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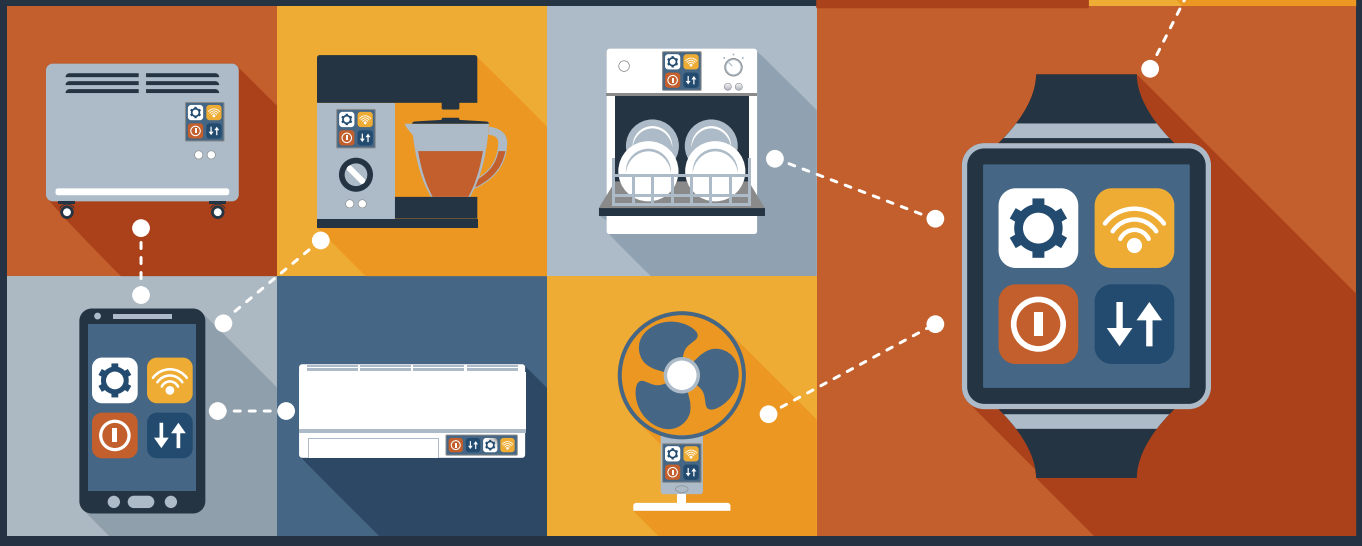
Rise of the Machine Culture



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Rise of the Machine Culture

By K. Williams

When is the last time you had a conversation with a real flesh and blood human? It seems that many of todays' conversations are occurring between people and machines. Try to conduct any business in virtually any place on the planet and part of that conversation will inevitably be with a machine. As much as the technologists try to make the machine sound like a human, you are not fooled (at least not most of the time)! Machines ("devices" and "machines" are used interchangeably) are expanding at an alarming rate! As this expansion progresses, we humans are sometimes displaced. The machine–assisted office phone menu system has virtually uprooted the job of the office receptionist. By the time you have completed your conversation with the machine that interprets and acts on your vocal responses on the phone, you have either completed your business or you are being transferred to a real human to finish up the details of your respective transaction. These machines free up the people to perform functions in the company that are core to the business and leaves the more common and repeatable functions to the machines to handle. In essence, the machines simplify the lives of the people in businesses (and even homes). Customers of the businesses may not the same level of affection for the machines as do the businesses!

Importance of Machines

While the machines described so far have lots of functional capabilities, they are not considered intelligent machines. That label is reserved more for the class of machines that perform key functions as well as communicate over the various media. They are outfitted with special sensors and actuators to determine the conditions under which the machines will exercise certain functions. For example, a *sensor* is a device that is especially tuned to detect the presence or occurrence of something specific in the environment. When there are harmful amounts of gasses (e.g. Carbon Monoxide or cigarette smoke) in the air, a gas sensor records this information and conveys it to a small computer that makes a call or sends a text message to the appropriate person or emergency response organization. An *actuator* is a device that exercises control within the environment. For example, the computer that received the gas alert

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can issue commands to an electronic gas line valve control and close the pipe to stop the leakage. This is a very simplistic example of how machines can work independently of humans to get something (useful) accomplished. This example does not obviate the need for human beings. It does, however, point to an essential issue that takes high precedence in the grand scheme of things: time to respond.

In the above example, if the entire scenario depended on human intervention alone, a person would need to be present to detect the leaking gas, calls or messaging would have to occur in order to dispatch the appropriate professionals to the site where the leak could be repaired.

That night, on the 11 o'clock news, the "breaking news" story might have been "Building explodes due to gas leak"! So, machines, of the "smart" variety, have value as well.

We Had No Idea!

As technology continues to advance, machines are given greater functionality and greater responsibilities in our everyday lives. As an experiment, quickly say out loud the number of internet connected devices in your home! Now, go and physically touch them and count the number. You will find out something about yourself and about your reliance on machines. Most people blurt out numbers of five or less as their response to the first question. After the second part of the experiment, many are shocked at the number of devices they are able to count. Okay. Let's take a tally. For a typical family of four, the device profile may look something like the following:

- Two cable/satellite/fiber boxes
- One network router
- Two smart televisions
- Four cellular phones
- Two gaming consoles (Xbox, PS2 or Wii)
- Two portable gaming platforms (DS or PSP)
- Three desktop/laptop computers
- Three tablet devices (iPad or Android)
- One network printer

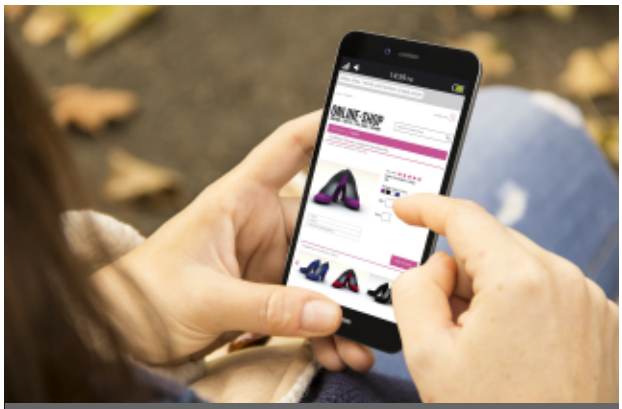
Without trying really hard, most households could easily land in the range of 18 to 24 internet capable devices. Just to be on the safe side, let's say on average, each person in the household contributes to 4 internet connected devices. Please note that many new devices such as the Nest climate controller, network storage appliance, home alarm monitoring systems and a plethora of smart kitchen and laundry appliances were omitted from the count. Given the fact that there are (according the U.S. Census Bureau) about 130 million households in the U.S. and about 305 million people. According to 2014 Census data, the U.S. population is roughly 86% connected to the internet. That means that about 260 million people in the U.S. are routinely on the internet in some form or fashion. If we apply the 4 connected devices per person rule, then the number of internet connected devices exceeds the 1 billion mark. Consider this example represents the U.S. population only. The world is home to some 7.8 billion people. According to the International Telecommunications Union (ITU) in 2013, the world's population was roughly 40% connected to the internet. Assuming that the rest of the world households may not exhibit the same profile as the U.S. households, let's (for grins) keep the same 4 devices per person as the standard and perform the same calculation:

- World Population = 7.8 Billion
- Percentage of Internet Connected People = 40%
- Devices Per Person = 4
- So, World Population
  + Percentage of Internet Connected People
  + Devices Per Person
  = Number of Internet Connected Devices
- The result is: Number of Internet Connected Devices
  = 12.5 Billion Devices

So, that new catchphrase "Internet of Things (IoT)", well, there you go! By

doing the math, we quickly showed that the number of internet capable machines far exceeds the number of people on the planet. The growth rate of these devices continues to expand at an alarming rate. In fact, the rapid expansion of devices helped to quickly exhaust the internet address space!

These are not your ordinary class of machines; they are constantly on and constantly online chatting it up with their fellow machines. The terms Telematics and Machine-to-Machine (M2M) arose from the reality that machines are working on our collective behalf in nearly every facet of our lives. Telematics, M2M and IoT are terms that define an emerging culture of machines that continuously affects our lives in ways that pushes human-driven functions into the automation realm, disrupts the manner in which business is conducted and causes us to rethink how our lives are managed by the machines.



Unlike the human-assisted machines such as the fax or the printer, where the human directs the machine to perform actions such as send the fax or print the document, machines with an internet presence learn from what they observe.

The Internet of People Things

The internet provides a means of global communications and serves as a great equalizer for new businesses to appear big and powerful, even if they are mere start-ups. The internet addressing structure provided enough space to allow 4 billion people to participate in this environment. Based on the previous math exercise, we showed that four billion addresses were good enough to provide for a little more than half of the Earth's population. That was fine when the network was accessible through rudimentary command line interfaces that were friendly to scientists. When the first internet browser (called Mosaic) emerged, the internet transformed into the internet of People. As the number of people interested in living online increased, the internet Protocol Version 4 (IPv4) address space reached saturation. The IPv4 address space represented the entire space for the internet. That led to the creation of the newer IPv6 which introduced a new way to count! You know how as children we used to make up nonsensical terms to represent big values, like "bazillion"? Well, here is a term that is not nonsensical but sounds just as horrific; "340 undecillion". What does it mean? That is an excellent question! It is the equivalent of 2^{128} or 10^{38}. Okay, that is a lot of (as compared to the IPv4's 2^{32}) internet! That means we can fit a little over 7.8 x 10^{28} IPv4 internets into the single IPv6 internet. So what does all this mean? For the foreseeable future, the emerging IoT market does not seem to pose a credible threat of exhausting the IPv6 addressable internet!

Now that we have established that the problems with the internet address space is sufficiently adequate to accommodate all of the machines, the world of internet machines can thrive. This means that interactions in human space will be reflected in machine space, in ways we never thought possible. That is how the internet retailers know when you are interested in a new car. If you have doubts, visit (as an example) the Amazon website and click on a product. Now, surf over to Facebook and you may see something interesting. The products you searched on at Amazon are being served up to you in the form of ads on your Facebook page, Coincidence, you ask? Hardly! This is the result of a new branch of data science called "machine learning". Machine learning is the modern equivalent of the 1970's artificial intelligence. Yes. The machines are talking and they are talking about us! They are

The machines are listening and they are talking. While people have conversations each day, only those people in close proximity can hear their conversations. In an electronic world, however, it is very likely that emails sent through a service provider are being mined and used to pitch products and services to you in addition to developing profiles about your behaviors and habits.

figuring out our travel, buying and recreational habits and they make suggestions that are in alignment with our respective lifestyles. Unlike the human-assisted machines such as the fax or the printer, where the human directs the machine to perform actions such as send the fax or print the document, machines with an internet presence learn from what they observe (sense) and work autonomously to make the appropriate adjustments (actuate) to yield favorable outcomes (for at least some of the involved parties)! These low-level M2M interactions will continue to occur and the volume of data exchanges is expected to rise as more sophisticated functionality is embodied within the machines.

From Utility to Futility

What's that? You don't wish to participate? Sorry human; "Resistance is futile. You will be assimilated"! Yes. The fantasy of Star Trek has become a reality for us poor Earthlings. If any aspect of your life touches the Internet, you are in the game. The standing rule when you join a game is to first identify the chump. If you cannot determine the identity of the chump, then you are the chump! As humans, we have to develop our knowledge about the IoT because there are true benefits if we are aware of how to harness them. Otherwise, the machines can become our downfall.

Do you want to know where members of your family are at all times? Enable an option in your cellular account, pay a few dollars and all of your family members show up on a map with their movements tracked in real-time. Do you want to track a recent order from an online retailer? This is a great example of the value of machines. I ordered a product recently from Best Buy. Within 30 seconds, an email showed up indicating the order was received. Within the next 30 minutes, another email arrived indicating that the order had been packed up and prepared for shipping. It provided the shipping company. In this particular case, it was United Parcel Service (UPS). In about hour, a text from UPS arrived saying that a shipping label had been prepared for the parcel. These automated updates kept occurring until the package was dropped at my front door. A text showed up to that effect. This was all the work of machines. As the parcel made its way from the merchant to my house, machines accounted for its location and the responsible parties.

Major Issues Wage Against the Machine

Earlier, we talked about machines displacing people for certain types of jobs. At the same time, there are thousands of jobs available but few people to fill them. So, the new reality is that as more functionality is manifest in the world of IoT, the job market will demand more technically savvy personnel as opposed to non-technical people. The drive to create more efficiency and to learn more interesting facts demands the development of more capable machines. This reality will have a profound effect on numerous existing career fields. As a positive fact, however, the IoT market will define new and exciting career fields over time.

Privacy and Profiling

The machines are listening and they are talking. While people have conversations each day, only those people in close proximity can hear their conversations. In an electronic

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Next Q: The Internet of Everything

The term used to describe the proliferation of smart, linked products – and the new opportunities therein. Beyond the connectivity of the internet is the change in nature of products, services, communications etc. In other words, internet of things will forever alter the competitive landscape, creating a revolution with far-reaching strategic and operational implications. Is your business prepared?

world, however, it is very likely that emails sent through a service provider are being mined and used to pitch products and services to you in addition to developing profiles about your behaviors and habits. How does this happen? Take a trip to the grocery store of your choice. When you step up to the counter to check out, you present your "grocery store card" followed by your payment. Everything you just bought was recorded, assigned to your account and to your method of payment. Each time you follow this pattern with this grocery store, a behavioral model of you emerges and is refined over time. You, perhaps, like to shop on Thursdays and your diet consists of fruit and dairy products. You spend an average of $100 per visit and you always pay for your purchases with your Bank-X debit card. By the way, when you registered for your grocery store card some time ago, you provided your email address. When you get around to checking your email messages later, you discover coupons for new dairy products that are redeemable only at your grocery store. Does this scenario sound familiar? It should. It happens to all of us each time we perform transactions of any type. From the grocery store perspective, this entire series of events occurs with no human touches.

Summary

The world is rapidly changing from a people-driven to a machine driven model. The machine is the new "man". We, as humans are relegated to feeding the machine so that it continues to collect and calculate new insights about us all so that we can be exploited more efficiently by businesses. Machines talk funny. They talk in 1s and 0s but the content called in those codes reveals all kinds of information about us, our habits and our life goals. We pass by machines all the time without giving it a thought. Never mind that the cell phone in your pocket just revealed your presence at the local pharmacy and you lingered for five minutes in front of the pregnancy testing kits. As you approach the cashier, your phone buzzes and you get a text message with a coupon for 25% off diapers and baby formula. Our cars, phones and grocery store checkout lanes are data collection centers that perform other functions like driving, talking and buying food, respectively. The world in which we live now performs the advertised function as a secondary function and data collection and manipulation as a primary function.

As kids, when friends made noteworthy achievements, we would say to them, "You the man!" In a parallel and machine dominated world, I can imagine internet devices achieving some computational goal and all of the other devices say in unison, "You the Machine"! I would also imagine that if the conversation were made audible, it would sound much like two fax machines during a call initiation!