Cooperating with Algorithms in the Workplace

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Abstract
The algorithmic landscape is highly heterogeneous. Lack of awareness with regard to the construction and deployment of algorithms can lead those unfamiliar with algorithms, to assume that they are homogenous and therefore interchangeable. Current approaches to planning and implementing algorithmic process automation in the workplace are rooted in high computational support, with the resulting process aggregations often well beyond the view and scope of any human within the process, including the planners and implementers. The emergent aggregate layer of this abstraction, distributed across a wide spectrum of individual companies, developers, protocols, machines, ideas, regions, and applications is collated by people through experiences and controls, many of which may live on mobile devices, kiosks, robots, or other interactive platforms in the environment. Cooperation is disrupted when people are bound by scripts, processes and algorithms that are inflexible and restrict their agency to solve problems and complete tasks. We suggest increasing trust in humans as a management strategy to foster cooperation with analog and digital algorithms, and productions in the workplace.

Introduction

Humans supply the "glue" for enacting and interfacing algorithmic adaptations, filling in the blanks that machines might miss, patiently (or impatiently) following scripts, processes and commands to interact with the things they are required to in the world [1]. For the past few thousand years these interactions and outcomes were achieved by people applying judgement and skill to interrelate objects and processes (and other algorithms) to create new processes and achieve an advancing range of outcomes. The recent trend in corporate and institutional algorithms appear to be aiming to remove deployment of either skill or judgement on the part of people, and instead formally deferring any skill or judgement to either computer software or embedded as checklists and policies to direct human action as if the person acting were embedded within a variant of Searle's 'Chinese Room' [2]. Informally, people still provide the basis for making things work in practice, employing what Applin and Fischer (2013) refer to as 'covert agency' [3][4] to moderate, at least, the worst situational extremes that can emerge from an algorithm.

With humans providing the nexus to assist these algorithms, different types of Social Machines [5] are created for which humans provide services required for automation to work at the end-user level — or at least work as well as it can if those entities creating and deploying the algorithms in the first place are not considering the interoperability humans are providing. Social Machines give back to users by sharing the aggregate of individual data, processed into meaningful contextually relevant formats, which are then shared back, benefitting both system and individual.

Workplace algorithms enable new ways of calculating results, collating data, and acting on each to provide some (possibly) useful experience or time/cost savings for people, in some cases to the extent that entirely new processes, outcomes and corresponding algorithms become possible. However, these algorithms are not easily implemented in all contexts, and require additional human effort, skill development and expertise to engage. Those deploying workplace algorithms hope to save money in labor by replacing their skilled workforce where possible with machines and algorithms. But some of this labor is shifted to customers and colleagues who also must often absorb some of the need for skills and expertise, and often must learn and do more in order to get a function to work. Automation is great for companies, but can create higher demands of labor and effort on users and customers, who must apply their own intelligence where sufficient intelligence is not built into the algorithmic process.

Effectively, companies extend algorithms beyond the bounds of their own domain and into civil society more generally. The cumulative demands of algorithmic extension by many companies induces the need for personal adaptation to improve lifestyle efficiency. Performing more tasks in the same time leads to time compression [6], creating pressure for people to do more and more, and inspiring them to support the idea that automation will help them. However, at the moment, this is a dubious idea, as more and more algorithms are created requiring human intervention to be fully operational in practical life [1]. As companies developing automation not only replace labor, but cut costs on user experience research, testing, and understanding the outcome of their devices, much of what makes it out in the world is in a Beta state—or worse—and people must work even harder to help these algorithms to function.

Thus, concerning algorithms at work, people are either replaced by them, required to help them, or have become them. Workplace algorithms have been evolving for some time in the form of scripts and processes that employers have put in place for efficiency, "quality control," brand consistency, product consistency, experience consistency and most particularly, cost savings. As a result phone calls to services such as hotels, shops and restaurants, may now have a script read out loud or memorized by the employee to the customer to ensure consistent experiences and task compliance. Consistency of experience is increasingly a goal within organizations, and implementing algorithms in the form of scripts and processes has been an early step in training humans to be more like machines [3]. Unfortunately, these algorithms can result in an inability to cooperate in contexts not addressed by the algorithm. These scripts and corresponding processes purposely greatly restrict human agency by failing to define clear boundaries for the domain of the algorithm and recognizing the need for adaptation outside these boundaries. Thus, often if a worker is asked a specialized or specific query, they lack the ability to respond to it and will either turn away the customer, or accelerate the query up (and down) a supervisory management chain, with each link bound by its own scripts, processes and rules, which may result in a non-answer or non-resolution for the customer.

These algorithmic forms can become dysfunctional when the rating of human worker performance is connected to their algorithmic compliance. This creates a system in which the human customer is no longer prioritized in the system and instead becomes a part of the system as they field regular requests to give feedback and ratings of both the algorithms and the human performing the script or processes' performance. In workplaces where worker adherence is tracked, timed and measured, a question from a customer requiring thought outside the bounds of algorithmic consideration becomes a bottleneck in the process rather than a way to satisfy a customer or collaborate with a colleague. Thus, people's needs are only considered within the context of the algorithmic performance and the customer or colleague only becomes considered and valued in their role in rating that adherence or performance. The following case illustrates this phenomena.

The Starwood Hotels and Resorts Worldwide
Aloft San Francisco Airport Hotel Case Study: Volume Levels and Brand Standards

The Starwood Hotels and Resorts Worldwide chain of properties takes great care in designing "brand standards" for each of their hotel brands to ensure that guest experiences are similar between different hotels. Each property within the Starwood chain must adhere to the "brand standards" designed by its parent brand. Furthermore, these "brand standards" are developed as rules rather than guidelines, and hotel employees are monitored for their adherence to these brand standards by their managers. The Aloft San Francisco Airport hotel is a Starwood Hotel, and thus, is governed by the specific "brand standards" guidelines for all aspects of its Aloft brand (even the gas fireplace must be lit and engaged during certain times of day—including during the hottest days of the year).

The SFO Aloft San Francisco Airport hotel has a large open-plan lobby. In 2013–2014, a few times a week, the hotel featured live music performances in the lobby. One night a week, a DJ played records and one night a week, a band played. Guests to the SFO Aloft San Francisco Airport hotel, were able to hear both live music and the DJ in the lobby, from many of the rooms, and while using the elevator during the time that the performers were engaged. All of these performances were louder than the "brand standards" volume prescribed for the SFO Aloft San Francisco Airport hotel lobby music.

The loudness during performances was a violation of the "brand standards." The volume levels in the lobby, as well as the elevators, outside grounds, and pool area speakers were set to "brand standards" levels and, at the time, could not be changed by those working at the front desk. Only a manager was allowed to touch the volume dial and even they were held accountable for this adjustment to "brand standards." Thus, it was highly unusual that a property so strictly guided by its brand would be willing to violate its "brand standards" at least twice a week, if not more, in so many areas of the property governed by "brand standards" volume levels.

The volume change when live music was performed, was a result of the disruption of an assumed automated process by invited participants to the process. Each week, the DJ who played live, was also the Manager of the hotel—yet the "brand standards" infraction persisted. While the dial set of the "brand standards" remained fixed, set at a certain level as designed, the sound volume was actually much louder because of the way that outside audio equipment was connected to the system. Even if the live music was sanctioned to be louder than the "brand standards" permitted, for a company that usually has strict control over their sound, to allow any musician plugging into their audio system to dictate the audio level within such a controlled brand environment was surprising.

The staff of the Aloft San Francisco Airport hotel, used the "brand standards" as an additional form of surveillance management, and were unable to complete certain tasks or requests if the "brand standards" did not accommodate guest requests due to their need to adhere to pre-designed hotel processes, e.g. "brand standards."

Currently, the volume levels during live music nights may continue to be too loud for the property, particularly the elevators, or it may not, depending upon who is playing and the levels pre-set on the audio equipment they bring into the property.

Discussion

The issue with the volume levels dramatically changing two nights a week was a convergence of automation in the form of scripts and processes, e.g. Starwood's "brand standards," with adding variables to the automation, which are not bound by the same standards. The result in this case was a scenario whereby "brand standards," carefully guarded and faithfully maintained, were easily circumvented by outsiders connecting their audio equipment in a way that bypassed the volume dial at the front desk. Thus, the volume dial at the front desk showed adherence to "brand standards" while the actual noise level was much louder.

The problem was in the way that the hotel scripts and processes converged with the scripts and processes of the musicians and the DJ playing in the venue, as well as the limits of the system and where it played (such as the elevator). When the musicians and the DJ played, they had their own amplifiers, which had a volume that was set to play louder than the "brand standards" specified for the hotel lobby.

This "brand standards" algorithm was a problem for guests as well as the front desk staff, who were not permitted to change the volume level, even though the noise was so loud that both the guests and guests had to shout to hear each other. The staff's "brand standards" script adherence forbade any level change. Because the elevator speakers, outside grounds, and pool area were also connected to the lobby audio system, it created an additional unforeseen volume problem that the staff were not 'authorized' to resolve.

The lobby was a vast expansive space, yet, the elevators were an enclosed metal box where sound resonated and bounced within the elevator walls. The "brand standards" level was way too loud for the tiny elevator, yet the "brand standards" specified strict adherence. No non-management employee would change it, even though it was potentially dangerous to hotel guest and staff hearing. In this instance, the front desk staff were adamant that the audio levels were correct because the knob at their station was set to "brand" standard, even though the live music was demonstrably louder than when the recorded lobby music played on non-live-performance days. The hotel staff believed the volume dial setting of their "brand standards," device over their own hearing, and would

not reduce the volume level because they believed that the level that the knob indicated on their control device was the correct "brand standards" level.

In this instance, the process and script (algorithm) for the hotel staff was set to a fixed number which could not be varied, yet was easily bypassed. Because of the rigid rules in place, the staff were restricted from varying the volume knob, yet the sound went well beyond the levels during live performances, violating the "brand standards." When the hotel front desk staff escalated the issue to their management, the manager, who was the only one with authority to lower the volume, did so, only slightly, and extremely reluctantly, while insisting that guests were violating the Aloft "brand standards" with their requests.

Algorithm Contexts

The former case is an example of how organizations are embedding algorithms into the practice of delivering goods and services. Although organizations have always had policies and practices and some sense of brand, the nature of these policies has shifted largely from a focus on outcomes relying on the set of skills and knowledge available, to a focus on processes that embed skills and knowledge within those processes.

In programming terms, this would be akin from a shift from a functional, declarative or object based design to pure procedural design, a move most programmers would classify as a step (or three) backwards.

The problem of the audio level being too loud was never solved at the Aloft hotel., The skill and knowledge of staff were not useful in the scenario, because they lacked the agency (power of choice) to adjust to circumstances. Their only recourse was to simply withdraw, making the problem an external one to the running of the hotel. Thus, the knob continued to conform to the "brand standards," while the audio level on live music nights continued not to. Algorithmic procedural conformance is not new. On a mass level this was first seen at the dawn of the Industrial Revolution in the late 1700s, when work shifted largely from small workshops and homes to factories with large powered machinery. People had to adapt to the machines, which themselves followed a kind of algorithm, but performance was mostly measured and evaluated with respect to outcomes, and the algorithm of the machines was rapidly adapted to improve outcomes.

The shift to optimizing processes over outcomes is relatively new, at least when this optimization bypasses consideration of outcomes. As robotics and the Internet of Things (IoT) become more common in the workplace, we can expect either a return to a focus on outcomes where processes, now embedded back in machines, will be optimized for outcomes, or continue to embed the workforce within processes that now include robots. We think that initially, we will find the latter, but it is likely that as robotics develop and become more social and cooperative, that the conception of algorithms will once again shift towards encapsulation and emphasis on outcomes—otherwise the working environment will be too brittle for robots to function. People may be able to adapt to becoming the homunculus in the machine, by constraining their agency to adapt to appearing to follow a rigid algorithm deployed within a heterogenous context, but robotics within the horizon of current development cannot—robots require more scope for adaptation to external conditions.

The Starwood Hotels and Resorts Worldwide
Aloft Hotels Case Study: Robot Replacements for Hotel Intralogicstics

While "brand standards" are the scripts and processes that run the Aloft hotels as an algorithm, with people providing the "glue," the Starwood Aloft Hotel brand is taking this a step further at some of their properties by deploying the Savioke Relay, a "service robot designed for the hospitality industry" that enables guests to "request items from the front desk" and have them "delivered by a robot" [7]. The Relay has been rebranded for Aloft hotels as "Botlr." Aloft has deployed three Botlrs, one in their Cupertino, CA, location and one in their Silicon Valley location. A third Botlr, travels the world, attending hotel openings as a PR mascot.

The Botlr robot is "approximately 3 feet tall, weighs less than 100 lbs., has a carrying capacity of 2 cubic feet, and is designed to travel at a human walking pace. It can even travel independently between floors via the hotel

elevator" [7]. The Botlr uses the phone to call the guest room when it is outside the door, so guests can open the door and receive their deliveries.

Botlr solves the "intralogistics" problem within hotels [8]. This is the labor of delivering small items to guest rooms at any hour. This need is hard to project and forecast for staffing humans, because guest needs are random and unpredictable. What is predictable is that there will be someone on the front desk and bell desk (for now), and that people will need things at random times delivered to their room.

Discussion

Botlr does replace people from doing a job in one sense, but removes them from a task that overloads their "lean" schedule in another. A human still must assist the process by loading requested items into Botlr, but is spared from leaving their post to go further into the hotel to attend to guest requests.

In some ways, Botlr could be considered an assistive tool (in the form of a service robot) for workers in the Aloft hotels that deploy them. The work of front desk and bell desk staff tasks are reduced, as they are no longer called off the floor for many errands to individual rooms, and they are able to concentrate on other tasks that only they as humans can do (for now). Some people who have received items from Botlr, have been relieved at not having to interact with a person after a day of travel, and are spared having to tip a person for each delivery [8]. However, when the interaction of guests to hotel staff (and vice versa) is reduced, as with Aloft's Botlr and "brand standards," the opportunity to add a "human touch" to the relationship between the guest and the Aloft hotel brand, changes. The substitution for this "human touch" becomes what Botlr is able to convey in combination with the standardization that the Aloft "brand standards" provide. Thus, the Aloft hotel can carefully control guest perception of its brand though the automation of tasks that formerly required human agency to complete.
On a broader scale, this strategy reduces workers' roles to supporting the algorithms (in the form of processes, scripts and robots) rather than infusing the "brand relationship" with their own personalities or character, and further, limits their ability to help guests with requests outside those that are pre-scripted [1][3][4].

Conclusion

While the Aloft San Francisco Airport Hotel scenario is an example of a workplace algorithm, it is easy to extrapolate it to a context where any sort of override would be impossible. This scenario is not unique. In many workplaces, scripted requirements are incompatible with real world situations and workers are often unable, due to strict requirements of their workplaces or jobs, to do much about it other than escalate issues further up the chain. Furthermore, when a robot is introduced into the workflow alongside humans, the adaptation changes the way that the workplace's products and/or brands are perceived by customers.

In order to have successful cooperation with algorithms in the workplace, those in charge of creating the workplace rules, scripts and processes must be willing to allow for those rules to be adapted and changed. In short, workers must be trusted to act autonomously, or at least semi-autonomously on behalf of their organizations, to enable successful completion of tasks, customer service engagement or workflows. At the moment, trust is misplaced, directed towards those scripts, processes and algorithms, with management and those in-charge, assuming the automation is trustworthy and secure [3]. In this scenario, customers and colleagues suffer as process, scripts, and algorithms are given absolute authority in all situations.

Shifting trust back to humans (at least for the time being), as part of a management strategy, will enable people to made decisions in real time from more options than machines or pre-scripted processes are capable of. While it seems that automation is cost efficient, the aggregate time and labor it takes to escalate minor requests (such as the example of the hotel lobby volume) could be a source of inefficiency, waste and lack of cooperation in organizations. Trust gives people the agency to create a sensible environment in their workplace with real-time solutions that may not have been able to be scripted in each instance of work. At the moment, it seems that the balance has defaulted to trust in the machines and processes (likely a result of the quantification trend) with little remaining faith in those actually making the processes work at all. Because processes, scripts, and algorithms are

enacted by management, those same people must be convinced to have more trust in their workers to solve problem and cooperate with their customers and colleagues.

With respect to expert systems, "... the knowledge base is created, selected and pruned by humans and consists of human expert judgements. This is also true of information supplied to the expert system … it is assumed that the human can answer the questions asked by the expert system appropriately and correctly. So in many ways the success of contemporary expert systems is a sleight of hand; all the human interaction in the process is taken for granted" [9].

References

1. Applin, Sally A. and Michael D. Fischer, 'New Technologies and Mixed-Use Convergence: How Humans and Algorithms are Adapting to Each Other', in IEEE International Symposium on Technology and Society (ISTAS'15), Dublin, IR, Nov. 11, 2015.

2. Searle, John R. "Minds, brains, and programs." Behavioral and brain sciences 3, no. 03 (1980): 417-424.

3. Applin, Sally A., and Michael D. Fischer. "Watching Me, Watching You.(Process surveillance and agency in the workplace)." In Technology and Society (ISTAS), 2013 IEEE International Symposium on, pp. 268-275. IEEE, 2013.

4. Applin, Sally A. and Michael D. Fischer, 'Cooperation between humans and robots: applied agency in autonomous processes', in 10th ACM/IEEE International Conference on Human/Robot Interaction,The Emerging Policy and Ethics of Human Robot Interaction workshop, Portland, OR, 2015. [Online]. Available: http://www.openroboethics.org/hri15/wp-content/uploads/2015/02/Af-Applin_Fischer.pdf [Accessed: 31-May- 2015].

5. Shadbolt, Nigel R., Daniel A. Smith, Elena Simperl, Max Van Kleek, Yang Yang, and Wendy Hall. "Towards a classification framework for social machines." In Proceedings of the 22nd international conference on World Wide Web companion, pp. 905-912. International World Wide Web Conferences Steering Committee, 2013.

6. Applin, Sally A., and Michael D. Fischer. "Asynchronous adaptations to complex social interactions." *Technology and Society Magazine, IEEE* 32, no. 4 (2013): 35-44.

7. Cousins, Steve. "Your Robot Butler Has Arrived." (2014). [Online.] Available from: http://www.savioke.com/blog/2014/8/11/your-robot-butler-has-arrived Accessed: 20-Feb-2016.
8. Goel, Sakshi. "Reimagining Intralogistics with Savioke." (2016). [Online.] Available from: https://medium.com/@sakshigoel/reimagining-intralogistics-with-savioke-d70ce12cbd9e#.l91i9o8mq Accessed: 20-Feb-2016.

9. Fischer, Michael D. "Expert systems and anthropological analysis." *Bulletin of Information on Computing and Anthropology* 4 (1985): 6-14.