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ABSTRACT

In this working paper, we propose that an organization is a living organism that generates energy to achieve certain outcomes. We propose that the relationship between the inputs (individual and group use of information systems) and the outputs (strategic alignment and competitive advantage) of a system (an organization) depends on the basic principles of quantum mechanics. Specifically, we connect the neuroscience research that addresses qualia (individual) and quale (group) to the Management Information Systems (MIS) research. In this paper, we proffer our research objective, discuss our constructs, and present our interview process and survey items that we plan to conduct and administer.

Keywords

Quantum, energy, competitive advantage, qualia

INTRODUCTION

Employees have the ability to choose if, when, and how much time and energy they put into adopting a new system or using an existing system even if using these systems is mandatory (Rivard et al. 2012). Employees can also choose whether they want to invest time and energy in creating and sharing knowledge with their co-workers using technology (Dobson et al. 2013). Taken together, individuals and groups can contribute energy to an organization by using technology (Gaskin et al. 2014) to create strategic alignment and competitive advantage (Tallon 2011).

Our broad objective is to understand how individual and group energy affects an organization's strategic alignment and competitive advantage. To meet this objective, we ask the following research questions: 1) What quantum constructs are relevant when considering technology use in an organization? 2) What is the effect of these constructs on an organization's strategic alignment and competitive advantage? Using a mixed methods research approach (Venkatesh et al. 2013), we will explore the first question using a qualitative study to identify individual and group competencies that may be relevant for creating value in an organization. Using a sequential approach, we will then conduct a quantitative study to see how individual and group competencies influence strategic alignment and competitive advantage.

In this paper, we first integrate the quantum constructs from neuroscience research into the extant MIS research. Then, we discuss our proposed interview process and method for analyzing the survey data. Finally, we present our survey items.

NARRATIVE REVIEW OF THE PROPOSED CONSTRUCTS

Merriam-Webster defines *quantum* as “any of the very small increments or parcels into which many forms of energy are subdivided”¹. This suggests quantum refers to an individual unit whether that unit is a particle in physics or an individual in a business. Yet, individual units in physics and in business do not work alone; instead, individuals interact with and have an impact on each other (Schultze et al.

¹ <https://www.merriam-webster.com/dictionary/quantum> accessed May 8, 2017

2012). Therefore, we argue quantum has two components: individual (qualia) and group (quale). *Qualia* is defined as “the actual experiences of things” (Tallis et al. 2008, p. 57). *Quale* is often associated with the more common term “universal” defined as “including or covering all or a whole collectively or distributively without limit or exception”². We discuss qualia and quale in detail next.

Qualia (Individual) Constructs

To understand how individuals use information technology, we adapted five consciousness properties developed by Tsuchiya et al. (2016) and argue the term “qualia” is comprised of progressively outward-looking yet individual-level constructs. First, an individual must choose whether to engage in an activity. In the context of using or accepting information technology, this is the concept of motivation. Extrinsic and intrinsic motivations (concepts introduced by Davis 1989) have been widely studied in MIS research (Gerow et al. 2013). We focus specifically on the idea of *intrinsic motivation* where “one engages in the activity because of inherent aspects of the activity itself” (Rodger et al. 2014, p. 32) as the most inward-looking construct (versus extrinsic motivation which focuses on external rewards such as usefulness and performance) (Davis et al. 1992).

Once the individual chooses to interact with technology (intrinsic motivation), then experiences are created to form a certain level of *consciousness* where individuals create an understanding of the technology (Butler et al. 2007). Computer experience and attitude toward technology have been studied widely in MIS research (Venkatesh 2000), but we adopt the broader “consciousness” term because experience generally refers to past computer use (Gist et al. 1989) and attitude is often confounded with intention or use (Venkatesh 2000) while consciousness encompasses use as well as interpretation and understanding of that use (Butler et al. 2007).

While the first two qualia constructs were internally focused, the last three consider the external environment. Once individuals choose to interact with technology and develop an interpretation and understanding of that technology, then they can reflect on their actions and consider how to explain their rationale to others (Shanks 1997); this is referred to as *informative* qualia. A step beyond this, individuals may adjust their interpretation and understanding of a situation based on the experiences of others (Cecez-Kecmanovic et al. 2002); this is referred to as *integration* qualia. Finally, individuals cannot know everything due to cognitive or time limitations even when they are thinking about how to approach the external environment (informative) or receive information for other individuals in the environment (integration); this is called *bounded rationality* (Lacity et al. 2011). In general, researchers simultaneously consider these qualia types particularly in the context of online markets since past experience (informative), feedback ratings (integration), and product/supplier uncertainty (bounded rationality) influence online purchasing (Dimoka et al. 2012).

Quale (Group) Constructs

While the qualia constructs are all focused on the individual, the quale constructs emphasize experiences formed by a group of individuals. We argue for three individual components of quale: relational social capital, rumoring, and complexity (some of these are discussed by Tsuchiya et al. 2016 as corresponding postulates to the qualia). *Relational social capital* focuses on working together to create knowledge in a way that creates trust and shared understanding (Karahanna et al. 2013). *Rumoring* is a way that a group

² <https://www.merriam-webster.com/dictionary/universal> accessed May 8, 2017

attempts to address inconsistencies between what is known and unknown such that the group can reach an agreement or resolve tensions and problems (Oh et al. 2013). Unlike relational social capital that emphasizes the positive aspects of group interactions, rumoring has negative connotations. For example, MIS researchers often study the concept of resistance to address inconsistencies between organizational groups or between individuals and the organization (Lapointe et al. 2005). Finally, *complexity* focuses on the constantly changing nature of MIS and of individual thinking; as such, this construct includes adjusting to environmental changes and group dynamics (Merali 2006) and typically focuses on the concepts of uncertainty and dynamic change in the MIS literature (Beck et al. 2014).

PROPOSED INTERVIEW PROCESS

We plan to conduct semi-structured interviews based on the survey items noted in the previous section. The goal of these interviews is to identify the relevant constructs used in businesses and to create a matrix of individual to group competencies. Given the nature of our study, we believe thoroughly interviewing one to two companies is the best strategy. In particular, we plan on interviewing as many knowledge workers (lower-level technology employees), low-level business workers (non-technology employees), middle managers from technology and business, and possibly c-level executives (e.g. Chief Executive Officer and/or Chief Information Officer - CIO) as we can from one or two companies. We plan to select companies that conduct a great deal of individual and teamwork such that alignment is critical to a successful business model. Another option for case study research is to interview only one individual at each level but to include six to ten companies in the study; we are opening to using this model if researchers in the community argue it is a better strategy.

QUANTITATIVE METHOD PLAN

To analyze the survey data, we plan to use Hierarchical Linear Modeling (HLM) regression since we propose that individual and group use of technology in an organization share variance according to their common outputs of strategic alignment and competitive advantage. We will enter our predictors in an order based on our findings from the qualitative study. We will then evaluate the increments in the explained variance and the changes in our regression coefficients.

PROPOSED SURVEY ITEMS³

Intrinsic Motivation (adapted Perceived Enjoyment items from Venkatesh 2000)

I find using technology to be enjoyable.
The actual process of using technology is pleasant.
I have fun using technology.

Consciousness (adapted Attitudes to Technology items from Conrad et al. 2008)

Computers enrich people's lives.
I find it overwhelming the amount of information available on the Internet.
I find that changes in computer technology happen so quickly that I always feel out of my depth.

Informative (adapted Rational Persuasion items from Narayanaswamy et al. 2013)

I use facts and logic to make a persuasive case for a request or a proposal.
I explain clearly why a request or proposed activity is necessary to attain a task objective.
I explain why a proposed task or change would be practical and cost effective.

³ We included a sample of three items per construct due to space limitations.

Integration (adapted Work Integration items from Torkzadeh et al. 2011)

I use technology to coordinate activities with others in my work group.
 I use technology to exchange information with people in my work group.
 I use technology to get feedback on job performance.

Bounded Rationality (adapted Motivation to Reduce Uncertainty items from Palmer 2008)

When I don't know something, I usually seek out something about it.
 When I don't know something, this usually doesn't make me seek out more information...I just deal with it.
 If I'm uncertain about something, I'll sometimes ignore it and act as though I do know it.

Relational Social Capital (adapted Shared Cognition items from Karahanna et al. 2013)

CIO and Top Management Team (TMT) members have a shared understanding of the role of IS in our organization.
 CIO and TMT members have a shared view of the role of IS as a competitive weapon for our organization.
 CIO and TMT members have a shared understanding of how IS can be used to increase productivity of our organization's operations.

Rumoring (adapted Loss of Control over People items from Narayanaswamy et al. 2013)

Team members are not responsive to the project manager.
 Team members spend time working on the wrong tasks.
 Team members spend time on tasks other than their assigned duties.

Complexity (adapted Environmental Turbulence items from Wolf et al. 2010)

Environmental changes in our industry are very difficult to forecast.
 In our kind of business, customers' product preferences change a lot over time.
 New product introductions are very frequent in our market.

CONCLUSION

In this paper, we propose a unique approach to decision making by combining the principles of neuroscience and MIS. We investigate the organization as a system through the lens of quantum mechanics. We plan to administer our research as presented above.

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