainty. The key is to be clear about what is being tested and what the organization wants to learn and to design experiments accordingly (Thomke and Manzi 2014). Experiments must also be carefully designed to prevent systemic bias, sampling errors, and the Hawthorne effect¹. These issues highlight the fact that new skills are required for successful experimentation.

Even with these preconditions in place, only about one-third of experiments successfully validate their hypotheses (Schrage 2015). The focus group stressed that "success" in an experiment is not always achieving the results expected. "We shouldn't always expect success," said a manager. If an experiment is well designed and carried out, there is much to be learned from failure (Thomke and Manzi 2014). It is therefore important to ensure that failed experiments enter a feedback loop where what was learned leads to new experiments (Schulte and Potter 2014). "We don't always leverage our experiments in this way," said a manager.

¹ Where participants perform better because they are aware they are being monitored.
"An experiment should be just the beginning. The true value comes from analyzing and exploiting the data collected" (Thomke and Manzi 2014). Smaller and more focused experiments can make it easier to learn from and build on the results involved and also to combine results with other forms of customer data (Bingham et al. 2014, Schrage 2015).

In addition to learning, there are other less tangible benefits from experimentation, said the focus group. "Having business and IT work together for the same outcome, being able to acknowledge discomfort, pushing the boundaries little-by-little and reframing questions all open organizations up to new ways of thinking and working," said a manager. They also help organizations better understand where value is for their customers and which ideas are the most promising. As well, experiments help organizations to "fail fast", which reduces the higher costs and risks of other types of innovation. Finally, experimentation helps organizations relax more about change. "IT always says 'it will take 18 months and cost one million dollars'", said a member. "With experimentation I can overcome the natural 'no' from IT and plant seeds of change in our business organization." "I keep saying, 'don't worry, we're just experimenting' to everyone and keep exploring new ideas," said another.

Within the category of experimentation, the focus group identified several different types of experiments:

- **Opportunistic Experiments.** These explore individual ideas or responses to competitors' innovations. They are designed to answer the following questions: Can we do it? Should we do it? Can we do it in ways that add more value?

- **Strategic Experiments.** These are designed to explore future visions of a business model or new products and services. They can also be focused on testing key assumptions of a new strategy (Sund et al., 2016).

- **Data Experiments.** These explore ways of collecting, analyzing, and displaying existing and new forms data (e.g., from sensors) to provide new insights (Thomke and Manzi 2014).

- **Customer Experiments.** These seek to find out what innovations will work best for customers – to improve their experience and influence retention or to increase sales (Brownng and Rammashesh 2015).

- **Business Model Experiments.** These explore new modes of delivering an organization's products and services with digital technologies. Typically, they involve digitizing one or more aspects of a company's offering.

- **Intra-Company Experiments.** These are designed to explore how two or more companies in an ecosystem can work together to deliver value. Typically, they involve companies of different types and sizes and experiments seek to balance costs and benefits appropriately.
Behavior Change Experiments. These experiments aim to change internal behaviors by enhancing buy-in to new ideas. "The trick is to let others take the credit for new ideas," said a manager. "For example, we have staff make their own training videos so that they are front and center in a change."

Experimentation and IT

If experimentation is a useful tool for exploring what an organization doesn't know, how does it fit into IT and its work? The focus group identified five areas in IT that should incorporate experimentation into its activities:

1. **Strategy.** It is often felt that experimentation is the antithesis of strategy and that experimentation is a series of one-off opportunistic events. But studies show that it is experimentation within strategy that yields the most valuable results (Bingham et al. 2014, Posner 2015). This does not mean that strategy should be inflexible, but that it should provide overall direction and alignment for experiments. Strategy serves as a screen for new ideas and a yardstick with which to measure experimental success (Collis 2016). By being more focused in the opportunities selected for experimentation and more disciplined about which opportunities to approach first, organizations can pursue the most advantageous opportunities in a sequence so that each experiment builds on the learning from the previous ones (Sund et al. 2016, Bingham et al. 2014). Using a strategic vision as a filter ensures that the right questions are asked and empowers local experimentation to refine them over time. Thus experimentation becomes emergent strategy as it identifies current mismatches, gaps, or opportunities to improve an organization's fit in the marketplace (Collis 2016).

The focus group agreed that visionary leadership asking the right questions is essential to effective experimentation. "Leaders can also help us evaluate the results of an experiment and decide whether to end, continue, or amend it," said a manager. "In our most recent experiment, as soon as they saw the results, they were eager to fund more work." The results of carefully structured, sequenced experiments can lead either to radical changes in products or business models or walking away from what initially appeared to be an attractive opportunity (Bingham et al. 2014). "Ideas come from everywhere but strategies are about going somewhere in particular, never about going everywhere" so experimentation within the context of strategy enables a disciplined approach to understanding the nature of opportunities and the linkages among them and help an organization move in a sequenced fashion from their current state to a desired end state (Hunter et al. 2014).

2. **Architecture.** Architecture has an important role to play in experimentation, said the group. Like strategy, architecture forms a context within which experiments should take place. "We provide a predefined set of tools and open source software for experimentation," said a
manger. "And we still need to govern what happens in experiments." Another added, "Architecture used to just say 'No' in the past when people wanted to do new things. Now we ask why and work with experimenters." Architects can also play a broker/facilitator role for those with good ideas, identifying people who might wish to support experiments and ensuring that all points of view are heard in an experiment. "We set the culture by identifying a go-to person," said a manager. "We also ensure openness to failure and mentor experimenters to ensure they define success carefully and promote their work publically." Finally, it is often architects who capture lessons learned so that they can be built upon in the future.

3. Development. Experimentation should be a precursor to other, more permanent forms of development, so there needs to be a clear understanding of what will constitute success and this will likely not be the same metrics as with other types of development. It is self-evident that experimentation calls for a flexible and iterative approach to development – one that incorporates rapid learning, adjustments, and a cross-functional team (Bingham et al. 2014, Conforto et al. 2016). "Agile and DevOps methodologies have helped us change our culture positively to accept this type of development," said one participant. Yet experiments also need discipline in project management and the design of performance metrics.

Experiments can be threatening to others, both in development and in the business, and communication about their purpose and longer-term benefits to the company is therefore essential as these initiatives take shape (Sund et al. 2016). One manager noted that his company is experimenting with a new digital platform for its products but there is considerable confusion about its purpose and its development practices. "We know we need a digital platform but we aren't selling much with this experimental one and it is using non-standard tools that won't work in the future, yet there seems to be no plan to change it or turn it off."

This situation underscores two key problems with executing experiments – when to stop them and when to move them into the full development process. By definition, experiments should be short-term but the reality is, when business people see something they like, they don't want to turn it off and wait for the 18 month/$1 million solution. "This is our nightmare scenario," said a manager. Yet it is extremely common and this fact emphasizes the fact that experiments need to be developed within an architectural framework and governed by clear success criteria and a formal evaluative process to which all stakeholders agree in advance. Failure to do so means supporting "lame duck" experiments much longer than desirable and eating up resources that could be more effectively used elsewhere (Ballé et al. 2016).

4. Structure. Organization structure is not the first thing that comes to mind with experimentation, but it is an important consideration, said the focus group. Many
companies are organizationally rigid and find it difficult to fit new experimental units into existing structures, particularly when experimenting with new business models. This is one reason why experiments can fail (Sund et al. 2016). Tension and power struggles for funding and other resources are also common since experimentation typically doesn’t fit with existing prioritization, business case, and resourcing practices. There is no obvious answer to these challenges but they must be dealt with if experimentation is to be successful.

Many companies have consigned experimentation to a lab or an offsite location in the belief that, freed of organizational constraints, it will flourish (Kane 2016, Applegate et al. 2016). This approach views innovation centres as places where all LOBs can come together to address common problems. According to proponents, the key benefit of this approach is its ability to foster synergies across the business anchored in the belief that innovation is best nurtured away from the mainstream business (McKeen and Smith 2012).

Others have created separate, but not offsite, IT and business units to drive experimentation. Here the goal is to place innovation centres internally either within IT or within specific lines of business (LOB) in order more closely tie IT experiments to “real” problems/opportunities and encourage business buy-in (McKeen and Smith 2012).

Neither solution has been totally successful. Separating out experimentation can solve some immediate resourcing issues and tensions, but in the longer-term organizations still need to contend with the fact that their core business is what sustains them. As John Hegel explains, in most companies there’s an unstated agreement that experimental units can do what they want in their sandboxes but if they come back to the core business, they will be crushed (Kane 2016).

Ideally, establishing an organizational structure suitable for experimentation should be an experiment itself. Organizations shouldn’t settle too quickly on a structure for experimentation. Structure is an aspect of the business that needs to be fully explored and experimented with before learning what works best (Sund et al. 2014). A critical element of any new organization structure is that it supports learning, not just in the experimental group but also in the broader organization. For example, reviews should be used as cross-functional learning events to make sure various stakeholder groups are on the same page (Ballé et al. 2016). After all, the primary goal of experimentation is not to undertake a successful experiment but to support business transformation, challenge entrenched assumptions, and evolve dynamically (Ballé et al. 2016, Kane 2016, Schrage 2016).

5. **Capabilities.** Experimentation is an art, not a science, said the focus group. While organizations must facilitate it, much of the success of experimentation devolves to the people involved. New capabilities are needed in both IT and business and these will be different from those traditionally needed in the core business (Sund et al. 2016). From a management perspective, senior leaders need to have visionary skills to set the right
context for experimentation and process design skills to create a work environment that supports and accelerates learning (Ballé et al. 2016). Leaders must signal clearly that failure is acceptable and expected since one of the biggest issues holding organizations back from exploring is fear of failure and the belief that failure gets punished (Kane 2016).

Within IT, staff need skills at framing problems, working with data, testing prototypes, and collaboration, in addition to agile methods (Ballé et al. 2016, Conforto et al. 2016). They must market their ideas in new and more accessible ways, such as graphics and stories, said the focus group. And they must also be able to deliver and learn continuously (Ballé et al. 2016). "Many of our existing IT staff won't successfully transition into this new environment," said a manager. "So we will need to bring in staff with new capabilities and insights from outside the firm."

Teams also must be designed differently to balance a much wider selection of skills including: data science, statistics, business analytics, financial modeling, industrial design, innovation management, psychology and social sciences (Blosch et al. 2016). They need broader stakeholder representation and commitment to more frequent and detailed reviews. Teams that know how to learn should be the goal, that is, teams that can translate disruptive ideas into experimental questions and hypotheses, grapple with real issues, work within standards, and solve problems creatively, all with idea of improving an organization’s products and services and their fit to markets, production, and its industry (Ballé et al. 2016, Blosch et al. 2016).

Although the focus group strongly believed that IT has a mandate to experiment, it recognized that change is tough for their organizations and the types of change involved in making experimentation a reality are hard to articulate and even more difficult to execute. As with experiments themselves, the best way to become an IT organization that fosters experimentation, is to experiment with the IT components involved.

The Experimentation Life Cycle
"One of the things we struggle most with is finding a way to formalize experimentation," said a focus group manager. "We need to understand where experimentation fits into our traditional development and production life cycles." Although there is no clear experimentation life cycle, the consensus is that experimentation is part of the innovation process, falling after ideation, where ideas are collected and evaluated, and before the formal development process (even if it’s agile) begins (Browning and Ramashesh 2015). The focus group identified several stages of experimentation that are roughly sequential, even though they may iterate several times (see Figure 1):

🏆 Set the Culture. As mentioned above, having a culture that supports experimentation and its high probability of negative outcomes is an essential prerequisite to undertaking experimentation (Browning and Ramashesh 2015). This needs to come from the organization's senior leadership, which will provide the resources, directives, and structure
for experimentation. Ideally, one business person and one IT person will be responsible for experimental initiatives. These people should understand the organization's vision for the future, be strong communicators, and have the skills to design and evaluate experiments.

Find Sponsor(s). Experiments should not be undertaken in a vacuum, said the focus group, but should be consistent with where the company or a business unit wants to move. Finding a sponsor is the acid test of whether an idea has "legs" and will be worthwhile experimenting with. Without one, it is likely that even successful experiments will fail to find traction in the organization. One focus group member found this out the hard way. "We didn't involve the business in our dashboard experiment and when we presented the results to them, they didn't want anything to do with it because they felt threatened and hadn't been involved," she said. Although business sponsorship is the ideal, many participant organizations also had some experiments underway with only IT sponsorship. These were of two types: to test out a new technology or to develop an idea that appears to have promise but which the business doesn't yet "get". Clearly, neither of these can go forward very far without business sponsorship, but occasionally it is worth undertaking a small internal IT experiment so that business leaders can see something that will capture their imagination. "When our leaders saw what we could do with our data, they immediately began asking for more," said another manager.
**Define Experiment and Success Criteria.** This is a critical step. Experiments need to be focused and have clear success criteria. A design should articulate a hypothesis to test and what result is expected. Early stage experiments should be simply designed to get very quick feedback, possibly initially from internal users or customer focus groups. Success criteria should also be focused on what the experiment is testing, for example understanding which market demographics would be interested in a new offering. These should be clearly agreed-on in advance by all stakeholders as they will form the basis of the learning and evaluation stage.

**Proof of Concept.** The goal of this stage is not to build THE solution but a minimal viable product to test an idea and see if it makes sense. Iterative development is essential for experiments, although very early stages may not be technology-based but could be mock-ups or storyboards. As with agile development, speed is of the essence, but iterations will likely be even more rapid with experiments, since there is much less certainty.

**Learning and Evaluation.** This stage is the focus of the experimentation process for several reasons. First, it is critical to assess the results of the experiment. What happened? What do the data say? Often, it will be important to dig down into the results to determine what can be learned from an experiment. Common pitfalls include: looking only at overall outcomes, not at specific market segments; cancelling the experiment too early when uptake is slow and not understanding the underlying reasons for this; and dragging the experiment on too long when initial results are not borne out over a longer time period. A second reason to carefully assess results is to determine if there were design or planning issues that undermined them. Often human error and systemic bias can lead to less-than-clear results. Such situations can feed back into the experimental design stage.

Third, what is learned will help direct future experiments. "Pivoting" is a key component of experiments as leaders increasingly understand more clearly how to develop an idea. Some key types of pivots include: zooming in on a particular feature; refocusing on a particular customer segment; reframing the business model proposition; changing the mix of channels involved; and changing the technology involved (Blosch et al. 2016).

Fourth, experimental results should be assessed with regard to the overall process of strategic transformation. Success could lead to the development of new products or services but all results will feed back into the strategy development process and dynamically help guide business strategy and transformation. Success could also lead to a series of related experiments to test improvements to existing products and services and/or features or new products and services. The goal is to conduct an ongoing number of experiments within a particular strategic context, rolling out the successful ones and re-evaluating the not-so-successful ones. Finally, learning should lead to an assessment of the skills, capabilities, and resources needed. Is more business participation needed? Is funding adequate? What new capabilities should be added to the team? Are there cultural or
Getting Started with Experimentation

As with all new ways of working, experimentation will take time to become engrained in an organization’s culture. However, the focus group had several recommendations for IT leaders who wish to get this change started should:

- **Provide space and time for experimentation.** Experimental thinking uses a different type of brainpower that requires a disengagement from current tasks and activities (Posner 2015). Nurturing it therefore requires people to gain a psychological distance from more performance-oriented work. Companies that wish to promote a culture of experimentation need to provide places and spaces for it – both physical and virtual – where people can take time away from their day-to-day activities to think, interact, cross-pollinate ideas, and design experiments related to different topics (Berman and Marshall 2014). This does not require a separate location and dedicated resources, at least initially, but it does mean recognizing and respecting a certain percentage of everyone’s time should be devoted to this type of work. One focus group organization has dedicated Friday afternoon as "thinking time" to be used for learning. "I don't care what my people do with it as long as they bring back something they’ve learned," said a manager.

- **Use cross-functional teams.** "I've learned the hard way that you have to involve business in experimentation or whatever you come up with is likely to fail," said a manager. The best way to do this, said the focus group, is to start a relationship with colleagues in the business. "Use food and drink," said a manager. "Spend some time cultivating them. Be humble and ask for their ideas and opinions. Be a little fuzzy if you’ve got an experiment underway so they can help." Many focus group companies now participate in offsite innovation labs, which involve a combination of technology and business partners. But others prefer to create internal cross-functional experimental teams that can seed changes back to the broader organizational culture, helping it learn from failure and become more comfortable with uncertainty (Blosch et al. 2016). Some experiments will also involve customer participation through focus groups.

- **Establish new ways to fund and govern experiments.** It is clear that experimentation cannot and should not compete with other types of IT projects and organizations need to develop quick and effective ways to engage in, fund, and disengage from experiments (Blosch et al. 2016). One focus group company has created a combined innovation council. “We’ve recognized that we can’t do things in silos so we’ve brought the business and IT together to experiment with how to manage experiments more effectively,” said a manager. Another organization uses a "dragon’s den" approach to experiments, where their proponents pitch their ideas to business leaders to obtain preliminary funding. "This emphasizes that experiments must be tied to a business problem," said the manager.
involved. All agreed that investment should be tied to individual iterations. "That way, we always ensure that we are going in the right direction for our company," explained a focus group member.

- **Reduce known unknowns.** Experiments actually comprise two sets of unknowns: things we don’t know we don’t know (unknown unknowns) and things we know we don’t know (known unknowns). The key to an effective experiment is to reduce the knowable unknowns by focusing attention on things that can be made more certain, such as: results, processes, communication, goals, vision, and requirements (Kane et al. 2015). "Many of our experiments fail because of human factors, such as poor planning, rushing design, and other things," said a manager. The remaining known unknowns are driven by complexity. Reduced complexity can be achieved through experiment decomposition and thorough planning, as well as scenario analysis and frequent communication. Experts also recommend using long interviews with users to pick up weak signals, using data mining to better understand the phenomenon to be studied, and incorporating a balance of local autonomy and central control into an experiment’s design (Kane et al. 2015).

- **Rethink the role of failure in the enterprise.** Celebrating failure and what has been learned is central to developing a culture of experimentation, agreed the focus group, but it is hard to sell this concept to the organization. Many leaders consider an experiment a failure if it does not bear out its hypothesis. Changing the culture means getting comfortable with failure and accepting some risks. Often the pressure to claim success keeps many experiments going on too long (Blosch et al. 2016). "The worst thing is when you can’t wind down an experiment and there are organizational politics associated with it," said a manager. Senior leaders therefore need to openly talk about failures and then deploy what has been learned in future experiments. This is the best way to keep more ideas and innovations flowing, agreed the focus group.

- **Build on what you learn.** "We had an experiment that wasn’t a business success but, when we looked at the results, we realized we could use the technology involved as a platform for other products and services," said a manager. "That learning was really key and, of course, we learned that this particular business opportunity should not be pursued as well." Focus group managers recommended experimenting first with IT staff as customers and then internal staff as it gives them firsthand experience before taking a bigger risk with customers. "We experimented with mobile business intelligence tools with carefully-selected participants," said another. "But others caught wind of it and it became a movement. Then the Board heard of it and wanted it too so we were able to experiment further. It was perfect!" Although not all experiments are successful in proving their hypotheses, they should all inform strategy. The key is learning from the results and then pivoting. The focus group stressed that experiments should be seen as a journey, not a road map. "Miracles come in small steps." said a manager. "You learn and then you adjust."
Conclusion

Few individuals or organizations are comfortable with experimentation but most recognize it is necessary for survival in the brave new world of the future when we will be bombarded with increasing amounts of change from all fronts. There are lots of ideas in organizations, but until recently, there has been little support for following up on them and few ways to do so. This paper has shown that introducing experimentation into an organization must be done holistically. Culture, capabilities, strategy, processes, governance, funding, HR practices, and functions must all be on board to do it successfully and learning from failures is essential. As a result, experimentation is not for the faint of heart. But the fact remains that organizations are experimenting and obtaining results and this increases pressure on others to do the same. Developing a culture where experimentation is accepted and even expected is the first step. Learning to experiment effectively will take longer and may require some process and structural experiments as well. However, the payoff will be the ability to navigate much more confidently in a world of continuous and dynamic change.

References


Concept

The purpose is to bring senior IT managers together to examine topics that are of critical concern to them and their organizations. Via the Forum, members share experiences, learn from their peers, establish valuable networks, and develop practical strategies for creating, implementing, and managing IT solutions.

Recent Papers

- Managing Maintenance
- Managing IT Demand
- IT in 2015
- Business Intelligence
- Improving Customer Experience
- Mobile Technology
- Redefining IT
- Innovation with Technology
- Emerging Technology Management
- Developing a Data Strategy
- Developing a Cloud Strategy
- IT in 2020
- Transforming to Dev-Ops
- Developing Thought Leaders in IT

Participating Organizations

- Bell Canada
- BMO Financial Group
- CAA
- Cadillac Fairview
- Canadian Tire
- CIBC
- eHealth Ontario
- Empire Financial Group
- LCBO
- Ontario Teachers Pension Plan
- Ontario Universities’ Application Centre
- Scotiabank
- Sun Life

Membership

Membership in the IT Forum is by invitation only. The annual fee is $3,000. Please direct inquiries to Dr. James McKeen at jmckeen@business.queensu.ca.