Building a Contemplative IS Workforce through Promoting Mindfulness in IS Design– A Case Study

Full papers

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Abstract

Incorporating mindfulness in the information systems (IS) development process is not new, but educating an IS workforce to promote the design for a contemplative user experience is. Building a contemplative IS workforce is critical for promoting contemplative societies as social interactions nowadays have been increasingly structured by IS infrastructures and capabilities. This research examines the definitions of mindfulness in IS literature and in Buddhism. It qualitatively studies the IS students' learning outcome on mindfulness. Students in a Systems Analysis and Design course were exposed to mindfulness literature, asked to design websites for a contemplative community of practice, and challenged to exercise and reflect on mindfulness when designing for spiritual information services. A majority of the students have recognized the importance of mindfulness in IS design, suggested approaches of reaching system outcome of promoting mindful user experience, and reported the incorporation of mindfulness in their daily attitudes and behaviors.

Keywords

Mindfulness, IS Education, Contemplative Studies, IS Design, User Experience, Spiritual Information Services

Introduction

In the Information Age, where personal information use and intrapersonal interactions have been increasingly shaped by technical infrastructures and capabilities, it is essential to educate the technical workforce about mindfulness in order to build a more contemplative society. Incorporating mindfulness in information systems (IS) development process is not new, but educating an IS workforce to promote the design for a contemplative user experience (UX) is. Reshaping an increasingly information-driven society may start with an education promoting mindfulness in an IS workforce.

Research has called for an IS workforce to incorporate mindfulness in the systems design process and systems outcome. Mindfulness in the IS literature has mainly focused on the design process and with limitations. Systems outcome in terms of promoting contemplative UX is lacking. The rationale for contemplative UX is to reduce the constant barrage of information inundating the user as well as to reduce the user's dependence on or addiction to information technologies, or at least allow users to have a more need-based, peaceful interaction with these new technologies and to encourage more considerate and compassionate intrapersonal interactions facilitated by the technologies. Some of these can be related to the relatively recent concepts of 'work-life balance' and 'awareness' being promoted within the workplace, but analogized in the design, development, and use of systems.

It follows that for these types of systemic changes to take hold, education promoting mindfulness must be directed at those who are currently and who will be responsible for the design and implementation of these systems, namely students preparing for careers in information technology (IT). These students have a responsibility to create environments which promote mindfulness in order to foster the benefits of such systems--safety, peacefulness, and sustainability with an eye towards ethical, loving user behavior.

As mentioned earlier, most of the existing IS research on mindfulness are related to the IS development process, exemplified in IT innovation (Swanson & Ramiller 2004, Ramiller & Swanson 2009, Mu & Butler 2009, and Surendra 2009), agile development (Tallon & Pinsonneault 2011), team management (Dabbish & Kraut 2008, Alunuaimi et al. 2010), and reliability (Butler & Gray 2006, Carlo *et al.* 2012) in the context of changing and risky environments that require attentiveness, alertness, and open-mindedness.

Current understanding of mindfulness in the IS literature is limited in comparison to the concept of mindfulness in the original Buddhist context. In Buddhism, mindfulness is referred to as an unchanging presence of a single-pointed focus on the nature of the mind (Norbu, 2006). Such mindfulness attends to the single state of dharmata (i.e., the true nature of phenomenal existence including mind); it is not about being attentive, alert, and open to everything happening in the environment, as these happenings could be the very distractions preventing one from being in the dharmata. Omniscience, loving-compassion, and peace are the natural attributes of one's being in the state of dharmata. Being attentive, alert, and open-minded without the fundamental experience of dharmata is like forcing oneself imagine what sneeze is following its word descriptions without ever experiencing it. Being attentive, alert, and open-minded with mental efforts is of no comparison to being omniscient, which is to know it all, innately, beyond the mental efforts.

Hence, being mindful in the Buddhist context is a lofty objective to be reached only by few awakened beings. But that difficulty should not preclude an IS workforce from the reasonable interpretations and feasible applications of mindfulness in the IS design. This research calls for such interpretations and applications and suggests the following perspective changes from the second-order descriptions of mindfulness in the IS literature back to the first-order meaning of mindfulness in Buddhism: 1) a shift from specific areas with design challenges calling for attentiveness back to the basic design principles and practices focusing on the fulfillment of the fundamentals (e.g., such fundamentals could be just to accomplish one single objective of a system, and accomplish it well); 2) adding a general system outcome requirement promoting end-user mindful UX with focus, peace, and love.

In an attempt to introduce mindfulness in an IS workforce, the researcher conducted a qualitative case study in an undergraduate Systems Analysis and Design (SAD) course. SAD courses are can be good candidates for contemplative IS topics, which include the typical research areas of IT innovation, agile development, team management, and reliability. Since educating mindfulness in an IS curriculum is still in the realm of research rather than an accepted practice recognized by accreditation, it must be conducted thoughtfully. The concept of mindfulness was introduced indirectly through a project that asked students to conduct systems analysis and design for a contemplative community.

The aim of this research is to qualitatively assess IS students' understanding and application of mindfulness in IS design and to use their reflections as indicators for learning outcomes. Since many students work for the IS industry while pursuing their IS degrees, educating IS students can serve as a pilot study for the training of mindfulness in an IS workforce.

Literature Review

Mindfulness in the IS Literature

Most of the existing research on mindfulness in IS development process. Swanson and Ramiller (2004) proposed mindfulness across an IT innovation process with strategic foresights, contextual sensitivity, and managerial mindfulness. In later research, they further examined the very nature of "routines" and "past" and introduced structural and temporal paradoxes that state the intrinsic conflict between searching/organizing for mindfulness and what mindfulness should entail (Ramiller & Swanson 2009).

They echoed what Butler and Gray (2006) mentioned--"routines are a double-edged sword–helpful when providing options but detrimental when hindering detection of changes"–as well as what they concluded from the literature that *mindfulness* involves "*openness to novelty, alertness to distinction, sensitivity to different contexts, awareness to multiple perspectives, and orientation in the present.*"

Vidgen and Wang (2009) applied the above definition of mindfulness in agile IT development. *Mindfulness* in agile IT development, together with "alertness, IT innovation, and opportunistic search," means that "alignment is built on a foundation of inclusive decision making that is fully supportive of agility" (Tallon & Rinsonneault, 2011). Maruping et al. (2009) suggest that "...control modes that emphasize outcomes will help to ensure that software development teams are constantly *mindful* of project objectives."

Other researchers studied what mindfulness implies in the management of teams. Being mindful in a self-managed team means "being aware of the activities of their peers and strive for the welfare of the group as a whole" (Dabbish & Kraut, 2008). Alunuaimi et al. (2010) discussed that "managers...might want to make sure that individuals in teams are attentive to their own loafing and mindful that they cannot attribute their shortcomings to others."

In the context of reliability, mindfulness has its specific connotation. Carlo *et al.* (2012) defined the five cognitive processes of collective mindfulness in the context of reliability as (1) preoccupation with failure; (2) reluctance to simplify interpretations; (3) sensitivity to operations; (4) commitment to resilience; and (5) under-specification of structures, and these five cognitive processes jointly "create a rich awareness of discriminatory detail and facilitate the discovery and correction of errors capable of escalation into catastrophe."

Mindfulness in Buddhism

Although the aforementioned definitions of mindfulness are helpful and have been widely used not only in IS but also in other disciplines like neuroscience, psychology, and management, it is still worthwhile to examine what mindfulness truly is before applying it in different knowledge domains. In Buddhism, being mindful has a much simpler but deeper meaning, and all the attributes mentioned above (openness, alertness, etc.) are only the *side effects* of being mindful--not its essence.

Mindfulness in current literature across disciplines is still a mental construct that is equivalent to "attentiveness." Being attentive is a desirable trait, but is not what mindfulness is in essence. If one's mind is agitated, one cannot be attentive. Mindfulness in Buddhism emphasizes a focus on the present moment with an eye towards current state of suchness without the disturbance of attending to emotions or sensations.

In addition, current literature in management contrasts mindfulness vs. mindlessness (McAvoy & Butler, 2009, Carlo *et al.* 2012). In Buddhism, every sentient being has a never-changing nature of the mind, and hence there is never "mindlessness." Mind could only be obscured but never cease to exist. What "mindless" actually refers to is "attention less" or "senseless."

To understand what mindfulness is, one has to know innately what 'mind' is. Mind is not simply the brain, i.e., mental efforts or the intellect. Mindfulness from the mind does not equate to attentiveness from the mental activities in the brain. The definitions and descriptions of mindfulness in the IS and other scientific literatures are mostly about the mental activities in the brain rather than regarding mindfulness as a whole-body or even beyond-body experience. Such an innate whole-body or beyond-body experience cannot be accomplished through mental understanding of scholarly descriptions and academic debates. These mental activities can be the very obstacles one must overcome to be open to such an experience. The nature of the mind is free from all elaboration; hence, the experience of it has to first cut through all the mental activities such as discursive thoughts or afflicted emotions. Mindfulness, i.e., "present awareness" (Norbu, 2006), does not mean "present mental attentiveness" but "present, one-pointed focus on dharmata–intrinsic nature of all phenomena," and such focus is not from the contrived mind, and "being present" implies unchanging. Since dharmata cannot be described in concepts, for educational purposes, mindfulness can be referred to as the *present, unchanging state of peace and love*–as peace and love are the byproducts of experiencing the dharmata. Experiencing the dharmata requires a set of

techniques. One may start with calm-abiding meditation that enables the practitioner to 'cut through' mental effort in order to experience peace and love.

Why is it important to promote education focusing on mindfulness to an IS workforce? An IS workforce has major input in the design of online societies. As personal information use and intrapersonal social interactions nowadays are becoming increasingly structured by IS infrastructures and capacities, IS practitioners and academics, as the architectural designers of the "digital earth" for its net-citizens and hence the leaders of the digital crowds, have the undeniable responsibilities of thoughtfully creating safe, peaceful yet still productive and sustainable digital environments so that the normative behaviors of the digital crowds are ethical, peaceful, and incentive-compatible with the human nature of love.

Hence, this research is to promote contemplative societies by educating IS designers the concept of mindfulness. It is recommended that IS designers, users, and researchers become avid meditators themselves so that they may truly experience what mindfulness feels like and what the mind is. But, as that takes time and effort, the hope is that seeds of mindfulness can be planted in IS students through course projects during the limited timeframe spanned by their studies.

Methods--Educating Mindfulness in IS Design

Informing Students about the Concepts of Mindfulness

Since a systems course is not a philosophy course, substantive course time cannot be spent directly teaching the concept of mindfulness. The researcher experimented with the indirect introduction of mindfulness in a group project of an advanced SAD course by asking students to design websites for the communities practicing and promoting mindfulness.

The students were given handouts that provide the above definitions of mindfulness in the IS literature. Students were also given an overview of the field of contemplative studies and shown the different kinds of contemplative practices. The meaning of mindfulness in the Buddhist context was indicated in the mindful IS design principles listed below and deliberately explained in course lectures. The researcher initiated a list of design principles that incorporate different perspectives of mindfulness. The following information was given to students, and it is intended to serve as a starting point triggering students' own contemplation and creativity on mindful IS design:

> "In the context of promoting mindfulness among IS users besides in IT innovation in an organization, the following is a list of sample mindful design principles for spiritual information services. It is hoped that these principles could be extended to general information systems design once the spiritual information services become successful.
>
> 1. In the creation of websites encouraging and supporting practitioners' mindfulness, the sites themselves must be created mindfully. The design, creation, and maintenance of these sites must be done with mindfulness and the intention to benefit stakeholders and users. Oftentimes, it is difficult to have everyone in the project practice mindfulness already; therefore, it is important to at least have the leaders who are mindful and able to set the intentions for the group. What do we mean by intention? The ultimate intention is to benefit all sentient beings. Do scientists want to benefit beings? Yes. Are they all contemplative practitioners? No. Therefore, the project leader and members do not have to do contemplative practices, but they do need to have a good heart.
>
> 2. The design should have the main purpose of accumulating merits rather than accumulating wealth. Every symbol and image of the websites is for accumulating collective merits. Even aesthetics should be downplayed as all aesthetics should serve spiritual purposes, and no distracting aesthetics should be added.
>
> 3. The purpose of contemplation is to have a single-pointed focus. Hence, the design should be simple and direct with a focus and should not contain distractions such as advertisements. The display of sponsorship information should be discrete and not disturb the focus in any way–it can appear pre- or post-a practice and never in the middle, like those appearing on YouTube or uStream.

4. The design should have clear boundaries. For instance, in the context of Tibetan Buddhism, the content should be tailored to practitioners with different capacities, paths and lineages. A careful and clear division of content should be guided by gurus and hence not cause confusion to practitioners on different paths.

5. The design should encourage practitioners' mindfulness and discourage discursive thoughts, their exchanges, or the increase of afflicted emotions such as pride and ignorance."

Applying Mindfulness in Systems Design

After the above introduction of mindfulness and relevant IS design principles, the students were asked to split into groups and conduct systems analysis and design for the subsidiary websites of the Contemplation Institute. The following background information was given to the students before they formed groups and each group selected a website to design:

> "The Contemplation Institute is a non-profit organization in incubation that builds, organizes and educates international communities of contemplative practitioners. It is an overarching organization providing interconnected spiritual information services (see Figure 1).

Figure 1 The organizational structure of *ContemplationInstitute.org* and its subsidiary websites
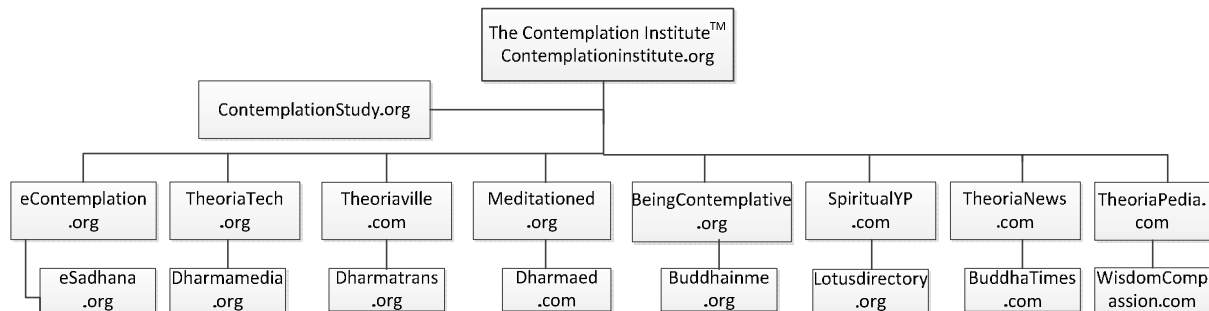
> As contemplative practices (CS) call for mindfulness and concentration, the design of the Contemplation Institute mindfully follows the principle of single-pointed focus by requiring a separated website for each major service targeted for a particular community.

> The development of the *ContemplativeInstitute.org* and its subsidiary websites is also a testing bed for mindful information systems design. As Garchen Rinpoche has stated that "the inner peace and happiness of mind greatly affects outer performance of the world, the cultivation of mindfulness in the practice of science and technology is essential," technology should be designed and implemented to increase its users' inner peace and reduce their afflicted emotions. This is particularly important for websites that promote contemplative practices. Since the nature of the mind is free from all elaboration, the websites should promote contemplative practices and encourage mindfulness but discourage discursive thoughts, unnecessary social networking, and ego-boosting forum discussions."

Assessing Learning Outcome on Mindfulness through Self-reflection

At the end of the course, students were asked to answer the following essay questions and were given bonus points for them:

> "1. Integrated with the subject knowledge you have learned from this "Advanced Systems Analysis and Design" course, please describe and support your views on how to exercise mindfulness (i.e., contemplation) in the context of information systems analysis and design.

2. Please provide at least three design/implementation strategies for delivering an information system that encourages mindful behaviors of its users. Please demonstrate with concrete example(s).

3. How have the class discussions and group projects on "contemplative studies" influenced your understanding of mindfulness? Have you added "mindfulness" into your vocabulary, thinking patterns, and/or daily behaviors, and in what way?"

Analysis – Learning Outcome on Mindfulness in IS

There were twenty-six students in this bachelor level advanced SAD class. They were mostly seniors in a Computer and Information Systems program at a small private university. Four students dropped out (they belonged to the same group). Among the remaining twenty-two students, nineteen students answered these three questions. Sixteen out of nineteen students reported that they have recognized the importance of mindfulness in systems analysis and design and suggested different approaches of designing a system that promotes its users' mindfulness. These students also reported that they were able to incorporate mindfulness into their daily attitudes and behaviors.

Interestingly, students' self-reflections show that they hold views on mindfulness corresponding to both the descriptions of mindfulness in the IS literature and that derived from the Buddhist teachings. Table 1 shows the students' self-reflections and the related constructs of mindfulness.

Areas where mindfulness applies	IS students/designers' self-reflection	Constructs of Mindfulness (IS Literature)	Constructs of Mindfulness (Buddhism)
Q1: "How to exercise mindfulness in the context of information systems analysis and design?	"It is important to *be willing and able to work collectively* to solve problems, *consider alternatives, seek and understanding of those aspects unknown to one or both parties*, and to give *attention* to practical and spiritual detail."	Openness Awareness Attentiveness	Love
	"Mindfulness to me …is a *minimalistic* approach and *the idea that the more the program can do to make the user have to do less, the better*. "Mindfulness…is about taking the process of creating a system seriously in order to *ensure that it works properly for the end user. The user should be held in the highest regard…*"		Focus Love Peace (as safety and control) Love
	"When designing a system, the *needs of the user and the cooperation and understanding of the designers* must all be taken into account. There *should not be criticism* throughout the process and it should be a *fun, informative learning process* for both end users and the designers. Each party should *be contemplative on the*	Awareness	Love Peace (as phlegmatic equanimity)

	requests and expected–and maybe unexpected–needs and benefits. Because each party should be mindful of the other group, they should *avoid censoring* each other."	Openness	
	"…users of [waterfall SDLC] system must be very mindful of their work…if a team is working on the project planning phase, all steps must be thoroughly completed to *ensure that everything is accounted for,* because once analysis begins, the planning is set in stone. Users must be aware of this and be mindful of their actions through this system."	Presence	Peace (as safety and control with accountability)
	"Agile development is a guiding philosophy…Essentially, this mindset keeps its users mindful of these core philosophies and wants them to follow them to better the development process. For example, if a change in needs comes unexpectedly, users must remember that the philosophy is not to follow a plan but to *respond positively to change and adversity.*"	Alertness	Peace (as phlegmatic equanimity)
	"it's important to contemplate and find the impacts of analysis and design decisions so that *ethical and necessary decisions* are made…."		Love (as ethical decision making)
Q2: "What are the design/imple-mentation strategies for delivering an information system that encourages mindful behaviors of its users?"	"Anything the system can do… it *should do.*"		Peace (as safety and control)
	"The user experience should be *smooth and easy*, but most importantly *non-intrusive*. When someone goes to use a website they *don't want to be distracted* by large quantities of advertisements or extra features that just distract you from the *core reason* they go to the site." "Despite the complexities of the system, the GUI should feel *easy to use* and follow while maintaining a *minimalistic* look. Distracting features and difficult to follow processes will only lead to frustration and possibly the abandonment of the system."		Peace Focus Peace Focus
	"In terms of the actual designed system, it should be geared toward *relaxed thinking.*"		Peace
	"it's important to *limit their options to making non-mindful actions…*" "Basic *"safeties"* of information systems that *limit* a user *from abusing the service or disrupting other users* are key to building a healthy and welcoming environment for users."		Peace (as safety & control) Peace (as safety & control)
	"create an environment that makes a user realize they're interacting with other *"real people"*, and also creating a		Love

	safe system that makes a user expect a good experience and want to add to it themselves."		Peace (as safety and control)
	"Another method for encouraging mindful behavior by users…is to have a sense of *accountability* and also give the users connections to each other and inspire a sense of real communication that both parties know that they are interacting with *a real person*."		Peace (as safety and control with accountability)
			Love
	"Creating an overall *safe and enjoyable* system is vital to being an inviting system to desirable users who will want to *contribute positively* to a community or information system. If an information system is in a state of near anarchy, users who would contribute [to] or improve the quality of the system will be turned off by the state of the system and not want to contribute or waste their time on the system. …By *limiting the ability for a user to harm to environment* or data…"		Peace (as safety and control)
			Peace (as phlegmatic equanimity)
	Especially in online communities and games, it's important to inspire feelings that people would have outside of an electronic community, such as *feeling empathy for other users and wanting to treat the other users as they would want to be treated*. E.g., An example of inspiring accountability was YouTube's decision to implement a slow-rollout of users using their real names instead of near-anonymous screen names. This reduced malicious, annoying, or "trolling" comments and messages by users on videos and user-to-user communication.		Love
			Peace (as safety and control with accountability)
	"Even as basic example of what is depicted in an icon to do an action on a system may or may not translate as well across cultures. *Systems designers should be in the users' shoes, and have forward thinking. Awareness to cross-culture and globalization for an information system…* I've grown in realization of how *it's vital for the users and stakeholders' culture and social norms of an information system to be understood…*"	Sensitivity Strategic foresight Awareness	Love
	"…with groups who have *disabilities such as blindness and deafness… it's vital that reasonable accommodations are made* so that an information system doesn't leave out such groups…"	Awareness	Love
Q3: "How have the class discussions and group projects on	"Designing a system with contemplative practices in mind allows a user to *recognize the ties and separations of technology and life.* When designing a system, it should *be designed to perform a task… but should not be geared to be an all-encompassing lifestyle in itself. There needs to be a fine line between technology and*	Mindful of objective	Peace (as safety and control)
			Focus

'contemplative studies' influenced your understanding of mindfulness? Have you added 'mindfulness' into your vocabulary, thinking patterns, and/or daily behaviors, and in what way?"	*living one's life.*" "The class and project have certainly forced me to think about technology, systems, and the daily use of them in relation to mindfulness....*Until this class, I was not a contemplative/mindful person.* I live my life in a very technology intensive world and recognize that the hustle and bustle of the world has certainly taken over my life. The only time I find myself reflecting on my thoughts, actions, and life events is late at night as I try to sleep. The business and collegiate world have taken such a hold on my days that I should probably set aside some time to just *relax away from electronics.* I had never thought of this until it was mentioned in this class. Electronics and technology (i.e. my computer, video games, etc.) bring me joy; thus, I have always thought that this was my relaxation. I seemed to have forgotten the joy of childhood where sitting outside was joy enough. I have never been a highly religious person...however, I have become more open to the thought of *reflecting on life and taking my technology and oversights of the natural beauties in life into account. My awareness of my lack of mindfulness has increased...*"		Awareness of mindfulness itself Peace Focus Awareness of mindfulness itself
	"After experiencing this class, I have learned that people come in all shapes, sizes, colors, and races and need to *be respected uniquely based on their backgrounds.*"	Sensitivity	Love
	"I also believe that I have been using the concept of mindfulness in my own life and my way of thinking. When it comes to treating others, I have always tried my hardest to treat everyone I meet with the utmost respect and care, as I would expect them to treat me.... I am mindful of their wants and needs and I want to be there in any way I can to support them. The discussions on mindfulness we have had in class has *made me realize that the way I feel about the people close to me falls in line with the concept of mindfulness.*"		Awareness of mindfulness itself
	"The only way that I could say I have added mindfulness ...is the fact that *people are very busy in this day and age and sometimes you may have to wait get the answers you require.* That is why it is very important to manage your time correctly."		Peace (as patience)

Table 1. Students' self-reflections on mindfulness and the related constructs

The researcher has carried out similar projects in other SAD courses. In order to address few student complaints (at the first time of using this project) that concepts outside the scope of a traditional IS curriculum were being addressed (caution: not all students in a Catholic university were open to the idea of learning about Buddhism in an IS course), the specific focus on Buddhist concepts was deemphasized and replaced with more general Contemplative Studies concepts (e.g., projects originally exemplified for temples were changed to projects for churches), and then there were no further complaints. A lesson learned is that contemplative IS is a relatively new concept and any teacher on this subject should proceed with caution.

The researcher has used the same project for an introductory SAD course as well and the end result was also positive. Two students continued to an advanced SAD course and continued working as a group to further develop their project. There was also an interesting unexpected development—one of the students in the basic SAD course requested a teaching and demonstration of meditation. The researcher introduced a breathing exercise and demonstrated with back-straight, balanced and symmetric posture. From that point, students were eager to conduct this exercise in follow-up class sessions, and can easily recall the good posture and relaxed breathing when reminded. Two students queried about research opportunities on mindfulness in IS after the course. Also for the same course, the researcher has invited a long-term meditation retreatant as a guest speaker, who sat in a full-lotus posture in his hour-long interactions with the students. The students were impressed with his posture and his views on technology, and some had further conversations with him after the class.

Conclusion

Education promoting mindfulness in an IS curriculum is relatively new. This qualitative case study in a Systems Analysis and Design course shows different interpretations related to the definitions of mindfulness. The results indicate that IS students were open to concepts from both the IS literature and Buddhism, and were able to understand and apply the diverse interpretations of mindfulness in the IS design process and in systems outcome. Overall, the majority of the IS students who were exposed to mindfulness have recognized its importance in IS design and have suggested approaches geared toward reaching a system outcome that promotes mindful user experience of the system, as well as reporting that they themselves are also incorporating mindfulness into their daily attitudes and behaviors.

The effort of teaching mindfulness to IS students already has parallels in the IS workforce, with examples of Google promoting meditation techniques among its employees and inviting top meditators like HH the 17th Karmapa to speak to Google executives and employees. Some top technology leaders (founders of Facebook, Twitter, and Paypal etc. and executives and managers from Microsoft, Cisco, and Google etc.) are active participants in the annual Wisdom 2.0 conference, indicating their recognition of the importance of stress-reduction and concentration for their IS workforce as well as the benefits of applying contemplative practices to address these issues. Hopefully, the increased mindfulness in technology leaders can gradually lead to the increase of contemplative IS design and implementation, which will eventually lead to the contemplative technology use in society.

This research serves as a pilot case study. The sample size is small and the measurement of the 'mindfulness' outcome is qualitative. Code descriptions and multiple raters will be applied in the future. Additionally, it will also be possible to conduct a quantitative study with survey instruments on mindfulness.

The generalizability of this research is also limited as IS students are not necessarily representative of the IS workforce. Student projects are of a much smaller scale and are under less time and financial constraints than real industry projects. Mindfulness may be better experienced in a classroom setting than in a more stressful real-world situation. What is defined here as mindfulness may need further expansion in real-world applications.

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