Modeling organizational intelligence: Nothing googles like Google

Bob Travica, *University of Manitoba, btravica@ms.umanitoba.ca*

Abstract

The purpose of this article is to contribute to theorizing organizational intelligence. The idea of organizational intelligence (OI) has been addressed from various perspectives and levels of analysis. Still, comprehensive modeling of OI, which would bring together relevant assumptions and concepts, is rather lacking. This article introduces such a model that draws on traditional assumptions about the organization and environment as well as on newer frameworks of knowledge management, organizational mindfulness, dynamic capabilities, and the informing view of organization. In pilot-testing the model, a case of Google Inc. is elaborated subsequently in the article. Findings reveal how OI is embedded in particular aspects of Google's organization, individual and group cognition, technology and management, while being indicated in a sustainable product innovation and organizational performance.

Keywords: Organizational intelligence, organizational mindfulness, dynamic capabilities, informing view of organization, innovation, organizational sustainability

Introduction

The idea of organizational intelligence (OI) has been addressed over past decades in various research disciplines (e.g., Argyris & Schön, 1978; Cronin & Davenport, 1991; Quinn 1992; Gupta & Sharma, 2004; March, 1999; Thannhuber, 2005; Travica, 2014; Wassermann, 2001; Wilensky, 1967). Different levels of analysis have been deployed—from the macro-organizational to the group and individual. Also, different assumptions have underlined the research. For some researchers, an intelligent organization is capable of making right decisions. For others, it is the organization that can learn how to fit to its environment and to survive. The capabilities of creating successful and innovative products, impacting the environment, mobilizing creative people and other resources, and of managing knowledge effectively have also been related to OI, more or less explicitly. As the contemporary organizational environments are swiftly changing, expanding to the global level and becoming increasingly competitive, the problem of OI is growing in importance. Take for an example the smart phone market.

The smart phone emerged in the 1990s out of the personal digital assistant (PDA), a gadget with limited data processing and voice transfer capabilities. At that time, the cell/mobile phone market was already developed. Improvements of the microchip processor allowed for better integration of voice transfer and data processing. PDA evolved into a multi-purpose machine embedded in the technical environments of both cellphone networks and the Internet. The Internet has been the source of inspiration and the main test-bed for innovations of the smart phone. Its global market reached 1.75 billion users in 2014. This evolution was initiated by agile innovators, such as Nokia and RIM. However, they were not able to sustain the innovation progress and fell

behind competitors, such as Samsung and Apple (a new entrant in the smart phone industry). As Nokia and RIM stopped shaping the industry environment, they found that even just adapting to its trends was difficult. Whole eco-systems have rapidly morphed, based on operating systems for smart phones, fitting application software, new businesses taking advantage of the smart phone-Internet loop, and customers/prosumers whose adoption choices cause the boom or doom for smart phone products.

The example above indicates some challenges of sustainable innovation, of remaining intelligent in a turbulent environment. In spite of the rich relevant literature, comprehensive modeling of OI is still lacking. The purpose of this article is to advance such modeling. An integrative model of OI will be introduced in the first part of this article. The model merges traditional assumptions about OI with a more recent relevant literature. The second part of the article will demonstrate a pilot validation of the OI model in a case study of Google Inc.

Conceptualizing Organizational Intelligence

Initial ideas on OI may be accredited to Wilensky (1967). Subsequently, modeling of OI has drawn a full cycle. It starts at the macro-organizational level, extends to a mezzo level of particular organizational aspects, includes the group and individual level, and closes back to the start point. In early studies, the focus was on organizational learning postulated as the strategy of a firm's adapting to its environment. Argyris and Schön (1978) modeled different levels of learning that were conducive to achieving a better fit with the environment. Similarly, institutional theory explained that organizations adapt to the environment by imitating benchmark examples. These approaches viewed an organization as a whole, disengaging lower levels of analysis. A learning organization was adaptable and thus capable of surviving in the environment, and survival was seen as an indication of intelligence.

Organizational structures and processes make the mezzo level of conceiving OI. Decision making processes have attracted a particular and continuous attention. For example, March (1999) posited that an *intelligent organization* would adopt decision making procedures that could consistently achieve outcomes of fulfilling desires as much as possible. Furthermore, individuals and groups have become interesting for OI research as they play distinguished roles, such as leader, innovator, and expert solver of unstructured problems. For example, Quinn (1992) discussed a concept of *intelligent corporation* in which knowledge exchanges needed for problem solving transpired between individual consultants residing at different locations and which utilizes CD-ROM, electronic bulletin boards, and remotely accessible databases. Morgan (1986) also underlined the importance of electronic information technologies in a metaphorical likening of organization to the human brain. He pointed out to work teams as the carrier of organizational knowledge and brain-like functions.

In the present time, the different levels of analysis are rather integrated in OI research. Another change that happened along the historical trajectory of OI research is that the assumption of adaptation has been supplemented with the assumption of environment enactment. The resource based view of organization and studies in strategic management have framed the firm as agency that can change environment rather than just adapt to it. The dynamic capabilities approach (Teece, 2007) pushes this assumption even further, by stipulating that firms' resources have to be continually modified in order to achieve sustainable innovation. Thus, one should think of a

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historical process of innovation rather than a single event/episode. This whole line of inquiry inspires to view OI as a factor in environment creation and in organizational success.

The modeling of OI in this article extends previous research and endorses the integrationist view of OI. While organizational products and action of a firm bear formally the stamp of an entire company, it does not suffice to look at a company as a black box. A company is not a mystical super-being with capabilities equivalent to individual cognition and behavior. Rather, a company consists of individuals that are grouped and placed in roles defined by particular organizing assumptions (part of organizational culture), production and management needs (organizational structure and processes), and environmental pressures. Therefore, organizational learning, problem solving, and environment adaptation/enactment are indeed carried out by individuals organized in a particular manner. A particular organization channels, facilitates, and synergizes the individual intellect in intricate processes that deliver OI.

Echoing March's (1999) ideas, OI is understood as a capability of an organization to bring about the outcomes it desires – both internally and in the environment. The desirable outcomes are indicated in the vision and mission statements, strategic plans, innovative products, and sustained competitive performance. Desirable outcomes do not always result from deliberate strategizing but also from emergent strategies (Mintzberg, 1978). In addition, the notion of individual intelligence is deemed a useful anchoring point for studying OI. An intelligent person is one who can learn from experience, understand abstract thought, resolve novel problems, adapt to and manipulate a given environment (Britannica, 2015; Webster, 2015). The historical trajectory of the OI concept outlined above shows its compliance with this concept of individual intelligence.

In the discussion that follows, the theorizing of OI will be advanced particularly through the concepts/frameworks of knowledge management, organizational mindfulness, dynamic capabilities, and informing view of organization.

Organizational Intelligence and Knowledge Management

Since intelligence has to do with learning and acting upon the learned, it follows that intelligence has to do with knowledge. An intelligent person is a knowledgeable person, even though intelligence is more than knowledge (for example, mental aptitudes for learning and the quality of learning make a difference in knowledge acquired). Raising individual knowledge/intelligence to the level of macro-organization requires appropriate management and organizational design. These are partly addressed in the concept of knowledge management (KM).

The usual KM process includes the activities of knowledge generating, codifying-validating-storing, sharing, utilizing and evaluating (Travica, 2013). These activities map into the initial concept of OI discussed so far in terms of learning, problem solving, and environment adaptation/enactment. Table 1 shows the mapping.

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Table 1. Relationships between KM activities and organizational intelligence

Knowledge Management Activity	Organizational Intelligence Aspect		
	Learning	New Problem Solving	Environment Adaptation/Enactment
Generation	x		
Codification, Validating, Recording	x		
Sharing	x	x	
Using		x	x
Evaluating	x		x

A large part of organizational learning is about the knowledge generation (see Table 1). Organizational members learn experientially on the job as well as from relevant literatures and training. Both the internal context of an organization and its environment are sources of learning. Organizational learning progresses through the next step in KM, as the newly learned content is put in a communicable form (codified), adjusted to fit with previous knowledge (validated), and represented in information systems for KM (also called knowledge work systems – KWS) that serve as organizational memory. The next KM step of knowledge sharing is crucial for elevating individual learning to the organizational level. Both the organizational memory and communication between new knowledge holders and knowledge seekers contribute to this transformation. When knowledge is evaluated for its fit with the present trends, organizational learning is invoked again. One has to look into the organizational environment and to assess how effective organizational knowledge is. Therefore, organizational learning has to do with four KM activities, as shown in Table 1.

The capability of solving novel problems is enabled by knowledge sharing and it is manifested in the use of knowledge (Table 1). This capability, however, may include other aspects, such as improvising, serendipity, and wisdom (Travica, 2014). Lastly, environment adaptation and/or enactment, has to do with the knowledge use and evaluation. It is important to realize that a piece of knowledge-in-use has ceased to be effective in a changed environment. This aspect concludes the mapping between OI aspects and knowledge management indicated in Table 1.

It is further assumed that an intelligent organization manages knowledge in a systematic manner. Such a manner can be understood in terms of knowledge culture that facilitates a heedful management of the entire knowledge management process discussed above (Travica, 2013). As opposed to companies that have no specific KM agenda or manage knowledge haphazardly, a company with knowledge culture places knowledge at the nexus of their beliefs and behaviors. Such a culture motivates innovation even when it deviates from the mainstream product philosophy, allocates the time for knowledge creation and sharing, stimulates knowledge use at work, and monitors its impact on the organizational performance. A knowledge culture also integrates the management of people with technology management. Therefore, KWS play a significant role. These include newer systems for analytics, Big Data mining, and simulation, which all help in generating knowledge, as well as familiar systems for managing knowledge documentation, case-based reasoning systems, artificial neural networks, and expert systems.

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The discussion in this section leads to the following proposition: Systematic knowledge management is an aspect of OI.

Organizational Intelligence and Mindfulness

Weick and Sutcliffe (2001) modeled organizational mindfulness to characterize an organization that is internally less tightly coupled and is capable of comprehending operational complexity. The mindful organization is partly a reaction to modern organizations that must use complex technologies, which are hardly comprehendible to human operators, and therefore are prone to unpredictable but inevitable accidents. The "normal accidents" (Perrow 1999/1984) in high-tech production processes, such as those in a nuclear power plant, are preventable in the mindful organization. Its organizational members are aware of possibilities of failure and pay close attention to the details of organizational complexity. Organization members of the mindful organization also maintain sensitivity to operations and stay continually attuned to the progression of events.

All these aspects of a mindful approach to an organization's functioning increase the likelihood of comprehending puzzling tight coupling between organizational parts that otherwise may result in malfunctioning and disaster. Such understanding enables organizational members to act on time and find solutions to problems as they arise. Consequently, dangerous chaining of perilous events in a high-tech context can be avoided. Mindfulness is a collective phenomenon enacted by smart, trusting, trustworthy, self-respecting people that are willing and able to negotiate the differences among their diverse views.

While it is designed to prevent big problems, the mindful organization can tolerate errors and turn them into a learning experience. Challengers of the status quo, skeptics, careful listeners, divergent thinkers as well as innovators populate the mindful organization. In addition, the creation of decisions that can be mindful is moved to the most qualified organization members regardless of their hierarchical rank. This resembles the autonomous nervous system in an individual human being: although the brain is the central seat of intelligence, intelligent behavior also engages senses, limbs and other body parts that learn and execute the learned behaviors when needed. This line of reasoning reveals a relationship between intelligence and the mindful organization.

It could be furthermore assumed that organizational mindfulness is not only about avoiding physical danger of a runaway technology, but also about crafting emergent innovation strategies. An emergent strategy involves a multiplicity of goals and interacting actors rather than a clear-cut goal, plan, and leader. An emergent strategy arises from a series of actions that over time turn into a consistent pattern regardless of specific intentions (Mintzberg, 1978). Therefore, mindfulness can pave the way to innovation in various areas, including product development, organizational change, and customer relations.

The discussion in this section leads to the following proposition: Organizational mindfulness is an aspect of OI.

Dynamic Capabilities

When organizational environments rapidly change, how can organizations sustain the capabilities of adapting to and shaping their environments? This research problem has been addressed by the model of dynamic capabilities (Teece et al., 1997; Teece, 2007). Since the 1980s, significant changes have been taking place in high-tech research, economy, and politics at both the nation-state and global levels. Dynamic environments are difficult to predict, let alone control. New competition can arise unexpectedly and undermine current winners. Recall the example of smart phone discussed in the beginning of this article.

Dynamic capabilities are organizational and managerial processes of coordinating/integrating, learning, and reconfiguring resources. Through these processes a firm is assumed to be able to integrate, build, and reconfigure its competences in order to address rapidly changing environments (Teece et al., 1997). This approach assumes that external threats to a firm's positioning are constant, and the best a company can do is to sense and manage them. By focusing on the process of reconfiguring company resources, the dynamic capability scholars imply that organizational competences must be evolving rather than static. Organizations need to coevolve with environments. Better yet, a firm with dynamic capabilities can influence the evolution of environments.

Two aspects may be distinguished for the sake of calibrating dynamic capabilities: technical fitness and evolutionary fitness (Helfat et al., 2007). Technical fitness addresses the question: How well a capability performs regardless of its impact on financial performance? In contrast, the concept of evolutionary fitness makes a connection between a capability and learning. How can a firm sense its environment? By which means can a firm influence the environment? The answer to these questions lies with the IS for interfacing with the environment. To interact with customers/prosumers and to benefit from crowdsourcing, a company needs to deploy systems for monitoring the usage of new products, customer sentiment analysis and dashboards, big data mining, and its own social media. These interfacing systems are part of OI.

The discussion in this section leads to the following proposition: Dynamic capabilities make an aspect of OI.

Informing View of Organization

The informing view of organization (IVO) (Travica, 2014) offers a way of looking at cognitive and technological aspects in conjunction with organizational design. From the IVO perspective:

> Organizational intelligence is a result of synergizing individual competences as well as of managing informing agents in various contexts, such as teams, enterprise-wide processes, inter-organizational arrangements, and so on. In addition, both cognitive and technological agents shoulder organizational intelligence rather than just one of these agents, as it has been assumed in the previous images of intelligent enterprise. (Travica, 2014: 4)

IVO starts with the individual organizational member that is framed as Homo Informaticus. The concept refers to the individual cognitive makeup. It consists of perceiving, thinking, feeling, learning, and memorizing. Complementary to these cognitive processes are the artifacts of

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knowledge, meaning (or information), data, and wisdom. These are involved in an interplay with technological agents – information technologies and their arrangements in information systems. There are different types of Homo Informaticus. For example, some people are focused on facts and others on logic; some people learn by assimilating diverse knowledge motivated by knowledge needs, while others learn more from the experience motivated by practical needs; and so on. If OI starts with individual intelligence, it is important to understand the desirable cognitive profile in a particular company pursing innovation goals in its industry (or industries).

Individual organization members can perform in work groups. Knowledge creation, sharing and using can take place in the group context. IVO approaches work groups from a stance of groupomatics. This concept refers to knowledge and cognition at the group level and augmented with group support systems. Groupomatics is indispensable for studying companies in which project teams carry out product innovation (e.g., producers of computer software). The next IVO aspect interesting for modeling OI is infoculture (culture of informing) – a part of organizational culture that has to do with knowledge, informing practices and beliefs, and KWS. A part of the IVO framework is a categorization of infocultures. The most interesting category here is knowledge culture (or infoculture in the IVO parlance) that was cited above in the context of KM.

IVO also introduces a concept of infostructure (structure of informing) that captures vertical and horizontal distribution of data, and data formalization. Demands of infostructure should reflect on the organizational structure if the company strives for higher intelligent levels. For instance, the distributed character of Internet-centric business requires a higher infodispersion in space, which, in turn, demands a more horizontally differentiated organization. The last relevant IVO aspect is that of infopolitics (politics of informing) – a part of organizational politics that captures the impact of knowledge and other informing agents on social power. For example, expertise may be the basis of power in a mindful organization rather than formal hierarchy. Or project teams rather than managers may control documentation and the needed IS for the sake of completing a product development project.

The discussion in this section leads to the following proposition: IVO aspects contribute to explaining OI at the intersection of cognition, technology and organization.

Sustainable Innovation

An intelligent organization is capable of sustaining product innovation rather than just creating a single new product. Recall the example of the smart phone at the beginning of this article: initial industry leaders lost the step in product innovation and were toppled by competitors. A complement to product innovation is innovation in internal organization. Highly intelligent companies set the scope and pace of innovation in both products and in their organization. Others have to follow in order to survive. Therefore, some degree of innovation is necessary for any organization. What differentiates sustainably innovative companies from others is that their source of innovation is systematic rather than random. It lies in dynamic capabilities discussed above.

Innovations come in various forms, including new products (goods and services), business models, novel aspects of organizational design, management methods, knowledge, and technology. Product innovation is certainly important as the expression of OI and a condition for

economic survival and success. Product innovation is about a capability of coming up with new products as well as about their innovative characteristics. Mere imitating of existing products is a lower level of innovation than creating new, ground-breaking products. The difference is one that sets apart deploying an expired patent from creating a new patent.

It is to be noted that the significance of product innovation should not obscure the importance of other areas of innovation. For instance, the Internet created new business opportunities that intelligent companies turned into successful business models; for example, the Internet portal (e.g., Yahoo, Google) and online store (e.g., Amazon.com). The inventiveness in the methods of revenue generation has made further differences between Internet-based business models. In addition, the rise of ubiquitous computing has inspired radical innovations in organizational designs, such as the advent of virtual organization (Travica, 2005). All these are innovation areas worthy of study. Study of innovation in the context of OI should be explicit as to which kind of innovation is investigated.

The discussion in this section leads to the following proposition: Sustainable product and organizational innovations are indications of OI.

Sustainable Organizational Performance

Intelligent organizations are able to perform well over time. Organizational performance can be assessed on a number of counts, including financial performance, efficiency, effectiveness, customer service, and employee satisfaction. A positive relationship between organizational learning and environmental adaptation has been commonly accepted since the time of contingency studies. As learning is a condition for OI, it follows that environmental adaptation is positively correlated with OI. In competitive business environments, the adaptation implies a sustainable organizational performance.

The financial performance is a necessary aspect of organizational performance that an intelligent firm is expected to exhibit. Other targets may be reached in different degrees. For example, performing at the efficiency benchmark may be met since it is likely to be related to financial performance. An intelligent firm knows how to make its employees and customers happy. Moreover, the sustainable innovation is likely to contribute to sustainable organizational performance. This conjecture has a broad acceptance in the innovation literature.

This discussion in this section leads to the following proposition: Sustainable organizational performance is positively related to OI and to sustainable innovation.

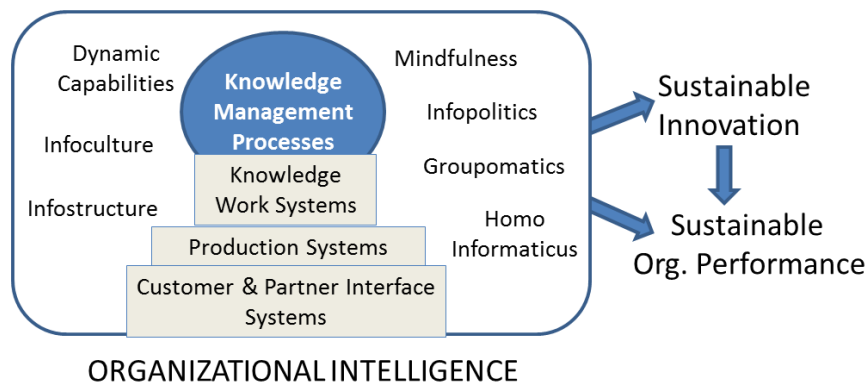## Model of Organizational Intelligence

The discussion in preceding sections created propositions for creating a new model of OI. To recapitulate the propositions:

1. Systematic knowledge management is an aspect of OI.
2. Organizational mindfulness is an aspect of OI.
3. Dynamic capabilities make an aspect of OI.
4. The informing view of organization contributes to explaining OI at the intersection of cognition, technology and organization.

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5. Sustainable product and organizational innovations are indications of OI.
6. Sustainable organizational performance is positively related to OI and to sustainable innovation.

The OI model that accounts for these six propositions is depicted in Figure 1. Inside the organization box are the OI dimensions implied in propositions 1-4, and shown at a finer level of detail. These are antecedents to the dimensions outside the box, which are implied in propositions 5-6. As OI is a matter of scale, any OI dimension can vary in extent making a certain impact on the overall OI. Sustainable Innovation and Sustainable Performance are expected to vary in the same direction as OI.

Figure 1. Model of Organizational Intelligence

The model of OI has been applied in a pilot investigation – a qualitative case study of Google Inc. The results are discussed in the following section.

Case Study: Googling Google's Intelligence

This section discusses Google Inc. as the case for OI. This company was founded in 1998 in California, USA. By the end of 2014, Google reached 55,000 employees, and earned US$ 60 billion in annual revenues, 20% of which was the net profit. Let us start elaborating on the Google case with several inferences that are general in character.

Google developed a superior Internet search system that delivers quick and useful results in response to search terms taken from everyday language. It became envy of experts focused on problems of data retrieval. By getting rid of controlled vocabularies on the user side, while creating a superb output in terms of recall, relevance and other measures, the Google search system made a dream come true. One way to put it is that the quality of search is reversely correlated with the ease of search. A commonly accepted expression of Google's success is that the company's name has branded the search activity: We do not search the Internet – we "google" it.

Innovative search technologies are a half of Google's accomplishments. The other half is manifested in the second-level effect, the consequences for the users. When a useful content consistently results from "googling" the Internet with words that make sense to any user (mundane vocabulary, specialist language, different national languages), the Internet appears as

an inexhaustible database, global library, an unprecedented source for learning and study. Indeed, Google aims at this effect since its mission statement pinpoints the goal of organizing informing resources on a global scale.

Part of Google's success and a manifestation of the company's intelligence is the discovery of earning methods while maintaining a capability of supplying free services to a massive user base. Examples are Gmail, Google Docs, Picasa, and Google Maps. The profit-and-freebies formula has given Google the reputation of a good corporation. This could be seen as an aspect of achieving the company's cultural imperative "Don't be evil." A product and maker of the Internet era, Google prolongs the spirit of the Internet's early, heroic stage. Almost everything was free of charge in the mid-1990s, when this network-of-networks was spreading from the academia to business and residence.

The amiable corporate image of Google is helped by the unorthodox language and imagery the company proliferates. Really smart people do not make a big deal of their aptitudes. Similarly, Google appears casual in its public communication and impression management. Examples start with the company's name "Google". The company itself interprets it as a play of words for a certain mathematical term. But the company's name also associates to some terms in the American urban dictionary; for example, "oogles" (young people living alternative lifestyles) and "oogling" (staring curiously at someone). The company also invented terms that rhyme with "Google," such as "Doodle," and "Froogle." The "Google Doodle" is the title of the company's program for commemorating notable dates by publishing the Google logo in witty variants. Resonating with the playfulness in the American pop culture, this imagery may be contributing to the impression management toward a friendly corporation.

Product Innovation

Google has been voted the second most innovative company for years, following Apple (Booz & Co, 2013; BCG Perspectives, 2014). In the MIT Technology Review (2014), Google was placed third (Apple had no ranking). The MIT ranking praises Google's post-2008 turn to making money on technology products rather than just monetizing its search products via advertising. The turn was eased by acquisitions of several high-tech companies, and the technology-related revenue reached 15% in 2014.

Google has developed a long list of products. Most are in the category of software, and some are hardware products and services. Wikipedia (2015) categorizes Google's products in the following rubrics: search, advertising, communication and publishing, system development, security, map-related products, statistics, operating systems, desktop, mobile Web and standalone software, hardware, and services. The search category is the largest. As the Internet is expanding, "googling" is becoming more specialized. There are over 100 billion googlings a month, and Google keeps updating indexes in seconds to ensure the freshest results; search by voice search is improving, being run off mobile platforms in 38 languages (Founders Letter, 2013).

Of Google's software products, Android operating system for mobile technologies stands out. It powers over 80% of mobile platforms in the world. For example, a Samsung line of smart phones deploys Android. Google's Chrome is a widely used Internet browser. Gmail, Calendar, Spreadsheets, Docs, and Presentations provide essential office support. In contrast to standard

commercial of-the-shelf software, Google doesn't charge for the non-corporate use of its software. Google's photo management software Picasa is also free and comparable to competitors' products. Google Maps and Google Earth are becoming ubiquitous navigation technologies accessible from both mobile and static platforms. Google+ is the company's entry into the world of social media. Google Translate helps the Internet be readable across the world regardless language barriers.

Another Google's service with a high acceptance is YouTube, an Internet-based video editing and storing system with a massive user base in various domains – from aspiring artists to educators using YouTube videos in teaching. As 100 hours of video are uploaded to YouTube every minute, it follows that the footage equaling the total annual production of the world's largest film centers combined (Hollywood, USA, Bollywood, India, and Nollywood, Nigeria) is uploaded to YouTube in just 1.3 hours. Furthermore, Google Analytics supplies the means of collecting and analyzing Web usage, which caters to the management, marketing, and social research needs. And then there is a set of non-software products, such as the Google phone, Google glasses, Google car, green energy projects, high bandwidth network technology, and some others. Some of these products have resulted from acquisitions, such as Picasa, YouTube, Google Earth, and Google Analytics.

Google's systems run very fast, materializing the cultural value "Fast is better than slow." This value resonates with the current world paced on the fast Internet time. Simplicity is another recognizable design principle (think of the Google's search page). Google also manages to link its various systems so that the user can seamlessly move form task to task, sheltered from the complexities of underlying systems and networks. Moreover, the users are actively involved in testing products, and their choices eventually decide which products and features will have a go. Another defining characteristic brings Google close to innovative companies in some other industries and countries. Innovation processes at Google start with a strategic ambiguity (Nonaka & Takeuchi, 1995). Executives create motivation and conditions for innovation, but the employees are not told what they are supposed to make.

It is safe to conclude that product innovation strategy is Google's staple. Given the broad and cross-industry character of Google's products, it seems that Google champions emergent rather than deliberate strategy (Mintzberg, 1978). In an emergent strategy, there are no unambiguous grand goal and plans for reaching it. Instead, many gaols and lines of action create a dynamic context and shaping of a resulting strategy resembles a stochastic rather than deterministic process. The scope of products can be confusing even for executives, as some of them have publicly admitted.

Internal Innovations

Internal organizational innovations at Google start with the business model. It belongs to the portal model of   e-commerce. The core production activity of Internet search with Google systems is free of charge, but it creates digital "real estate" that is being sold to advertisers. The attraction that the powerful, free search service has for users does generate a large advertising audience that is attractive to advertisers.

Google supports advertising via the services called AdWords and AdSense. The basic idea behind AdWords is to match semantically a user's search terms with the content of ads. This

very idea is not new. Yellow Pages in paper form display business addresses (the searched content) categorized on the business domain, along with paid advertisements associated with the business category. In fact, the portal business model was spearheaded by Yahoo which simply replicated the Yellow Pages model on the Web. The novelty of Google's model is in an original search algorithm that uses backlinks referencing a given Web page. The frequency of referencing determines the inclusion and ranking of a Webpage in the search output.

The advertising part is an extension of the original Google's business of making the Internet search system. The novelty is that the growing portfolio of Googles systems and services keeps expanding Google's Internet estate. Some of its segments are Websites that contain ads-related content, videos, YouTube, apps running on Android platforms, Gmail, Blogger, Google Finance, and Google Maps. AdSense is a self-service that ad publishers can deploy in order to connect their Websites with the Google digital estate (the Display Network, in Google's parlance). Any owner of Internet estate (Website, blog, etc.) may partner with Google's advertising business via AdSense. (See Google Advertising, 2015)

In the beginning, Google's organization was flat, and the founders seriously considered the possibility of permanently rejecting hierarchy. But the organizational size had to make the inevitable impact on the structure of Google's organization. As the company grew fast, layers of management have been introduced and evolution into a large corporation played out. Still, the company has strived to uphold the intellectual nimbleness and playfulness of a start-up. Instead of simply imitating other high-tech enterprises, Google did it in its own way with a touch of innovation.

As an instance of unorthodox management, the evaluation of work performance runs both down and up at Google. Rather than just being evaluated, employees also evaluate the performance of their managers semi-annually. The engineering professionals appreciate technically competent managers who empower and do not micromanage, have a vision and strategy for the team, and are able to facilitate career development. These criteria resulted from a careful investigation and massive analysis of data related to hiring, employee evaluation, and exit interviews. (See Garvin, 2013)

Management evaluation has delivered measurable benefits for Google. Some managers have found themselves in a contradictory position as their unfavorable evaluations from below contradicted their favorable evaluations from above. The realization that employees do not quit companies but they quit managers triggered a strong motivation in some managers to learn new methods and adjust. The new methods were formulated and taught through formalized training. From the OI perspective, Google's innovative management methods represent an aspect of the company's intelligence. The following discussion will illuminate further indications of innovations at Google.

Homo Informaticus at Google

Following the OI model, the discussion starts with the dimension of homo informaticus. In Google's parlance, a company member is called "Googler". From the IVO perspective, the label "Homo Googlematicus" may fit as well, as Googlers have some unique characteristics. Google's core labor force consists of software engineers. The selection at the hiring point is exhaustive and rests on analyzing diverse candidates-related data. Once employed, the professionals are treated

with income and benefits standard for the high-tech industry in California. In addition, they are showered with amenities, from personal services to entertainment. The Googleplex headquarters resembles a kindergarten classroom and a youth summer camp, serving free, top-class meals, and offering various means for relaxation (Hill & Stecker, 2010a).

The production at Google work transpires in project teams. However, each Googler works 80% of the time on core search products and 20% on their own inventions; delivery and evaluation deadlines are not firmly set, and success of an innovation is not necessarily expected. This open space for innovation is appreciated by innovative people and self-starters. On the other hand, a pressure to deliver something new is upon everybody.

How does this creative, entrepreneurial self-starter look from the cognitive perspective, the homo informaticus angle? A typical Googlematicus resembles the converger type of learner. A converger is strong on the thinking side and has the ability of promptly converting ideas into action. The Googlematicus is also an experimenter and improviser, as both capabilities may spawn innovation. In the IVO framework, these are marks of wisdom. While being focused on rational seeking of a solution to a clearly defined problem, the engineering work requires flexibility in the beginning of the process. What precisely the problem to solve is, that may not be easily defined in the emerging world of breakthrough technologies and associated social forms. Sometimes, a solution may come before the problem, as posited by the model of garbage can decision making. Indeed, a solution may help to define an ambiguously sensed problem. Or it may not be clear upfront what the full range of problems is possible to solve with a solution to a target problem. The Googlematicus faces opportunities of this sort. However, playing by wisdom at the start of an innovation process is balanced by rational, rigorously analytical steps that follow. A chaotic ideation process gets followed by rigorous, data-driven methods for evaluating ideas (Iyer & Davenport, 2008). This is a characteristic of both Googlematicus and the corporation's infoculture.

Groupomatics at Google

Most of the work at Google transpires in project teams of up to five people. Teams have discretion in their operations and are not subjected to tight supervision. The company tends to keep team members collocated, assuming this method makes the work communication and coordination more efficient. In addition, reaching a consensus in team's decision making is often the goal and team management is mostly about aggregation of viewpoints. (See Eideman & Eisemann, 2011) All these characteristics indicate that conditions for developing group mind and knowledge exist at Google.

When valuable knowledge is developed through teamwork, managers would try to preserve it even though the particular project is abandoned. The case in point is developing a new storage system at Google in the mid-2000s. Two project teams were competing by developing two different solutions. The winner was a solution with a higher scalability, suiting Google's growing needs for digital storage. The other project was canceled. However, managers in charge realized a value in technical knowledge generated by the losing team and moved its members to a future storage project. That way, the group knowledge was preserved and could be moved into the new product. (See Hill & Stecker, 2010b).

Google's Knowledge Infoculture and Infopolitics

Advanced digital technologies and knowledge are centerpieces of Google's infoculture. Both have been addressed throughout the discussion. Another staple characteristic is Google's approach to informing, which involves exhaustive empirical data and rigorous analysis. This resembles a scientific approach. As in science, Google makes no definite conclusions until representative data are collected and analyzed with appropriate methods. Google's scientific approach applies to the product development as well as to organizing and management (e.g., hiring, management evaluation discussed above, and employee evaluation).

Based on limited evidence available, it is apparent that Google's infoculture exhibits elements of the knowledge infoculture. There is a strong focus on generating knowledge that combines a free exploration (during the 20% of the business time allocated to innovation) and rigorous evaluation of new product ideas. The free exploration is reinforced by valuing creativity over immediate commercial success and action over caution for failure. The company also stimulates knowledge sharing through teamwork and deploying knowledge for the creation of new products. As they put it: "We strive to maintain the open culture often associated with start-ups… Our offices and cafes are designed to encourage interactions between Googlers within and across teams, and to spark conversation about work as well as play." (Google culture, 2015)

Evidence is lacking with regard to knowledge codification and storing of knowledge representations in KWS (both KM steps). Indeed, of the whole KWS domain just the systems for analytics have been addressed. These have a strong presence in the company, which is in agreement with the leaning toward the general rational, scientific approach. Still, analytics systems support just the first step in KM process, knowledge creation as it is discussed in the first part of this article. Similarly, it is not visible whether the last step in KM, the evaluation of existing knowledge, is performed systematically, although it is apparent that the company keeps coming up with ground-breaking products.

As for other IVO aspects, it is apparent that Google's infostructure shows high data and system dispersion, which enable its global Internet-centric operations. Regarding infopolitics, evidence indicates a salience of expert power. It surfaces in the treatment of software engineers, project teams, and the balancing rather directing role that managers play (Eideman & Eisemann, 2011; Hill & Stecker, 2010; Hill & Stecker, 2010a). Consequences of expert power dominance for Google's strategies and operations need further investigation.

The Production and Interface Systems at Google

Google's production systems are those for Internet search and search-related advertising. The search algorithm is based on the frequency of referencing a Web page/document by other Websites (backlinks): The higher the frequency, the higher the ranking of the Web page/document in the search output. In essence, the Web users determine the relevance of the Web-based content rather than some formal authority (a librarian, a domain expert). This is an instance of crowdsourcing. Since the Internet continually changes, Google has to search, index, and run the ranking algorithm without stop. While providing the free search for Internet users

around the world, Google monetizes the search output that stretches over extensive digital domains (see above about the business model).

Google's Internet search systems connect to the company's network and extensive data repositories. They constitute a part of the interface between the company and its environment. Google has an extensive array of technologies and systems for monitoring behavior of users of its systems and the Internet. Therefore, it could be said that the Google's interface with the environment is a natural extension of its production systems.

The promotion/advertising focus pervades some of Google's mashup systems as well. An example is combining Google Maps with real estate offerings. As Google maps are backed by GPS on Android platforms, a real estate customer is smoothly guided to the listings. The user gets the typical Google-like, free, effortless service, while Google earns by charging real estate agencies. Mashups bring Google into a number of partnerships and help to create its ecosystem.

Dynamic Capabilities and Mindfulness at Google

Google's dynamic capabilities surface in the innovative products. By delivering fast new and quite different products, the company demonstrates that it is capable of reconfiguring its resources in new ways. Google products shape multiple technological and customer environments. Dynamic capabilities surface also when Google promptly modifies products based on users' evaluations and monitoring of user and system behaviors. Therefore, Google undoubtedly has the technical fitness discussed above.

The evolutionary fitness is the question of economic viability. Since Google managed to tie its Internet search competences with lucrative advertising, the company enjoys flexibility with regard to evolutionary fitness. Not all products have to nor are expected to generate revenues on the short run. Some products can be cannibalized. Others with a larger earning potential can be allowed longer project times. Turning technical fitness into the evolutionary counterpart happens through monetizing of widely accepted products (e.g., YouTube was first ads-free, then ads were added).

Organizational mindfulness refers to a capability of preventing tight coupling between organizational parts that may result in malfunctioning or disaster. Organization members of the mindful organization are aware of possibilities of failure in operations and thus they pay close attention to these at a detail level. Operational decisions in a mindful organization is moved to the most qualified organization members regardless of their hierarchical rank. Google matches these characteristics by closely monitoring the performance of its Internet-bound systems that carry its core search-and-advertising production process. Numerous loops link the users back to system operators and developers and enable prompt adjustments in system-based operations. In addition, a mindful organization employs smart, trusting, trustworthy, self-respecting people, who are willing and able to negotiate the differences among their diverse views. These are challengers of the status quo, skeptics, careful listeners and innovators. This part of mindfulness matches the innovator side of Google's homo informaticus. While operational performance must hold to benchmarks, the innovation domain is more liberal and tolerates creative tension, errors and even pricy failures.

Sustainable Organizational Performance

Google has sustained an avid financial performance since its early days. Currently, it is one of the most valuable high-tech companies in the world, based on different financial metrics. Rapid introduction of new products contributed since these increased the company's Internet-based estate used for generating advertising income. Table 2 summarize the characteristics of Google's intelligence discussed in this section.

This case portrays Google Inc. as an organization with a higher level of intelligence. The lacking literature marks limitations of the case study and call for more investigation of this company from the OI perspective. In conclusion, the challenge for Google will be to sustain advertising revenues when the Internet channel becomes saturated. As the traditional advertising media became over-crowded with ads and lost some appeal, the same can happen to the Internet in the future. Therefore, Google's digital estate may erode in value and weaken as the source of financing non-commercial innovations. Enlarging non-advertising sources of income will be increasingly important over time. In addition, the seamless linking of various systems on the Internet demands from users to share private details and their Internet histories. Privacy concerns may become a major roadblock in further technological development with plausible tiring of the current users' enthusiasm.

Table 2. Google's Intelligence

OI Dimension	Google's Characteristic
Homo Informaticus	Converger, experimenter, rational decision maker
Groupomatics	Group mind elements exist.
Infoculture	Elements of knowledge infoculture. Strong focus on knowledge creation and use. Scientific approach.
Knowledge Management	Strong emphasis on knowledge creation.
Infopolitics	Expert power is dominant.
Dynamic Capabilities	Continual reconfiguring of resources for innovation purposes.
Mindfulness	Pursuing emergent product strategy. Close attention to system-based operations. Nurturing smart challengers of status-quo.
Information Systems	Systems for analytics support knowledge creation. Extensive production systems for Internet search and related advertising. Interface systems are a natural extension of production systems.

Conclusion

The first part of this article introduced a new model of OI. It builds on traditional assumptions about OI and on more recent frameworks of knowledge management, organizational mindfulness, dynamic capabilities, and the informing view of organization. OI is embedded in

particular aspects of organization, cognition, technology, and management, and it is indicated in the sustainable product innovation and organizational performance.

The second part of the article compared Google Inc. with the model of OI. Google appears as a friendly corporation that has invented a profit-and-freebies formula staked on its superior Internet search systems. It is a typical company of the Internet age: Google's business model is based on Internet searching and advertising, Google's systems and products are Internet-focused, the company paces itself on a faster Internet-like time and creates/appropriates the Internet "real estate". Google exhibits a number of characteristics constituting OI: the typical Googler is of the converger-experimenter type; project teams can develop elements of group mind; knowledge infoculture is nurtured with a strong focus on knowledge creation and a scientific approach to informing and decision making; and the organization demonstrates mindfulness and dynamic capabilities. Challenges to Google's intelligence will be in reducing dependence on advertising revenues and in balancing technological requirements with privacy concerns.   The case of Google is just the first step in testing the OI model. The model needs further validation in future research.

References

Argyris, C., and Schön, D. (1978). *Organizational learning: A theory of perspective*. San Francisco: Jossey Bass.

Cronin, B., and Davenport, E. (1991). *Elements of information management*. Metuchen, NJ S: Scarecrow Press.

BCG Perspectives, Innovation in 2014. Available: https://www.bcgperspectives.com/content/articles/innovation_growth_digital_economy_innovation_in_2014/

BCG (January 2014). *Out in front: Exploiting digital disruption in the B2B value chain*.

Booz & Co. (2013). *The 2013 global innovation study*.

Britannica, Encyclopedia. (2015). Available: http://www.britannica.com/EBchecked/topic/289766/human-intelligence.

Eideman & Eisemann (2011). *Google Inc.* HBS Publishing.

Founders Letter (2013). Available: https://investor.google.com/corporate/2013/founders-letter.html.

Garvin, D. (2013). How Google sold its engineers on management. HBR, December.

Google Advertising (2015). Available: https://support.google.com/adwords/answer/6080593?rd=2

Google Culture (2015). Available**:** http://www.google.com/about/company/facts/culture/; http://www.google.com/about/company/philosophy/

Google Products (2015). Available: http://www.google.com/about/company/timeline/

Gupta, J., and Sharma, S. (2004). *Creating knowledge based organizations*. Hershey, PA: Idea Group.

Helfat C., Finkelstein S., Mitchell W., Peteraf M.A., Singh H., Teece D.J., Winter S.G. (2007). *Dynamic capabilities: Understanding strategic change in organizations*. Blackwell: Oxford, U.K.

Hill, A., and Stecker, A. (2010a). Systems infrastructure at Google (A). HBR Publishing Corp. Harvard: MA.

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Hill, A., and Stecker, B. (2010b). Systems infrastructure at Google (B). HBR Publishing Corp. Harvard: MA.

Iyer, B., and Davenport, T. (2008). Reverse engineering Google's innovation machine. HBR Publishing Corp. Harvard: MA.

March, J. (1999). The Pursuit of Organizational Intelligence. Blackwell: Oxford.

Merriam-Webster, 2015. Available: http://www.merriam-webster.com/dictionary/intelligence

Mintzberg, H. (1978). Patterns in strategy formation. *Management Science*, *24*(9), 934–948.

MIT Technology Review (2014). 50 Smartest companies. *MIT Technology Review*. Available: http://www2.technologyreview.com/tr50/2014/.

Morgan, G. (1986). *Images of organization*. Newbury Park, CA: Sage.

Nonaka, I., and Takeuchi, H. (1995). *The knowledge-creating company*. New York, NY: Oxford University Press.

Perrow, C. (1999/1984). *Normal accidents: Living with high risk technologies*. Princeton, NJ: Princeton Univ. Press.

Quinn, J. (1992). *Intelligent enterprise: A knowledge and service based paradigm for industry*. New York, NY: The Free Press.

Thannhuber, M. (2005). *The intelligent enterprise: Theoretical concepts and practical implications.* Berlin: Springer.

Teece, D. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28,* 1319–1350.

Teece, D., Pisano, G., and Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

Travica, B. (2005). Virtual organization and electronic commerce. *The DATA BASE for Advances in Information Systems*, *36*(3), 45-68.

Travica, B. (2013). Conceptualizing knowledge culture. *Online Journal of Applied Knowledge Management*, *1*(2).

Travica, B. (2014). Examining the informing view of organization: Applying theoretical and managerial approaches. Hershey, PA: IGI Global.

Wassermann, O. (2001). *The intelligent organization: Winning the global competition with the supply chain idea.* Berlin: Springer.

Wilensky, H. (1967). *Organizational intelligence: Knowledge and policy in government and industry*. New York: Basic Books.

Weick, K., and Sutcliffe, K. (2001). *Managing the unexpected: Assuring high performance in an age of complexity*. San Francisco, CA: Jossey-Bass Publishing.

Wikipedia (2015). Available: http://en.wikipedia.org/wiki/List_of_Google_products; http://en.wikipedia.org/wiki/Google.

Author Biography

Bob Travica is Associate Professor of information systems at the University of Manitoba in Canada. He has taught and conducted research in North America, South America, and Europe. Bob investigates organizations from the perspective of information systems. His current preoccupations are with advancing the informing view of organization, knowledge management, and innovation with technology.