Seeing Sludge:

Towards a Dashboard to Help Organizations Recognize Impedance to End-User Decisions and Action

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24 September, 2019

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BEAR
Behavioural Economics
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Research Report Series
Behaviourally Informed Organizations Partnership;
Behavioural Economics in Action at Rotman

Rotman School of Management
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Suggested citation: Soman, Dilip, Daniel Cowen, Niketana Kannan, and Bing Feng (2019), *Seeing Sludge: Towards a Dashboard to Help Organizations Recognize Impedance to End-User Decisions and Action*, Toronto, Canada: Behavioural Economics in Action at Rotman (BEAR) Report series, available at http://www.rotman.utoronto.ca/bear

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ABSTRACT

Small factors in the context - things that might seem irrelevant to decisions and action - might either facilitate or impede the end user in accomplishing their objectives. If they are designed to facilitate, these contextual variables are called nudges. On the other hand, there is a category of situations where these contextual variables actively impede activities that are in the consumers' best interest, resulting in a reduction of welfare. These are known as sludge. Because sludge (or contextual variables) works by heightening natural human behavioural tendencies like procrastination and complexity aversion, a sludge to one person might not be similarly seen as a sludge by another person. Therefore, seeing sludge is not easy.

Hence, there is a need for a tool or a dashboard that allows organizations to see sludge. Our goal was to create a tool (scorecards and a dashboard) that organizations could use to see sludge so that they could go about clearing it. Scorecards have three components – a score for the Process, Communication and Inclusivity.

Our efforts represent an important first step in developing tools for helping organizations in seeing sludge. We **do not claim** that our scorecards are definitively the most appropriate tool for all organizations, but we believe they are appropriate for a wide range of organizations and end-user interactions. Our key points are to a) **highlight the role of scorecards** in seeing sludge, b) propose scorecards that might serve as a **starting point** for an organization to adapt, c) illustrate **a process** to generate scorecards and dashboards, and d) discuss several **implementation issues** in using these tools effectively.

Our paper also includes a TL;DR version – a standalone summary that could be used to communicate the key ideas.

Keywords: Behavioural Insights, Sludge, Context, Channel Factors, Impedance, PCI Scorecards and Dashboards, Implementation, Behaviourally Informed Organizations

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1. Introduction: The Architecture of Choice

Whether it be getting this paper ready for publication, designing a randomized controlled trial, analyzing data, planning a Behavioural Exchange conference, purchasing groceries for the household, saving for retirement, shopping, opening a retirement account, helping our students navigate through the course materials, or even returning a product to a store, getting things done is central to much of the human enterprise (Allen, 2002; Tu & Soman, 2014). It is also evident that many people struggle to accomplish tasks, as there is a demand market for self-help books and MBA courses on this topic.

Behavioural scientists have long been intrigued by the fact that many individuals who plan to get certain things done fail to accomplish these tasks (Thaler, 2015). In fact, the so-called intention-action gap is one of the prominent findings from research in the burgeoning field of behavioural economics (Sheeran & Webb, 2016; Soman & Ly, 2018). This field portrays human behaviour as distinct from the behaviour of rational agents often assumed in economics textbooks – as well as in the central paradigms of business and policy. In particular, economic approaches to decision making assumes that agents are forward looking, have the ability to execute complex cognitive calculations, are unemotional and are interested in maximizing their own wellbeing - assumptions that are captured by the notion of utility maximization. On the other hand, human beings are characterized as being myopic, forgetful, cognitively and physically lazy and often emotional.

This distinction between **humans** and **econs** was first described by Richard Thaler and Cass Sunstein in their book, '*Nudge'* (2008), and was used to illustrate what the field of behavioural economics is all about. More recently, Soman (2015) argued that organizations struggle to engage with their end users and to create outstanding experiences because they design products, processes and systems for econs, when in reality; it is humans that use those products and processes. This mismatch results in what he called **The Last Mile problem**.

For instance, a pension organization might assume that consumers are motivated to plan for their retirement. A financial institution might assume that consumers want to be able to make informed choices and therefore provide the consumer with plentiful information. A retail store might assume that consumers value variety and hence provide large assortments to choose from. In contrast to these implicit assumptions and in reality, end users might be unmotivated to plan their retirement, unable to consume lots of information and find it difficult to make choices. Soman therefore argues that in order to make human-compliant products and services, organizations should keep in mind that they are designing for human beings who are cognitively lazy, forgetful, emotional and myopic, rather than for econs.

1.1. Planners, Doers, Channel Factors, and Failures in Getting Things Done

The intention-action gap has been modeled by several researchers by using the notion of multiple entities. In particular, Richard Thaler and Hersh Shefrin (1981) proposed the idea that every human being is comprised of two different entities, the planner and the doer. The planner is the visionary and makes decisions on what needs to be accomplished, while the doer has to execute on the plans laid out by the planner. However, the doer has greater power in this relationship because they follow the planner in time. As research has shown in many different domains, the doer is often not very good at executing on the plans of the planner. In particular, there are a number of contextual factors that might interfere with the doer's ability to execute according to the planner's wishes. These contextual factors are heightened by several behavioural tendencies of the average human.

Given that the success in various domains of life essentially boils down to the ability of the individual to get things done, it is not a surprise that a lot of research has been conducted with the aim of better understanding how people accomplish tasks and what facilitates and hinders the attainment of these tasks. Early researchers typically drew a distinction between two stages in task pursuit. The first stage was motivation, and the second stage was volition (Kuhl, 1992). Perhaps the earliest researcher to touch on the notion of volition was Kurt Lewin when he wrote about the field theory of psychology (Lewin, 1939). One of the central ideas in the field theory is that human behaviour – and in particular the ability to get things done is a function of both the person (the actor) and the situation (the context). This central idea is reinforced by other scholars (Ross & Nisbett, 1991).

In particular, Lewin explained human behaviour by emphasizing various forces and tensions that influence it. These forces and tensions arise not only as a function of the individual's motivation but as a result of factors in the environment that either help or hinder the individual in making progress towards a goal. In his conceptualization, channel forces are small situational factors that facilitate or hinder a specific desired behaviour. In the original writing, Lewin spoke about factors that facilitate behaviour as *gates* (see Hobman & Walker, 2015). To complete the metaphor, we refer to factors that hinder behaviour as *fences* or obstacles.

Researchers have subsequently used the term 'channel factors' to refer to contextual interventions employed to influence behaviour. For example, research has showed that attending a lecture on the importance of receiving a vaccination, participants who had received a campus map with the location of the health center circled were much more likely to receive that vaccination than participants who did not receive this map (Leventhal et al., 1965). Other researchers showed that amongst attendees of a financial literacy workshop designed to encourage low-income individuals to open bank accounts, those who could submit the first form to a bank representative at the workshop itself were much more likely to complete the application process and use the bank services more regularly as compared to attendees who had merely received the application material but needed to get started at the bank (Mullainathan

& Shafir, 2009).

Using the words of Kurt Lewin, psychologists could influence the behaviour of individuals positively by changing the force field, i.e. the context in which people need to get things done. In the language of Lewin, opening more gates in the channel would facilitate the accomplishment of a task, while closing gates (or adding fences) would hinder it. The early work of Richard Thaler and Cass Sunstein, who made the argument that changes in the context can steer people towards appropriate choices, is very similar in nature to this idea. In particular, they used the term choice architecture to refer to changes in the context that could help (or hinder) individuals in goal pursuit. A nudge refers to a situation in which a contextual intervention opens the metaphorical gates and makes things easier for people. Conversely, contextual variables that add fences and make things harder for individuals are called sludge (Sunstein, 2018).

1.2. The Empathy Gap and the Need for Seeing Sludge

We note that the notion of gates (and fences) would be irrelevant to the econ. As long as the econ knows what needs to be done to accomplish a certain goal and as long as the utility of the said goal was sufficiently high, contextual factors should not influence their eventual success.

Prior research shows that developers of products and services often find it very difficult to empathize with the viewpoint of the end user because their proximity to the new product development makes them more like econs with respect to the benefits offered by the products (Gourville, 2006; Soman, 2014). A similar empathy gap arises in thinking about the role of context. For instance, a cognitively sophisticated and highly organized individual might never see the potential sludge faced by complex information for others; and a forward-looking individual with excellent time planning skills might not see why a delay in an application process might trip up a myopic and impulsive individual.

Given that a contextual variable might be sludge for one person but not for another, it could sometimes be *difficult* for many to *see the sludge*. Hence, organizations will benefit from a tool that breaks down this sludge into its antecedent contextual variables – in other words, a tool that facilitates *seeing sludge*!

The rest of this paper is structured as follows. First we outline a conceptual distinction between "nudge" and "sludge" and decompose the notion of sludge into antecedent variables. Next we identify different sources of sludge and try to develop the foundations of a scorecard that will allow an observer to see sludge in organizations and their processes. We propose a preliminary version of this scorecard as well as a dashboard, and finally conclude with the general discussion and recommendations on how sludge can best be measured, audited and eliminated from organizations.

2. Nudge and Sludge

The econ should not care about gates and fences. However, the popular press and cocktail parties are often replete with stories of people who fell flat at trying to achieve the simplest of things.

In our research, we spoke to individuals who were accidentally defaulted into purchasing a subscription to a newspaper, but were unable to cancel the subscription because cancellation required them to keep the original receipt and to mail it in using snail mail. Accidental subscriptions are so common that there is a well-accepted term; subscription traps; for this phenomenon (see, for example, Government of Canada, 2018). We also spoke to another individual who had picked up the motivation to register for a digital tax filing service offered by their country's tax agency because it would eventually simplify the process of filing income tax. This person was motivated to apply for the service after filling in a particularly arduous tax return. However, as they went through the registration process, they reached a stage where they were told that a password and a PIN number would be sent to them by snail mail and that they could continue registration after they had received the said password. By the time the password arrived in the mail a couple of weeks later, the individual had lost the motivation to continue with the registration process.

Other individuals struggled with excess fees because the manner in which that fee information was presented to them was ambiguous, and yet others ended up purchasing a more expensive product than they wanted because the information about a cheaper product or a free trial version were difficult to find on a company's web page. Figure 1 summarizes a number of stories of people who set out to achieve seemingly simple tasks, but fell short!

FIGURE 1. SLUDGE STORIES

1. Process

#1

An interviewee needed to file an additional document and a $900 adjustment in her taxes because her tuition changed after filing. The document was not available online, and after 30 minutes on hold, the customer rep gave her general information unrelated to the issue. She was transferred, and after 20 minutes on hold, she restated her issue and this rep resolved it.

#2

A passport applicant completed an online form that the consular website directed them to. After completing 14 screens, they were asked to verify that their parents were citizens of the same country. Since they were not, they were redirected to another form where they had to re-enter all the information. This was again not the correct form. The applicant went through this process 4 times.

#3

An individual was required to use a money transfer app to place a deposit for a case competition. She attempted (and failed) several times to get her deposit back. Focusing primarily on how to make it easy for customers to transfer funds into the app, designers omitted the functionality of transferring funds out.

2. Communications

#1

In renewing her health card, an interviewee brought the required documents listed online. After waiting in line for more than an hour, she was told that her residency document couldn't be a copy and when she returned that her utility bill couldn't be an e-bill. To get her health card, she had to get her license to have an acceptable document.

#2

The visa requirement for a particular country included a yellow-fever vaccination. Despite getting the vaccination, an applicant was turned down because they did not have proof of vaccination in an acceptable format (information on which was not provided).

3. Inclusivity

#1

An interviewee and her family's airline seats were changed a week before the flight. They had asked to sit together, so she called the customer support line to resolve the issue. The seat allocation algorithm did not recognize families. As it was a week before the flight it would be cost prohibitive to re-book.

#2

A family signed up for a benefits program. They completed the forms online at a public library and were told that they would need to complete registration by entering a code they would receive as a text message on their mobile phone. Since they did not have a mobile phone, they were not able to register.

#3

A respondent pointed out to a mental health and suicide prevention helpline poster that is posted to many subway stations. The poster is in a prominent, well lit area and is highly unlikely to attract the attention of people who need it most – reading the poster puts the spotlight on the reader, and the resulting embarrassment would deter them from reading it.

In all of these examples, natural human tendencies like the desire to procrastinate (Soman & Ly, 2018), or cognitive laziness (Kahneman, 2011) were amplified by specific actions that the firm took. In particular, the delay imposed by waiting for a password from the tax authority significantly reinforced the tendency to procrastinate, while the decision to obfuscate information about fees fed into cognitive miserliness on the part of the consumer to not read the fine print in great detail.

Many behavioural scientists and experts, including Cass Sunstein (2018) and Richard Thaler (2018) have referred to this as sludge. In the words of Sunstein (2019), "Consumers, employees, students and others are often subjected to sludge: excessive or unjustified friction such as paperwork burdens that cost time or money that make life difficult to navigate, that may be frustrating, stigmatizing or humiliating and that might end up depriving people of access to important goods, opportunities and services." In many ways, sludge is the opposite of nudge. While nudging "makes it easier" and facilitates action, sludge "makes it more difficult" and hinders actions [where "it" refers to the actions needed to be undertaken to complete a task].

2.1 Behaviour Change as a Plumbing Problem

Any attempt at a behaviour change, be it a change in decision or a change in a series of requirements and actions needed to accomplish a particular outcome can be conceptualized as a plumbing problem.

In his book, '*The Last Mile'*, Soman (2015) drew an analogy between moving people from a particular state (for example, desiring to open a bank account) to a new state (for example, actually having completed everything needed to be done and having a new bank account) to the movement of a fluid in a pipeline. In particular, this conceptualization is based on two observations. First, in order for fluid to move from one point in a pipeline to another, there needs to be a pressure differential across the pipeline so that the fluid can move from a higher pressure to a lower pressure point in the pipeline. The psychological equivalent of this is motivation. Unless there is a motivation to accomplish a given task, psychology would suggest that consumers will not set about trying to accomplish their task.

The second observation is that the stretch of pipeline between these two points can be comprised of many distinct segments, and the engineer's task is simply to keep the segments clean and leak-free. This second observation is a metaphor for the idea of nudging. In particular, the most successful nudges rely on principles of psychology to ensure that tasks are easy and simple to do. For instance, knowing that the majority of the population prefers option B over option A will lead the choice architect to make B the default option rather than A. Alternately, knowing that a lot of people struggle with telephoning their doctor to make an appointment for an annual health checkup would lead the choice architect to assign people an appointment and have them opt out if they are unable to make it.

Fluid will not flow easily through the pipeline when there is sludge in the pipeline. In the context of plumbing and fluid mechanics, sludge can be defined as "a thick, wet mud or similar viscous mixture of liquids and solid components that are typically the product of an industrial or refining

process (Oxford English Dictionary, 2019)." Sludge can coat pipelines and make it difficult for fluids to flow through it (Tchobanoglous et al., 2003).

Metaphorically speaking, in a behavioural context, we define sludge as any component of the context that makes it difficult for people to make decisions or to perform all of the actions needed to accomplish a task. In the language we developed earlier in talking about field theory, sludge represents fences!

We note that the negative effects of sludge on human behaviour depend on the intrinsic underlying motivation. Recently, Soman and Ly (2018) wrote based on their experience across a broad range of behaviour change challenges that there are three segments of people in terms of how they respond to a request to change behaviour.

The first segment are ***motivated enthusiasts***. These are people who are highly motivated to not just agree to the switch but to make it. They act on plans at the soonest possible opportunity. A second segment is the ***diehard opponents***. These are people who might be opposed to the behaviour change that is being asked of them based on a variety of reasons that could include personal beliefs, philosophical grounds or they might simply not be a good candidate for that particular behaviour change.

The third and potentially the largest and the most insidious segment are known as the ***naïve intenders***. These are people who believe in what is being asked of them and fully plan to do it, but their intentions might never convert into actions because of procrastination.

Fences in the environment - sludge - might be particularly deadly for this last segment because it might frustrate, delay and eventually get these people to give up on taking the required series of actions. Conversely, they might not have much of an effect on motivated enthusiasts who have high levels of motivation to complete the task right away.

2.2 Sludge: A Conceptual Framework

Given that the notion of sludge comes to our field as a metaphorical extension of engineering, we break it down into two distinct components. The first component is a feature of contextual variables. In particular, does the context **facilitate** decision making by making things easy or does it **impede** decision making by adding a friction? However, not all impedance results in a bad outcome. Therefore, a second dimension has to do with the outcome for the end user. Does the facilitation or impedance help the consumer by **increasing their welfare** or does it harm the consumer by **decreasing their welfare**? Figure 2 captures our thinking about the taxonomy of nudge and sludge situations and is similar to Table 1 in Sunstein's (2019) paper.

FIGURE 2. A FRAMEWORK FOR UNDERSTANDING NUDGE AND SLUDGE

	Facilitate Decision Making	**Impede Decision Making**
Helps Consumers	*Nudge*: making things easy for end users	*Decision Points* or *Cooling-off Periods*: that prompt vigilance and thoughtfulness
Harms Consumers	*Nudge-for-Bad* or *Dark Patterns*: making it easy to choose welfare – reducing options (subscription traps, default add-on purchases)	*Sludge*: making it difficult to cancel subscriptions, to return products, to change privacy settings, etc.

We first focus on the dimension of facilitating versus impeding action. Interventions that make things easy, for example, the simplification of forms (Bhargava & Manoli, 2015), the easy and simplified access to information that allows consumers to make better choices (Richburg-Hayes et al., 2017), the presence of sensible defaults that are consistent with inherent consumer preferences (Jachimowicz et al. 2019) and the reframing of communications to make salient appropriate attributes (Castelo et al. 2015) that will help decision making are all examples of interventions that facilitate the appropriate action and that help consumers make the best choice.

Indeed, much of the work originally proposed in the book '*Nudge'* and subsequently done by several 'nudge units' all around the world in both the policy, welfare and business domains is in the spirit of increasing consumer welfare by making it easy for them to choose and to act upon their choice. A recent publication from the OECD summarizes a large number of such facilitating interventions from units all cross the world (OECD, 2017).

However, facilitating - making things easy - also comes with a potential negative consequence. For example, as illustrated by one of the stories in section one, a consumer might be easily defaulted into purchasing a subscription to a magazine that she had no intention of purchasing. Similarly, an inattentive consumer might easily consent to have their digital footprint shared with businesses who are interested in customizing products, services and offers to their customers. The popular press has often highlighted the potential negative effects of facilitating choice and action (see Albrecht, 2017). In the field of digital interface design, these facilitating interventions might be designed to get users to purchase products or services that they don't need, or to spend more than they had wanted to (see Mathur et al., 2019). Collectively, these interventions – as well as other digital interventions that might reduce consumer welfare are referred to as dark patterns (Brignull, 2018). More formally, dark patterns are "user interface design choices

that benefit an online service by coercing, steering, or deceiving users into making unintended and potentially harmful decisions" (Mathur et al., 2019, p1.)

We next turn to the two cells in Figure 2 where context impedes decision making and action. Is friction in a process or choice, or the impedance in getting things done always a bad thing? In previous research, Soman and colleagues have argued that sometimes interventions that add friction to the decision making or consumption process might actually increase consumer welfare (Soman et al., 2010). In particular, we focused our efforts on helping people that have self-control problems but are aware of these problems and want to do something about them. Researchers Matt Rabin and Ted O'Donoghue have referred to these individuals as sophisticates (O'Donoghue & Rabin, 1999). Sophisticates are all around us.

For example, people routinely say that they would like to lose weight or save more money, but they simply cannot due to forces they feel are sometimes outside of their control. These are the so-called naïve intenders. In previous work, we contend that these individuals could be encouraged to control their consumption behaviour by providing them with what we called *decision points* (Soman et al., 2010). Imagine a consumer that has purchased a large bucket of popcorn and now has to make decisions about consuming it. Imagine further that in a parallel universe, the same consumer received the exact amount of popcorn, but instead of receiving it in one bucket, they received it in six bags of equal quantities. The question is, would we expect the consumption to be different across these parallel universes?

Based on a series of experiments, researchers Amar Cheema and Dilip Soman found that consumption was significantly greater when the popcorn was in the metaphorical bucket than when it was in the metaphorical six equal bags (Cheema & Soman, 2008). This happens because when individuals are in the process of consumption, they start off in a deliberative mode in which they actually think about the pros and cons of consumption. However, once they start consuming the popcorn, they quickly shift into an automatic mode where continued consumption becomes mindless, habitual and easy.

In this case, the ease ends up in getting consumers to over-consume, and hence the provision of a decision point – in this case an explicit decision of whether to open the next bag once the previous one has been completed – can enable the individual to snap back into a deliberate and vigilant mode. For a sophisticate, this entails a call to vigilance and the realization that the consumption was something that they should do in a controlled manner. This impedance, the decision point, allows the planner to take control of the individual's organization and transports the individual from a zone of impulsivity to a more detached view of the choices confronting them.

A decision point can be defined as any intervention that adds friction to a process with the objective of getting an individual to pause and think about the consumption that they are currently engaged in. There are three broad methods for creating decision points. One, inserting a transaction cost, which works on the premise that requiring the individual to take a positive action makes them deliberative about the consumption decision. Second, providing reminders

or information, which works on the premise that drawing attention to a neglected activity can provide the impetus to get it done. Third, creating interruptions to the consumption activity, which works on the premise that the interruption allows the individual to refresh their thought process and hence to rethink about what is to come next.

The third approach to decision points – creating an interruption – is conceptually identical to another family of interventions that impede quick decision making and action. This family of interventions is known as "cooling off periods." In many contractual settings or in the field of negotiations, cooling off periods are windows of time after the conclusion of the transaction or negotiation before the contract (e.g., a sale) becomes binding. The psychological account that explains the need for cooling off periods is known as the hot-cold empathy gap (Loewenstein, 1996). In particular, Lowenstein argues that decisions might often get made "in the heat of the moment" (or on the basis of visceral factors; Loewenstein, 2000). These viscerally-charged decisions might be sub-optimal, and allowing people to let these visceral arousals cool down and re-examine their decisions through the passage of time might again get them to be vigilant and make more responsible choices. This is another example of an impedance that can increase consumer welfare.

Put differently, there are definitely domains in which friction or impedance can actually be welfare-enhancing for the end user. However, it is the bottom right cell of Figure 2 that is most interesting for the present work, and that is the focus of our current project - interventions that impede decision making and that also result in a reduction in consumer welfare. A number of the examples that we quoted in section one and that Sunstein (2018) refers to in his research fall into this cell in our two-by-two matrix.

2.3 Sources and Moderators of Impedance

In thinking about situations where impedance of friction in the environment can reduce the welfare of consumers, we identified different sources of friction.

The *first source* of impedance could be from the **actual process** required to complete a task. For example, are the channels to accomplish the task easy to use or do they require multiple interfaces and multiple interactions with service personnel? How many unique activities or steps are required to complete a task? How many distinct entities or touch points does the end user need to interact with in completing the task? Do some parts of the process interfere with other parts of the process? Does the service provider see all elements of the process at the same time and can control them simultaneously? A rich literature in disciplines including process design (Evans & Lindsay, 2014) and process improvement (Boutros & Purdie, 2013) has identified several principles for maximizing the effectiveness of a process from the end-users' perspective, and for maximizing customer experience (see Figure 3 for a summary).

FIGURE 3. KEY IDEAS FROM SIX SIGMA

1. Define
Create teams and identify the process to focus on

2. Measure
Establish baseline through measuring the performance on inputs to the process.

Six Sigma equips teams of "users" (the employees closest to the process) with the advanced statistics, financial analysis, and quantitative project management tools to identify and repair specific inputs within processes.

3. Analyze
Isolate each input and test it to see if it is the source of the error in the process.

5. Controls
The team then implements controls to ensure that it doesn't became faulty again

4. Improve
Once faulty input is identified, the team can fix it to make the overall process more efficient.

One particular aspect of the process that causes impedance relates to the manner in which **re-engagements** are handled by the process. Consider a patient navigating their way through a healthcare system. Perhaps the single biggest source of frustration relates to the need to repeat a medical history or describe symptoms separately to different members within a given hospital or clinic, as well as to healthcare providers across hospitals, clinics or labs (Ganguli, 2012). While the repetition can be functional in some cases, a significant amount of repetition could be eliminated by a well-designed electronic health record (EHR) system (eHealth Ontario, 2019). More generally, the experience of the patient could be a metaphor for many processes in which a user needs to interact with multiple parts of a process, or with the same entity over time. Does a process have memory, such that the user navigating the system repeatedly does not incur the same costs? Are various parts of the process and system coordinated so that learning in any one part can be immediately updated and shared with the rest of the system?

A **second source** of impedance is the nature of the communication. For example, we know that the human brain is particularly efficient at processing information that is structured, linear and that takes the form of concrete checklists, rather than identical information that is presented in a block of text. We also know from prior research (Manoli & Turner, 2014; Bhargava & Manoli, 2015 as cited earlier) that the mere act of simplifying information into distinct blocks or bullet points can increase the engagement of the end user, simplify the communication, and help the user to accomplish tasks.

In addition to the complexity of information, there are several other features that can create impedance for the end user. In thinking about failures of communication on the part of organizations, we could think about three different kinds of failures (see Soman, 2015, chapter 12 for a more detailed analysis).

The first type of failure is an **outright failure to disclose information**. Imagine that a consumer clicks through a website and makes a purchase using her credit card. After the credit card has been approved and the order has been confirmed, she sees a message saying that all shipments to her geographic location will be subjected to an additional surcharge. This information has not been disclosed during the entire purchasing process (but might have been available elsewhere on the website), and hence this example illustrates an outright failure to disclose a relevant piece of data in the context of the purchasing process. Similarly, financial advisors might fail to disclose fees, and organizations might fail to disclose all the terms and conditions of a contractual purchase.

A second type of failure relates to **delayed or hidden disclosure**. Imagine that a consumer clicks through the same website and is about to make a purchase using her credit card. On the final (purchase) screen, she learns that she will need to pay the surcharge for shipping to her geographic region. By the time she sees the information on the surcharge, she is psychologically committed to making the purchase, and hence this information does not affect her to the same extent as it would have if it were presented at the beginning of the process.

A third form of failure is called **shrouding** or **obfuscation** (Gabaix & Laibson, 2006; Brown et

al., 2010). The firm in this case does disclose the surcharge early on in the process, but the disclosure is shrouded in the sense that it is not easy to read or to interpret. This could be done in a number of different ways. For example, the seller could use small or otherwise difficult to read fonts so that it is easy to overlook the disclosed information. Or, they could break down the surcharge into smaller components that require some computation on the part of the consumer; or use complicated and confusing language about when and where the surcharge might or might not become relevant so that the consumer is not clear about whether they would see the surcharge.

A ***third source*** of impedance could come from direct outcomes of, or the emotions that are generated by a process that might create differences in ***inclusivity***. Sometimes, inclusivity might be threatened by specific processes that are built into a system. For instance, an organization that requires forms to be completed in a particular language excludes people who are not fluent in the language, an organization that asks for a monetary deposit to process an application excludes people who have liquidity constraints, and an organization that accepts applications only electronically exclude people who have no access to a computer or the Internet. However, processes could also create exclusion as a second order effect. For instance, an operations researcher might design an allocation program that assigns temporary workers to a shift on a just-in-time basis to maximize the labour demand and supply match. However, single parents who are not able to organize last-minute childcare get excluded from the labour force as a result.

One particular domain in which emotions cause impedance is the domain of welfare or poverty programs. For instance, much has been written about the fact that the Canada Learning Bond – a welfare program designed to provide low-income Canadians with $2,000 of support to educate their children – ended up with very low take-up rates (see for example Hardy et al., 2018; Soman et al., 2013). One of the reasons for the low take-up rates was the fact that target recipients who were eligible for the Canada Learning Bond felt embarrassed going into a bank and signing up for the respective education savings account. By doing so, many felt that they would be confessing to the banker that they were in need of aid. In this case, it wasn't the complexity of the procedure per se that provided the impedance, but the fact that the procedure resulted in a source of potential embarrassment and awkwardness for the end user. Note that many of these frictions cause an impedance because they heighten the effectiveness or the role of certain human behavioural tendencies.

More generally, a number of researchers (see Handler and Hollingsworth, 1969; Orbach, 2006) as well as the popular press (Aleccia, 2013; Seabrook, 2014) has documented the extreme embarrassment and shame experienced by welfare recipients; and the potential embarrassment might dissuade people from engaging with the welfare application process. Elements of a process that heighten potential negative emotions can serve as an impedance.

2.4 Impedance for Humans, not Econs

The same 'sludges' that are generated as a result of process, communication, inclusivity and re-engagement issues will not create impedances for a pure econ. By definition, econs are motivated to complete tasks, are not tripped up by small impedance costs, can read through and interpret complex information and are not swayed by emotion. However, they will definitely cause frictions for humans who are attempting to go through the process. There are five particular insights from behavioural research that magnify the effect of seemingly small contextual frictions on outcome.

The first insight is procrastination (see O'Donoghue & Rabin, 1999; Schelling, 1992). Consumers will do whatever they can to put off an unpleasant task. This tendency is magnified by processes that somehow introduce delays.

The second insight has to do with consumers' resistance to complexity in information (Simon, 1957). Unlike econs, humans have limited cognitive abilities to process information, and therefore information that is perceived to be complex is often used as an excuse to stop working on tasks.

The third insight has to do with aversion to making choices amongst large assortments (Iyengar & Lepper, 2000; Gourville & Soman, 2005). Previous research has shown that as assortment sizes grow, individuals are more likely to choose not to choose or more generally to make sub-optimal choices. If processes force individuals to make choices amongst large alternatives, this can serve as another reason for individuals to stop trying to accomplish the outcome.

The fourth insight has to do with the lack of information transparency resulting in a lack of trust in the system (Buell et al.,2017). If the end user believes that there is a lack of transparency or that a business or organization is trying deliberately to obfuscate information that may serve as yet another excuse to stop trying to accomplish the task.

Finally, the fifth insight is that emotions matter (Rick & Loewenstein, 2008). Research tells us that individuals care about how others in society will perceive them and what judgments they will make about them. Therefore, many individuals choose not to meet with a financial advisor even though it is in their best interest to do so because they feel that they will be judged negatively by the financial advisor who is seen to be an expert on the financial markets when they are not.

Likewise, people might abstain from getting advice, help or insights from experts for the fear of feeling embarrassed or feeling foolish. Low-income individuals might choose not to accept welfare payments to which they are entitled to because they feel that they might be belittled by others. In our research, we conducted a series of interviews and found support for these insights in converting seemingly innocuous aspects of a process into large frictions that create impedance.

3. Towards a Dashboard

Now that we have developed a conceptual framework after a thorough review of the relevant literature, our next goal was to try and develop an instrument by which we could measure the degree of impedance in a system. In particular, we were interested in developing a dashboard that organizations could use to monitor, track, and therefore correct for contextual variables that might heighten behavioural problems for individuals.

3.1 Methods

In developing our measurement tools, we used four different methods – literature review, survey, expert interviews and informal audit of digital interfaces. The details of these methods are provided in the table below.

Method	Objective	Sample
Literature Review	To identify the role of contextual variables in facilitating and impeding decisions and actions, b) to develop a conceptual framework for sludge, c) to identify specific behavioural tendencies that could be exaggerated by contextual variables.	Publications on behavioural insights including books, journal articles, white papers and study reports.
Survey	To collect a compendium of cases where end-user experienced frustration because of sludge. Questions included: a) Have you had a frustrating experience dealing with business of government, b) What about the experience was frustrating, c) ranking those selections for what was most frustrating, and to d) Describe one particular frustrating experience.	The survey was distributed digitally (Qualtrics). A total of 50 complete responses were collected and used.
Expert Interviews	Experts were interviewed to a) validate the conceptual model, b) validate a preliminary list of contextual variables as the basis of scorecards, c) suggest additional factors, and d) advise on design choices for the dashboard. Interviews were conducted on phone and lasted an average of 45 minutes (range: 30-70 minutes).	We conducted a total of 10 expert interviews with behavioural scientists, process designers, and behavioural experts within organizations.
Informal Audit	Audits were done as a preliminary validation of the scorecard and to collect additional insights. We a) did customer simulations on each of the products that could be applied for/accessed on the sites, b) scanned the review sites, blogs and other searches for people describing their experiences with these organizations and c) Clicked on links, and did an audit of the sites to check functionality, language use, consistency, and if they have updated information.	The digital interfaces of 5 large financial institutions and 5 additional consumer product companies were audited.

3.2 Procedure

We accomplish this through a seven-stage procedure. While the procedure is described as linear and sequential, there were unsurprisingly instances where we iterated across steps (for example, an earlier iteration of the scorecards appears in Cowen et al., 2019).

Step 1: We started with the end-user journey. In particular, we identified a number of issues that an end user might have to deal with in interacting with an organization. In the case of a for-profit organization, end users (customers) may need to purchase products, order service, get product problems solved, cancel orders, return products, pay bills or get refunds. In the case of government organizations, end users (citizens) might need to apply for programs, visas, passports, subsidies or vehicular permits, pay taxes, register transactions or documents, make complaints or get access to health records. We also considered different media through which the end user might interact with the organization. For example, these might include face-to-face communication with service personnel, digital touchpoints such as web pages, mobile apps or email, paper communications including brochures, forms and information booklets, or traditional media including radio and television commercial messages.

It was important to start our process by understanding the end-user journey from the perspective of the individual, simply because we know from the research in behavioural economics, psychology and design thinking that there is a fundamental empathy gap (Davis, 1994; Hampton et al., 2016). In particular, we know that people have a hard time empathizing with the behaviour and the context experienced by other actors in the same system, and hence cannot empathize with the effects that those contextual variables might have on the decisions and actions of the other person.

Step 2: Based on our literature review, we identified behavioural tendencies that can amplify the effects of context (see Section 2.4). In particular, we looked closely at the literature on procrastination, aversion to complex information, difficulty in making choices amongst large assortments and lack of trust – among many other behavioural tendencies. A thorough understanding of these basic behavioural tendencies allows us to examine the effect of each contextual variable on impeding decision making and action.

Step 3: We identified broad categories of places where impedance occurs. We started with a number of different categories of end user – organization interactions that were relatively fine-grained. For example, we examined the possible prevalence of impedance in digital versus in-person communication, or in purchasing processes versus re-purchasing processes, or at sales interactions versus service interactions. After developing an exhaustive list of touchpoints at which impedance could show up, we worked to try and create categories that made sense from the perspective of items in each category being similar within and different across, but also such that the categories mapped on relatively well to different parts of the organization, and their respective responsibilities. This process culminated with three specific categories that we identified earlier in Section 2.3.

The first category was the nature of the ***process***. This related to questions such as the number of tasks that needed to be done by the end user (steps), the number of different touchpoints they needed to contact, the length of the process required, interdependencies between the various steps, reliance on critical paths, as well as complexity involved in completing the various tasks. The second category was ***communications***. Here we looked at both written and verbal communications, and focused primarily on questions that related to whether the consumer had all of the information needed to make the right decision, and needed to engage in the right action, and whether the information was clear and simple. The third category was one of ***inclusivity***. In this category, we identified whether aspects of the process or communications might explicitly or implicitly exclude certain groups of individuals from engaging with the organization.

Step 4: A number of case examples of impedance reported by end users was used to generate an initial list of contextual frictions. We developed a short survey that was distributed electronically, and that invited participants to report stories about engagements that they had with organizations that were particularly frustrating or difficult to complete (see Section 3.1 for details on methods). Responses were used to generate specific touchpoints or elements in the context that we used as a starting place for developing a scorecard.

Step 5: Expert interviews were to validate the initial list and to identify additional contextual items. Our experts were able to provide insight into the interrelationships between these various elements. Furthermore, one particular point of insight that we receive from our expert interviews related to the need to decouple the presence or absence of impedance / friction in a system from the intention.

In particular, going back to the two-by-two matrix represented in Figure 2, our expert interviews pointed out to the need for any scorecard to stay away from the implied intention of friction, and focus solely on identifying items that could be used to quantify the degree of friction in the system. Our experts also pointed out that while there are some cases in which sludge is egregious (in other words, companies try specifically to make it difficult for the consumer to get things done; for example, canceling subscriptions or returning products), there are many other cases in which impedance could be inadvertent. Inadvertent impedance could arise because of legacy processes, communications that have not been updated over a period of time, or through siloed process management whereby different parts of the organization take responsibility for different parts of the user journey. "Inadvertent sludge" is inherently different from "egregious sludge." More importantly, it is precisely in the cases of the inadvertent impedance that our "seeing sludge" tools will be particularly helpful.

Step 6: We conducted an informal audit of five financial service institutions and five consumer product companies, and used the audit to conceptually expand and reorganize the checklist to eliminate redundancies and generate a preliminary scorecard. Our fieldwork initially focused on a detailed evaluation of several institutions based on the online services that they offer through their website. This was later expanded to include various review websites that gave a

comprehensive platform for the gathering of online opinions about user experiences with these institutions. In conjunction with our survey, our audit resulted in three key insights.

Key Insight #1: Lengthy processes involving large amounts of wait time, excessive required documentation and difficult-to-complete tasks were the most common sources of impedance.

Almost half (47.89%) of our survey participants attributed lengthy wait times, difficult tasks, and excessive requirement of documents as the main friction that made their experiences frustrating. This corresponded with the plethora of reviews that we noted when conducting an online scan for negative experiences with the five financial institutions. For instance, one customer complained of how it, "took 7 months to get [a] bank statement" from their bank, "and [he is] still waiting for the rest of it" (Lanford, 2018). Appendix 2 provides a list of all the sources of friction identified by respondents.

A lengthy process, excess requirement of documents, and difficult tasks are all examples of impedance that prevents customers from resolving their initial problem. These impedances have effectively impeded the actions of consumers by imposing additional opportunity costs, such as time and effort, on consumers' actions, which appeal to the consumer's preference for inertia. If a consumer deems that the effort or time taken to complete an action is greater than the short-term problems caused by the impedance, the consumer will cease to complete that action. However, consumers often fail to consider the long-term consequences when impeded by sludge, such as additional financial burdens, if they do cease to complete the action, thus resulting in the reduction of overall welfare.

There are several underlying causes that generates long wait times, excessive documentation, and difficult tasks. Firstly, many of the documentation is required by law. For instance, a "stress test" is now required to determine if "homebuyer would be able to afford their principal and interest payments should interest rates increase" (Toronto-Dominion Bank, n.d.), and privacy laws require important document or passwords to be sent through snail mail rather than e-mail. Secondly, the paperwork often passes through the hands of many people, making the process of getting something done long and tedious. Finally, many organizations have outsourced entire end-user facing units to save money, this leads to a need to coordinate across more entities and lower service quality.

Key Insight #2: Sludge is especially prominent in customer service

A common theme throughout consumers' experiences with sludge arises from customer service. This is seen when service representatives intentionally invoke guilt in the customer with the interest of the bank in mind. Consumers are discouraged from cancelling a service that they are unsatisfied, with or pushed to purchase more products that are irrelevant. Furthermore, many representatives lack the necessary training and thus information to respond efficiently to the concerns of customers. As a result, the client is either given false and redundant information, or put on hold while the agent searches for further assistance. As an example, a

customer reported that "I have made approximately 10-12 calls concerning this topic but each time the change in personal information never happened" (Joseph, 2019).

The cause of this issue can be attributed to budget cuts or procedural rigidity. As the world becomes increasingly digital, banks are, at a minimum, expected to have online banking services. Budgets originally used to train service reps are then likely to be reallocated to developing these services, leading to a decrease in the quality of customer service.

Key Insight #3: Technology is a new breeding ground for sludge

While technology has often been seen a panacea for inefficiencies, it had created a new breeding ground for sludge. For the purpose of this paper, we consider technology - the utilization of machinery and/or equipment - to conduct end-user facing activities. Examples might include self-service kiosks and websites, ATMs, QR code scanners and mobile applications. The most common technological problems that impede consumer decisions include, but are not limited to, website/machine/account shutdowns; difficulty in navigating through the website and app to find necessary information; outdated websites and information; and slow loading times. As one example, one bank's online application for Long-term mortgages took about 5 minutes to load. What makes these technology failures especially problematic is the fact that in many instances they have completely replaced traditional "human touch" solutions, so there is no back up when technology fails.

Understanding sludge in technology is important concerning a young and growing population that is increasingly reliant on their phone, laptop, and internet. In Canada, 76% of the population uses a smartphone and 71% owns a laptop or netbook (Statistics Canada, 2017). Furthermore, 76% of Canadians currently uses digital channels, such as mobile and online, to do their banking, and this number is expected to grow in the future (Canadian Bankers Association, 2019). Furthermore, according to an online study that surveyed 1,600 US bank users, "32% reported that they would be willing to leave their current bank or credit union for a better digital experience." (Bank News, 2019).

Our auditing exercise was helpful in that it allowed us to ensure that the items we had generated in the checklist in step 5 were indeed relevant and experienced by individuals in their interactions with organizations, and to ensure that there were no additional items that we had missed.

Step 7: Validate through additional feedback, iterate and design dashboard. Now that we had an initial scorecard at the end of step 6, we conducted several other interviews with individuals to try to see if their responses to various organizations on the scorecard and the scores that they generated, were indeed correlated with their overall perceptions of sludge in those organizations. Admittedly, step 7 was done with a very small sample of individuals. In particular, our goal at this stage was to collect feedback on the scorecard in depth, but with a smaller number of respondents. Our hope is that we (or others) will be able to test our scorecard with a larger sample of consumers in the future.

3.3 Scorecards and Dashboard

At the end of the seven-stage process, we had a scorecard that had three different components: **P**rocess, **C**ommunication, and **I**nclusivity. When we discussed inclusivity earlier (see Section 2.3), we had discussed multiple ways in which people might feel excluded. More generally, exclusion could result from aspects of a) process, b) communication and c) emotional responses. In our scorecards, we include items in both the Process and Communication scorecards to assess possible effects on inclusivity; and our Inclusivity scorecard focuses exclusively on impedance from negative emotional reactions. We focused on these three dimensions because each of these dimensions is typically handled by different parts of an organization. In particular, an operations research group or a customer experience design team usually does process design. Communications are usually designed by marketing or an external agency, whereas inclusivity usually falls under the purview of corporate policy. Each of these three components has a list of contextual factors that can be scored by using the sample rubrics / scorecards presented in figures 4, 5 and 6.

FIGURE 4. SAMPLE PROCESS SCORECARD

		Yes	No	N/A
Paperwork	No duplicate questions			
	If documents are not provided in preferred language, process to request support or translate is available and easy			
	Answering questions do not require additional documentation to be accessed or submitted			
	Forms provide options for inclusive demographic categories*			
Issue Resolution	The process of how to resolve issue is clear			
	Two or fewer interactions required to resolve issue			
	Issue resolution takes fewer than 10 minutes			
	Stated process is consistent with actual process			
Tasks and Requirements	All forms for all products available and can be shared on all devices			
	Three or fewer forms to complete			
	No redundancy in supporting documents required			
	Forms take appropriate amount of time to complete**			
Human Interaction	One or fewer meetings required			
	Meeting shorter than 15 minutes			
	Representatives have appropriate availability**			
	All contact options available			
	Contacting takes less than 5 mins (branch location, or remote access)			
	Wait for service (in-person, on-phone or on-line) fewer than 2 mins			
Total				

Glossary:
Demographic categories refer to all gender and race identifications
**The determination of appropriateness is at the discretion of the reviewer*

Overall P (Process) Score = #Yes / (#Yes + #No) = **_____%**

FIGURE 5. SAMPLE COMMUNICATION SCORECARD

	Yes	No	N/A
Length of process and requirements transparent from beginning			
Information about process on landing page for enrolling in service			
Information provided online same as provided onsite and on the phone			
All available products or services in this category are shown explicitly to end user			
All features of all products or services in category are shown explicitly to end user			
Grade 5 English comprehension level used			
Resources available in multiple languages			
All information needed to make a choice is presented prior to the end user making any preliminary commitment			
Total			

Overall C (Communication) Score = #Yes / (#Yes + #No) = **_____%**

FIGURE 6. SAMPLE INCLUSIVITY SCORECARD

Please rate the following on a scale from 1 to 5.
1: Strongly agree
2: Somewhat agree
3: Neither agree nor disagree
4: Somewhat disagree
5: Strongly disagree

	Anxious	Socially Awkward	Embarrassed	Excluded	Discouraged	Average
When browsing through the web page of the organization, end users feel…						
When completing an online application, end users feel…						
When talking with a representative at the organization end users feel…						
When speaking to a representative on the phone end users feel…						
When visiting a branch location, end users feel…						
End users limit their interactions with the organization because it makes them feel…						
Total Average Across Six Rows						

Maximum Score= 6 Questions x 5 = 30; Overall (Inclusivity) Score: Total Score / 30 = _____%

A greater score indicates a higher degree of "human compliance" and hence a lower degree of impedance / sludge. Scores are assigned separately for each of the three dimensions, and are calculated as the percentage score (i.e., the actual score obtained divided by the maximum score possible on that dimension). By generating scorecards that measured these three elements separately, we were able to provide an overall dashboard that had three components. This dashboard was similar in spirit to the RFM analysis that is typically used in the customer relationship management program (see Fader et al., 2005; Kumar & Reinartz, 2018). We will refer to this analysis as the **PCI analysis** and our dashboard as the **PCI dashboard**. Appendix 1 shows the PCI analysis for two hypothetical organizations.

Note that a PCI analysis could be done for a specific process, a division or department, or for an organization as a whole. Organizations (or processes) are assigned a PCI score that has three components for each of the three parameters in our dashboard. These three factors can be used to predict how likely or unlikely it is that an end user will be frustrated with interactions with a particular organization.

It is important to note that while this three-dimensional analysis can provide a quick snapshot of which organizations or processes have done well on various dimensions of impedance, it does not necessarily mean that a simple addition of the three scores correlates with overall satisfaction. Scoring organizations based on a single parameter is often insufficient. For example, an organization could design an extremely efficient process that end users could navigate in the shortest possible time and with minimal effort. However, the very same organization might have underlying policies that are implicitly discriminatory, or it could be that the communication explaining what the user needs to do to accomplish the task is extremely complicated or jargon-ridden. Therefore, just having a simple, short, and effective process does not make a firm sludge-free. Judging firms on just one aspect will probably give an inaccurate report of impedance and the quality of the engagement process with the firm.

Figures 7 and 8 provide two ways in which PCI scores could be visually represented. In Figure 7, the three dials that visually mimic an automobile dashboard can provide a snapshot of dimensions in which the organization is doing well and where it is riddled with sludge. The two hypothetical organizations on the dashboard have impedance in different parts of their end-user experience. In Figure 8, the PCI scores are represented on a cube in which corner 4 represents a very high-degree of end-user experience – a sludge-free environment. The location of the same two hypothetical organizations from Figure 7 is shown on the cube in Figure 8.

FIGURE 7. THE PCI DASHBOARD FOR TWO HYPOTHETICAL ORGANIZATIONS (SEE APPENDIX 1 FOR SCORING)

Organization A

P = 53.33%   **C = 75.00%**   **I = 26.67%**

Organization B

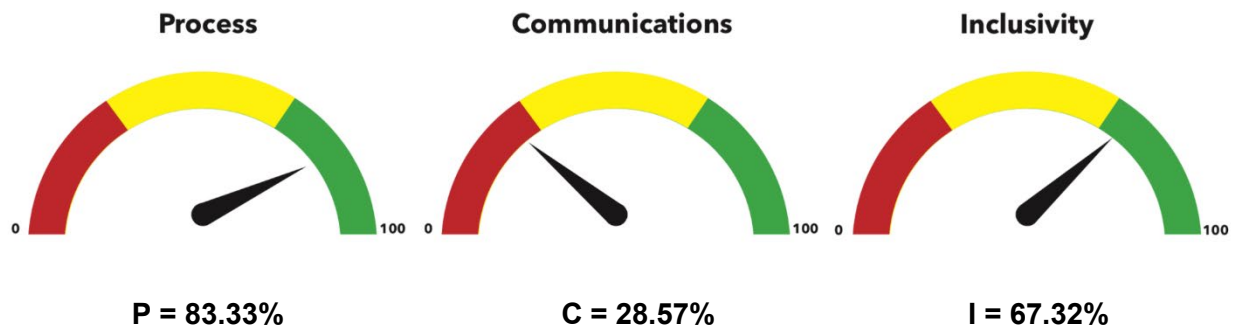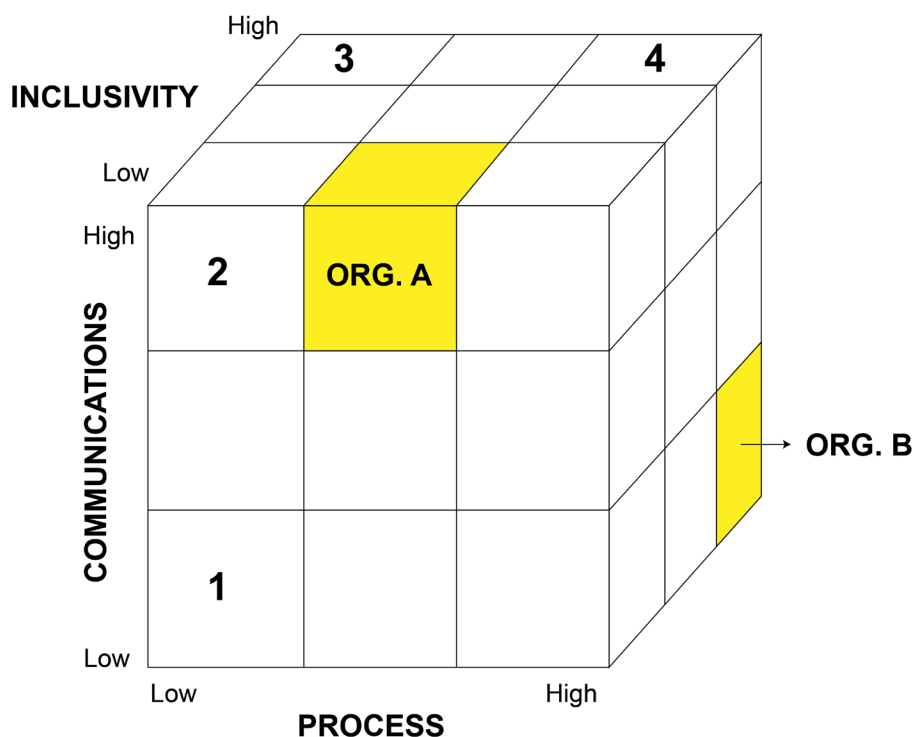**P = 83.33%**   **C = 28.57%**   **I = 67.32%**
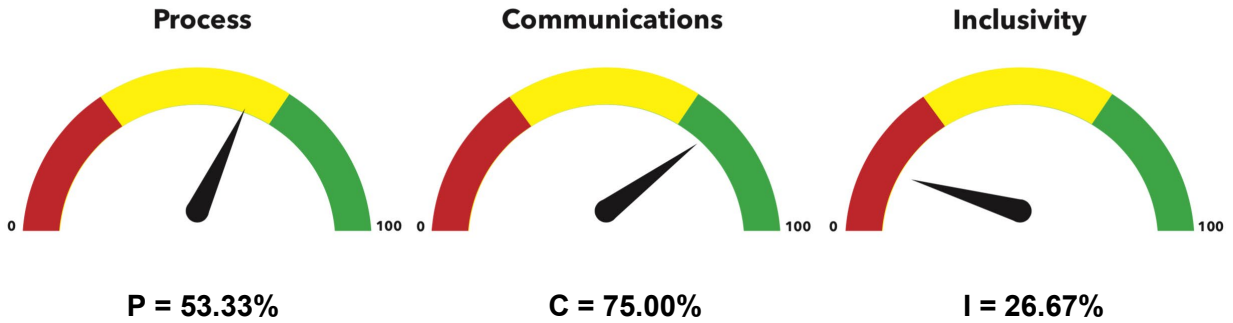
FIGURE 8. THE PCI CUBE

An important question in using these scorecards relates to who should be involved in conducting these audits. A majority of items in the scorecards are unambiguous yes or no items. That said, decades of research in managerial decision making shows that inherent motivation caused by the incentive to look good can result in biased responses to even the simplest yes / no questions (Bazerman & Moore, 2013). As with other forms of audit, therefore, it is imperative that an external team of auditors generates dashboards using these scorecards. In addition, given that different people can see impedance in different things, it is critically important for teams of auditors to be **diverse**, and **representative** of the end-user population.

Furthermore, there are items on the scorecard (in particular, items in the Inclusivity scorecard) which involve judgments to be made by sludge auditors. While diversity amongst auditors is helpful, we recommend that the judgments of auditors can be combined with feedback from a representative panel of end users. Following the best practices in aggregating judgments, we recommend that averaging the scores across a large number of diverse and representative auditors and panelists (Larrick & Soll, 2006) will result in a robust dashboard.

4. Conclusion and Discussion

4.1 Summary and Next Steps

In this paper, we started by making the claim that small factors in the context - things that might seemingly be irrelevant to decision making and to the pursuit of getting things done for end users - might either facilitate or impede the end user in accomplishing their objectives. If they facilitate, these contextual variables are typically known as nudges. On the other hand, there is a category of situations where these contextual variables actively impede activities that are in the consumers' best interest and that optimize the end users' welfare. These are known as sludge. Because these contextual variables (sludge) work by heightening natural human behaviour tendencies like procrastination and complexity aversion, a sludge to one person might not be similarly seen as a sludge by another person.

In general, there is a fundamental empathy gap where individuals might often not realize the value or the impact of contextual variables on their decision making and actions of another individual. This empathy gap makes it particularly difficult to see sludge. Hence, there is a need for a tool or a dashboard that allows organizations to see sludge. In our research, we conducted an exhaust of literature review, a survey of end users, interviews with expert and informal audits on the digital interfaces of several large organizations. Our goal was to compile a tool that organizations could use to see sludge. We accomplished this through a seven-stage process, beginning with the end-user journey, identifying behavioural tendencies that can amplify the effects of context, developing broad categories of places where sludge occurs, developing case studies based on end-user reports, using expert insights to validate and refine and testing our preliminary scorecard with informal audits.

Our scorecards are designed to be relatively easy to generate dashboards from. More importantly, the three components of the dashboard map onto three different aspects of the user experience design process that different parts of an organization might handle. In particular, a process design team might look at the first dimension, the marketing group or an external agency might benefit from understanding sludge on the second dimension, while corporate strategy would need to look at sludge on the third dimension.

Our efforts represent an important first step in developing tools for helping organizations in seeing sludge. However, we emphasize the fact that it is ***only a first step***. Much work needs to be done to validate our dashboard in order to ensure that the list of items used in generating a sludge score is appropriate, and that no other additional items need to be considered. More generally, we ***do not claim*** that our scorecards are definitively the most appropriate tool for all organizations, but we believe they are appropriate for a wide range of organizations and end-user interactions. Our key points are to a) ***highlight the role of scorecards*** in seeing sludge, b) propose scorecards that might serve as a ***starting point*** for an organization to adapt, c) illustrate ***a process*** to generate scorecards and dashboards, and d) discuss several ***implementation issues*** in using these tools effectively. Depending on the nature of the organization, some items might not be applicable, others might need to be included, and the relative weights to each component might need to be adjusted.

Furthermore, the tool might need to be adapted for auditing impedance at different levels within an organization. For example, a tool that assesses sludge in a particular process can have fine-grained variables as items in the scorecard than one looking to assess the degree of sludge in an organization overall. That said, we believe that the development of a tool is an important first step because it allows an organization to measure the degree of sludge in the system. After all, as the old management adage goes, "anything that is measured is more likely to be managed."

We hope that a dashboard based on our work is readily embraced and used by many organizations. In the adoption process, several questions will be raised. For example, *when* and *how often* should a sludge audit be done? How can an organization use this tool more effectively? Should the criteria – the individual lines in the scorecard – change with time? If the organization sees sludge and decides to clean it up, who should be tasked with the act of cleaning up? We next discuss each of these issues.

4.2 When and how often should the scorecards be run and a dashboard generated?

Ideally, measurements are most useful when they result in dynamic data. When driving a car, for example, a driver looking for data to make specific driving related decisions gains no useful insight from knowing the average speed over the past hour, or how much fuel was in the tank at the end of the last quarterly cycle. Instead, they need real-time information!

In a similar vein, the scorecards should be used on an ongoing basis to measure sludge over time, so that the organization can get a better sense of why there might be temporary changes in the degree of sludge and more importantly drive more effectively towards a sludge-free environment. Ongoing measurements might reveal additional insights. For instance, could it be the case that perceived sludge is higher on certain days of the week as compared to other days of the week? Are there other forms of seasonality? Does the degree of sludge vary as a function of the user demographic that visits a particular location?

However, we recognize that while ongoing use of the scorecard is ideal, the real world is often not ideal. Hence, we advocate that sludge scorecards be implemented – at the very minimum - when one of the following five conditions occur.

1) The organization launches a new product or service, or there is a new set of touchpoints with the end user. These touchpoints could include new digital channels, new brochures or communication materials, or the introduction of additional ways in which users could interact with the organization.
2) When there is a reorganization of the user-facing part of the business. This could happen when there is a merger or an acquisition of different organizations, or when product lines within the same organizations are reorganized, so that customers might now need to deal with different parts of the organization than they previously did.
3) When an organization decides to include a third party as an intermediary with their end users. For example, an organization might decide to outsource communication to a call center or to use an intermediary agency to collect applications on their behalf.

4) When there are changes in end-user tastes, preferences or demographics. For example, as customers start getting more familiar with digital interactions with organizations, they are likely to experience a greater degree of sludge with non-digital interactions. Indeed, the same interaction that seemed to be easy in the past might now seem "sludgy" because of the end user's greater comfort level with technology.
5) When there are changes in the environment overall. In many societies, it is fair to say that the level of user experience has gone up overall over the past few years. In conditions like these, organizations whose processes do not improve with time will seem to be at a disadvantage and it is particularly important for these organizations to then use scorecards to assess the degree of perceived sludge.

4.3 How can the scorecard be used?

In addition to the obvious benefit of allowing organizations to see sludge, the scorecards can be used in two different ways. First, the PCI scores can be tracked over time to not only assess the impact of environment and other external factors on perceived sludge but also as an indicator of progress over time. In particular, if an organization decides to upgrade a process that it sees to be particularly sludgy, a "before and after" PCI score comparison will allow that organization to gauge success in efforts.

In addition, PCI scores could also be used to benchmark organizations relative to the industry or to other peer organizations as a whole, to identify areas where that particular organization does better than or needs improvement compared to its peers.

4.4 How should the PCI scorecard change with time?

As time passes, it is perhaps not surprising to expect that the bar in terms of what constitutes excellent service and experience (therefore, low sludge) increases. However, there is also a need for monitoring to assess the impact of each contextual variable as time passes. Consider, for example, the notion of waiting time. Over two decades ago, asking an end user to wait for service was considered especially deleterious because waiting time was a pure cost. Indeed, many consumers have memories of waiting in rooms at government offices, hospitals and service centers with nothing else to do while their number was called out.

Today, however, the exact same waiting time is less of a cost to individuals. This is because they now have access to mobile electronic devices through which they can stay connected to the rest of their activities (e.g., checking email, editing documents, making phone calls, planning events) while they wait. In this case, the same line in a scorecard, waiting time, used to have a higher impact before the advent of mobile technology but now has a lower impact.
Likewise, every variable in the scorecard needs to be monitored over time to make sure that its impact does not change. For instance, if new technology that allows a smartphone app to crawl through complex information and distil it into digestible facts becomes widely used, then the importance of having simplified communications will diminish.

4.5 Closing Thoughts

If a scorecard allows an organization to see sludge, who should be tasked with the job of removing it? In many cases, sludge forms because user touchpoints and processes are created in silos. In a typical organization, a process design team who are primarily trained to maximize throughput will create a process, and hand it over to the customer service division who will be tasked with implementation. This customer service team might see sludge in the process, but might not have the ability to fix it. Whose responsibility should sludge busting be? Clearly, leaving sludge busting in the hands of teams where the sludge resides should only be optimal if organizations and employees were all econs. We suggest that just as an independent group of auditors is tasked with seeing sludge, a team that is independent from the front-line and the original designers of process and communication be tasked with generating sludge-busting solutions.

It is important to note that if an organization sees sludge but does not correct for it, other market-based solutions will likely emerge. Very recently, an app that automatically cancels subscriptions (made digitally) after their trial period is over was launched (Kleinman, 2019). Previously, MasterCard announced a program that would stop automatic billing for subscriptions to physical products that were assumed to have been purchased after a free trial and instead introduce an active-choice decision point (Dellinger, 2019). If successful, external solutions like these would help improve the welfare of end users and, at the same time, reduce the reputation of the offending organization. It would therefore be in every organization's best interest to proactively see, and to clean up sludge.

We end this paper with two philosophical issues. The first has to do with the notion of human-centricity more generally. Companies spend a lot of time, energy and effort being compliant with the law. Given the increased focus on end-user experience, we believe that it is time that they started thinking about compliance with human behaviour in all its interactions. The key point of behavioural economics is not the fact that people are irrational in a negative way. However, as organizations, we expect them to be rational and hence we design for econs instead of humans. We need to start designing for humans in the first place in order to be human compliant. This need to be human-compliant goes far beyond an organizations interaction with end users – it includes other enterprise functions and activities including human resources management, quality control, innovation systems, corporate culture and strategy formulation. More generally, sludge busting helps us understand how organizations can become human compliant with respect to the external stakeholders. However, we advocate for a broader set of scorecards to help organizations understand if they are being compliant with human behaviour both internally and externally.

Finally, in many organizations, people and teams often are rewarded for big thinking, and management gurus often emphasize the need for thinking out of the box (see, for example Schwartz, 1987; Schmitt, 2007). Our work shows that it is also important to think small (Service & Gallagher, 2017). Seeing and cleaning up sludge involves an appreciation of the fact that seemingly little, and seemingly irrelevant things matter. It is only if we develop habits to think small and look for the little things that might create impedance for humans, that we will be successful in developing more human-compliant organizations.

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Appendices

Appendix 1: Sample Scorecards for Two Hypothetical Organizations

Organization A

Process Scorecard for A

		Yes	No	N/A
Paperwork	No duplicate questions	x		
	If documents are not provided in preferred language, process to request support or translate is available and easy	x		
	Answering questions do not require additional documentation to be accessed or submitted		x	
	Forms provide options for inclusive demographic categories*		x	
Issue Resolution	The process of how to resolve issue is clear	x		
	Two or fewer interactions required to resolve issue	x		
	Issue resolution takes fewer than 10 minutes		x	
	Stated process is consistent with actual process		x	
Tasks and Requirements	All forms for all products available and can be shared on all devices		x	
	Three or fewer forms to complete	x		
	No redundancy in supporting documents required	x		
	Forms take appropriate amount of time to complete**		x	
Human Interaction	One or fewer meetings required			x
	Meeting shorter than 15 minutes			x
	Representatives have appropriate availability**	x		
	All contact options available			x
	Contacting takes less than 5 mins (branch location, or remote access)	x		
	Wait for service (in-person, on-phone or on-line) fewer than 2 mins		x	
Total		**8**	**7**	**3**

Glossary:
* Demographic categories refer to all gender and race identifications
** The determination of appropriateness is at the discretion of the reviewer

Overall P (Process) Score = 8 / (8+7) = **53.33%**

Communication Scorecard for A

	Yes	No	N/A
Length of process and requirements transparent from beginning		x	
Information about process on landing page for enrolling in service	x		
Information provided online same as provided onsite and on the phone		x	
All available products or services in this category are shown explicitly to end user	x		
All features of all products or services in category are shown explicitly to end user	x		
Grade 5 English comprehension level used	x		
Resources available in multiple languages	x		
All information needed to make a choice is presented prior to the end user making any preliminary commitment	x		
Total	**6**	**2**	**0**

Overall C (Communication) Score = 6 / (6+2) = **75.00%**

Inclusivity Scorecard for A

Please rate the following on a scale from 1 to 5.
1: Strongly agree
2: Somewhat agree
3: Neither agree nor disagree
4: Somewhat disagree
5: Strongly disagree

	Anxious	Socially Awkward	Embarrassed	Excluded	Discouraged	Average
When browsing through the web page of the organization, end users feel…	1	2	1	3	1	1.6
When completing an online application, end users feel…	2	1	2	1	1	1.4
When talking with a representative at the organization end users feel…	3	1	1	2	1	1.6
When speaking to a representative on the phone end users feel…	1	1	3	1	1	1.4
When visiting a branch location, end users feel…	1	2	1	1	2	1.4
End users limit their interactions with the organization because it makes them feel…	1	1	1	2	1	1.2
Total Average Across Six Rows						**8.6**

Overall I (Inclusivity) Score: Total Score / 30 = **26.67%**

Organization B

Process Scorecard for B

		Yes	No	N/A
Paperwork	No duplicate questions			x
	If documents are not provided in preferred language, process to request support or translate is available and easy			x
	Answering questions do not require additional documentation to be accessed or submitted			x
	Forms provide options for inclusive demographic categories*	x		
Issue Resolution	The process of how to resolve issue is clear	x		
	Two or fewer interactions required to resolve issue		x	
	Issue resolution takes fewer than 10 minutes	x		
	Stated process is consistent with actual process	x		
Tasks and Requirements	All forms for all products available and can be shared on all devices	x		
	Three or fewer forms to complete			x
	No redundancy in supporting documents required			x
	Forms take appropriate amount of time to complete**			x
Human Interaction	One or fewer meetings required	x		
	Meeting shorter than 15 minutes		x	
	Representatives have appropriate availability**	x		
	All contact options available	x		
	Contacting takes less than 5 mins (branch location, or remote access)	x		
	Wait for service (in-person, on-phone or on-line) fewer than 2 mins	x		
Total		**10**	**2**	**6**

Glossary:
* Demographic categories refer to all gender and race identifications
** The determination of appropriateness is at the discretion of the reviewer

Overall P (Process) Score = 10 / (10+2) = **83.33%**

Communication Scorecard for B

	Yes	No	N/A
Length of process and requirements transparent from beginning		x	
Information about process on landing page for enrolling in service			x
Information provided online same as provided onsite and on the phone	x		
All available products or services in this category are shown explicitly to end user	x		
All features of all products or services in category are shown explicitly to end user		x	
Grade 5 English comprehension level used		x	
Resources available in multiple languages		x	
All information needed to make a choice is presented prior to the end user making any preliminary commitment		x	
Total	**2**	**5**	**1**

Overall C (Communication) Score = 2 / (2+5) = **28.57%**

Inclusivity Scorecard for B

Please rate the following on a scale from 1 to 5.
1: Strongly agree
2: Somewhat agree
3: Neither agree nor disagree
4: Somewhat disagree
5: Strongly disagree

	Anxious	Socially Awkward	Embarrassed	Excluded	Discouraged	Average
When browsing through the web page of the organization, end users feel…	5	4	3	4	5	4.2
When completing an online application, end users feel…	3	3	4	5	3	3.6
When talking with a representative at the organization end users feel…	3	4	3	2	2	2.8
When speaking to a representative on the phone end users feel…	4	2	2	3	4	3
When visiting a branch location, end users feel…	2	5	2	5	3	3.4
End users limit their interactions with the organization because it makes them feel…	1	5	4	2	4	3.2
Total Average Across Six Rows						**20.2**

Overall I (Inclusivity) Score: Total Score / 30 = **67.32%**

Appendix 2: Frictions Listed by Respondents

Survey Responses on Frictions that Make Experiences Frustrating

1. Information withheld, not communicated or difficult to find

2. Wrong information given

3. Documentation requirements were excessive

4. Process was too lengthy

5. Tasks were difficult to complete

6. Inconvenient business hours

7. Product/service was frustrating to use

8. Cancellation was difficult

9. Fees for cancellation

Seeing Sludge: The TL;DR version

The Motivation
- Getting things done is part and parcel of life, yet many people struggle to get things done
- *Natural behavioural tendencies* (procrastination, aversion to complexity etc.) are **amplified** by seemingly irrelevant features of the context.
- When context makes things easy for people to get things done, it is called a **nudge**.
- However, sometimes context imposes an impedance – this is called *sludge.*
- Different people react differently to context. Hence, seeing sludge might not be easy
- Our goal: To develop tools that allow organizations to *see sludge* so they can clean it up.

Sludge and Impedance
- Contextual variables can facilitate action (nudge) or impede it. However, not all impedance is bad. For example, decision-points (or cooling off periods) increase welfare.
- Impedance has three sources: The nature of the *Process,* the *Communication* with end users and *Inclusivity*. These form the three dimensions of our **PCI dashboard.**
- We focus on impedance that reduces welfare for end users.

Constructing a Dashboard
- Step 1: Draw various end-user journeys to know where to look for impedance
- Step 2: Identify relevant behavioural tendencies that might cause impedance
- Step 3: Develop broad categories of sources of sludge to narrow down to P,C, and I
- Step 4: End-user stories to develop list of relevant contextual variables to use in scoring
- Step 5: Validation and refining through expert interviews
- Step 6: Informal Audit of sample organizations to refine scorecards
- Step 7: Feedback, Refine and Designing final scorecards and dashboards

Key Takeaways
- The PCI scores are designed to be simple to compute, and easy to assign action items
- We *do not claim* that our scorecards are the definitive tool for all organizations.
- Our key points are to a) *highlight the role of scorecards* in seeing sludge, b) propose scorecard that are a *starting point* for organizations, c) illustrate *a process* to develop scorecards and d) discuss several *implementation issues*.
- Scorecards will need to be *adapted* / adjusted for different industries, organization type and level of analysis
- Auditors should be *diverse and representative* of the end-user population
- Dashboards can be used to *monitor* sludge, *benchmark* against peers, *track* it over time and to assess *effectiveness* of cleanup efforts
- Audits should be done as *frequently* as possible, but definitely when end user facing interactions *change* (e.g., mergers, re-organizations, new media and channels)
- In addition to the big ideas, we encourage organizations to **think small** – look for small contextual variables that trip people up!

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