DIGITAL TRANSFORMATION - TREASURE AND WEALTH FROM DIGITAL DUST AND SMART DUST

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Introduction

People of wisdom proverbially taught us that lots can be done by a stem of grass at the time of need if safely preserved. That stem of grass metaphorically signifies anything which prima facie appears to be trifling. They wanted us to be more cautious, vigilant and apply providential judgement before rejecting or accepting anything. Their advice was to follow this rule even for anything that is ranked as trivial in common parlance.

A goldsmith knows this better than any other professional because of being mindful that his work process generates tiny gold particles which get mixed up with volumes of other unwanted particles. He never uses a traditional broom to sweep his workshop and throws the gathered dust. Instead, he uses a specially crafted brush and preserves gatherings in a container. The art and science of extracting gold from dust has been passed on to him through generations which he has further upgraded.

Why this rule should be different in this era of hyper social media activism and neck breaking speed of contents creations by all and sundry, when data is called the new gold mine? An experiment to prove that different types of digital dusts (DDs) are gathered by open digital objects can be performed by a simple task. Let an account in Facebook, LinkedIn, Instagram, or Twitter be opened by anybody with minimum and mandatory information and left for some days as it is. One would most certainly find that many unwanted information, notices, advice, contents, etc. have been thrown at that account. Infliction of such digital dusts would be more if that person has an account in more than one media or Applications (App) under control of the same digital giant as Google for Gmail and YouTube.

Business entities mostly gather varieties of DDs thrown at them by customers and other stakeholders. Most of those are sought for and welcomed, and even if not, efforts are made to make meaning out of those. This is because, as readers would further read in following paragraphs, refined DDs help getting business intelligence, formulating business strategies, and generating income in a digitally transformed operating environment like that goldsmith getting gold from shopfloor dusts.

Smart Dusts (SDs) on the other hand are self-inserted digital dusts which are used for enhancing multiplicity of applications and effectiveness of certain digital devices and platforms. SDs are also enablers for gathering DDs. More have been explained about these in some of the following segments.

Objective

Digital dusts are of hardly any value for an individual user of

computing devices and smart digital devices like mobile phones. Marie Kondo[1], a tidying expert and a bestselling author suggests *"…… getting rid of things that don't spark joy, consider what a good old fashioned spring cleaning might do for your digital life and mental health. We'd suggest focusing on three areas: social media, apps, and notifications."* But such an axiomatic advice does not hold good for business organisations. Accordingly, this article aims to achieve two simple objectives, viz., bring more clarity in conceptual understanding of digital dusts and smart dusts, and know more about their meaningful use by business entities. Efforts have been made to generate some ideas for wider utilisation of digital dusts to generate economically meaningful results.

Digital Dusts and Smart Dusts - Definitions

Oxford dictionary has defined 'dust' as *"Any material in the form of tiny particles"* and the word 'digital' as *"Relating to, using, or storing data or information in the form of digital signals."* Before combining these two it will be useful to know what is meant by the world 'digitise'. Again, Oxford dictionary defined the same as *"Convert pictures, text or sound into a digital form that can be processed by a computer."*

If these three definitions are combined one can simply define digital dusts as digitised texts, sounds, images, or documents that were used in some transaction, auto captured/inserted due to some one's footfall in an entity's website, which are not purged-off and allowed to snowball. One simple example of DDs is the set of personal details provided by job seekers when they visit a company's website, click the 'Career' Tab, and punch in minimum personal information for which the company provided slots.

Incidentally, the very first Tab on the landing page of Infosys https://www.infosys.com/ is 'Careers'. Almost every large company provides such a Tab to collect digital dust, irrespective of their nature of products and services. Like a gold smith these companies have some objectives to serve from such DDs and derive benefits by way of reduced expenditure for hunting before talent acquisition.

Smart Dusts are technically called as Micro Electro Mechanical Systems (MEMS). These items, as tiny as one grain of coarse salt, are fitted with sensors to detect light, sound, temperature, magnetism, chemicals, and vibrations. Eminent digital influencer Bernard Marr[2] writes, *"With an incredible amount of power packed into its small size, MEMSs combine sensing, an autonomous power supply, computing and wireless communication in a space that is typically only a few millimetres in volume. With such a small size, these devices can stay suspended in an environment just like a particle of dust. ….. The potential of smart dust to collect information about any environment in incredible detail could impact plenty of things in a variety of industries from safety to compliance to productivity."*

Challenges for innovating and manufacturing such tiny MEMS by using traditional processes are avoided by using 3D Printers. Thus, optical lenses required for incredibly powerful sensors become performance effective. Readers can know more about SDs from the quoted article of Bernard Marr[2].

The author has chosen the words 'Treasure' and 'Wealth', while coining the title of this article, to symbolically convey two different points. As per Oxford dictionary Treasure means *"a quantity precious metals, gems, or other valuable objects"* and Wealth means '*an abundance of valuable possessions or money*". This article aims to convey that smart dusts are certainly treasures because those generate enormous digital signals for process improving effectiveness, speed, cost optimisation and energy savings. Whereas digital dusts can be converted to treasure of business insights and help framing strategies that can contribute and enhance income and wealth of business entities.

Difference between Data and DD

Merriam webster dictionary has provided the following two definitions of data:

- ⊙ *"Information in digital form that can be transmitted or processed.*

- ⊙ *"Information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful"*

From the perspectives of data scientists and commercial organisations any data is nothing but a pile of digital dusts (bites) if those cannot be used as it is, or irrelevant, or contain redundant information. From the perspective of an individual user also unwanted and unusable data is nothing but digital dusts. However, computer scientists also have innovated ways and means for exacting treasure of information from DDs like a goldsmith extracts gold from shopfloor dusts.

Digital Dust to Internet of Behaviour

The author has written about applications of Internet of Things (IoTs) in his earlier two articles[3&4] on digital transformation of health care services and manufacturing operations. Readers will inter alia note that IoTs attached to a machine can observe its performance by reading throughputs, recognising noise, electricity consumed, idle time, etc. Those IoTs can also transmit such observations to a computing device as DDs which prima facie may not be of any use, albeit can pile up. However, if need be, engineers can put those DDs together, refine and process for further analyses. The digital gold that can be extracted is the machine's behaviour, which helps planning and initiating actions for maintenance and performance improvement.

The concept of 'Internet of Behaviour' (IoB) is the essence in the form of heuristic features of an user that can be extracted from DDs thrown by computers, smart phones, wearables like FitBits, Smart Watches etc. IoTs fitted to a patient's pillow can even study sleeping pattern and transmit information to the attending doctor's smartphone/computer. DDs thrown by such IoTs can be put together, refined, converted into useful data for further analyse and drawing inferences as IoBs.

Such DDs can be auto accessed by other Applications (Apps) with permission. Facebook and Instagram use software for analysing the psychological and behavioural characteristics of various pictures and videos posed by users, which are otherwise nothing but DDs for them. Inferences from all those help them to create IoBs of a user. This in turn lead them to decide and push through advertisements for products that are likely to be of interest to the concerned users.

Brian Burke, Research Vice President of Gartner in his paper on top strategic technology trends of 2021[5] commented that, *"IoB captures digital dust of people's lives. … Collecting data to influence behaviours has the potential to be a powerful tool, and its social reception might depend on just how heavy-handed*

organizations are with what they're trying to do. For example, while drivers may not object to having speed, breaking, and cornering tracked in exchange for lower insurance premiums, they might not be as receptive to law enforcement also being able to track that information. At the end of the day, the IoB must offer a mutual benefit to both parties or risk being rejected by consumers."

A user of a smart phone downloads and uses many Apps. Certain Apps are even pre-embedded. Many of such Apps can generate piles of unwanted bites, i. e., DDs. Some can access generations by other Apps like photographs, list of websites visited, health data, results of daily physical exercises, etc. Certain Apps concurrently work in coordination to process and generate out of such DDs meaningful data and/or pattern of the user's behaviour.

For example, IoTs fitted in a car can be connected to the Driver's smartphone and the computing system of insurance companies. These IoTs continuously generate and throws DDs to the driver's smart phone and insurance company's portal(s) indicating driver's style of driving, number of hard pressing of breaks, routes followed (in coordination with GPS App), etc. If need be, the insurance company can put those unstructured DDs into a process of data analytics to assess the degree of risks taken by the driver and determine premium on a daily basis, if the scheme opted contains such a term. Even in an unfortunate incident of accident such DDs can be gathered to derive help for investigating the causes and nature of actual incident which in turn would help ascertaining and speedy settlement of claims.

Digital Dusts for Business Intelligence

An example has been quoted above about the process by which DDs are converted to IoB and how marketing managers use those IoBs crafted by digital giants like Facebook and Google for pushing advertisements for target customers. The second quoted example is of employment related DDs inflicted by job seekers from which business entities hunts out treasure of talents.

Readers, with experience of shopping from eCommerce sites like that of Amazon, Flipkart, Zivame, etc. are aware that those players make best use of trends of past purchases and products spotted/reviewed by customers both at individual and different demographic groups levels. Essentially customers generate DDs while shopping at their websites which remain as floor dusts in their data storage systems. Those business entities welcome such dusts. There is an organisation by the name Digital Dust Agency https://digitaldustagency.com/?lang=en. Their service is to make best use of such DDs and derive business intelligence for their client companies which in turn helps framing strategic plans. They claim themselves as "…. a *boutique agency specialised in influencer marketing and content production for the social media world.*"

If a product is out of stock and not added to wish list for purchase, as one can do while on the website of www. amazon.in, that item is thrown up to the computer screen of the concerned shopper during her/his next visit. This is nothing but use of digital dust. eCommerce players also use 'Search Keys' which are used by customers at their website to check whether a particular item is available for shopping. These keys are not data in its true sense but DDs. Such search keys are processed for extracting useful data related to frequencies of use to get a sense of items which are wanted by customers. Such processed information is mapped against existing list of products to ascertain gaps, plan for contracting vendors, and intermediating sales in future. One therefore, can conclude that DDs are primary sources of business intelligence and thus collectively a source of treasure.

Let another example be considered which is a live experience of the author. At the outset permission is being solicited for writing this section in first person. The words I and me would mean the present author. Let me request readers to carefully look at the following picture, which is a screen shot of my laptop computer:
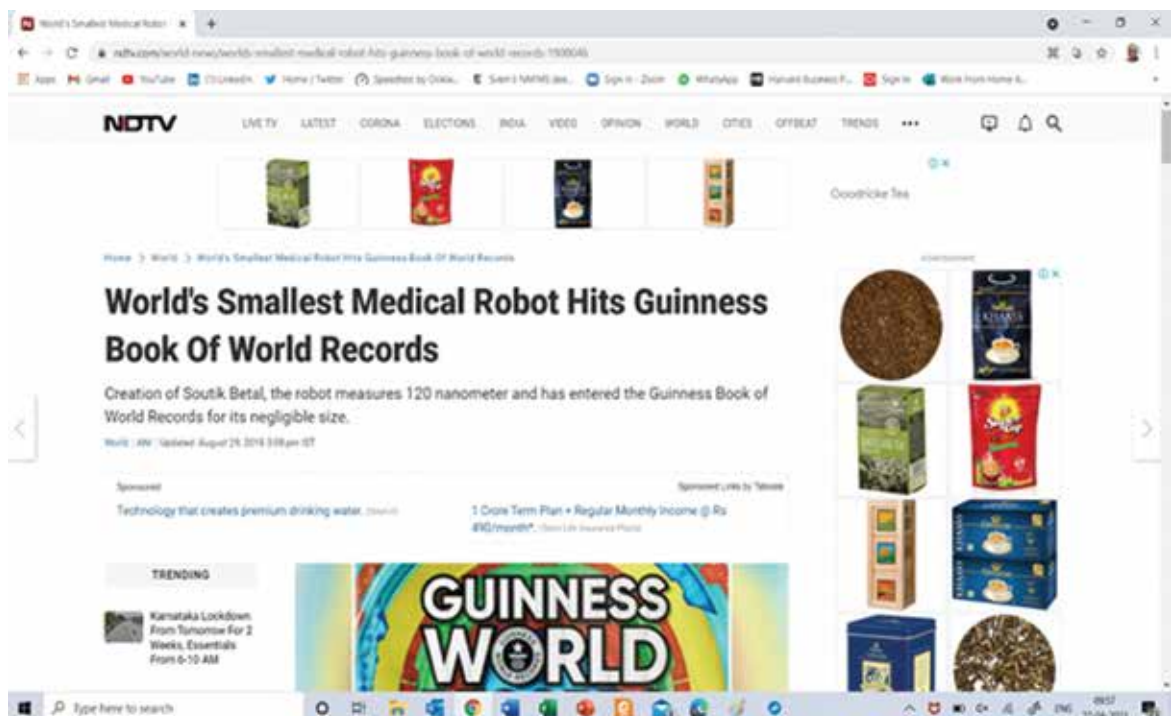
Let me narrate what it is all about. A few days ago, I was browsing through Google Chrome to confirm whether Soutik Betal's claim of creating the tiniest medical robot of the world is bearing with reality or not. Within nano split of a second certain digital dusts were thrown at my laptop covering circa 30% of screen space. Those pictures of coloured boxes are actually various options for buying tea thrown at me by Google perhaps by using an embedded software of Chrome.

Let me confess that just about a day before I bought a particular type of Darjeeling leaf tea from the eCommerce website of a tea garden company. Other products of the same company have been thrown as displays for alluring me to buy. This is a standard practice followed by many consumer goods selling companies, including wearing apparels, etc. Probably Google has contractually done this under a commercial contract with that company. This revenue generation model may be based on collaborative digital transformation of the trio, viz., Google, that tea company and the news service provider. That tea company is using such digital dusts for marketing campaign and revenue generation.

As if this is not enough, readers may notice that Google has given a short text-based link for a news item about lockdown in Karnataka due to the second wave of Covid-19 Pandemic, which is a DD for me. This is because I read eNews using Apps on my Apple phone. The driving motive is, if I click to read that news item, there will be another digital footfall, which will again give Google an opportunity to push some other advertisements based on my behaviour of browsing. Thus, more the footfall more the revenue for Google.

Applications of Smart Dust

Smart Dusts, as have been defined above, are pre-programmed MicroElectroMechanical Systems and fall in the field of nano technology. These are also called Motes because of their minuscule size and insignificant weight. They can work without any human mediation.

SDs are used while designing any IT oriented device/component and connected with remote computing system for receiving signals. However, some designers are sceptical about their applications because such powerful objects if fall in the hands of people with ulterior motives, probabilities of data infringement cannot be ruled out.

Because of being tiny, it is also a challenge while making a device with perfection, and thereafter to detect and retrieve after they are deployed.

Readers may know more about another type of SDs called Internet of Body (IoB) in the author's article[5] on digital transformation of health care services. Such tiny IoBs are planted into a patient's body or swallowed by her/him with water. These tiny objects emit signals about physical conditions of nearby organs which facilitates diagnosis, radiography, robotic surgery and administering internal medicines. Swallowed IoBs dissolves after a defined time span.

Readers may hold their breath before reading that a smart dust can be a robot also. Dr. Soutik Betal[6] an Indian Bengali student of the University of Texas "… *has built the world's smallest medical robot that cannot be seen with the human eye ….. the robot measures 120 nano meter ….. The robot is basically a series of nano-composite particles of multi-functional oxide materials that can be remotely controlled by an electromagnetic field"*. The author had the benefit of speaking to Dr. Betal, presently a faculty member of IIT Delhi, on this during a personal conversation. This tiny robot would be of great help in diagnosis administering medicines to human cells in conditions such as cancer and Alzheimer's because it can interact with biological cells.

SDs are used for designing solutions for digital transformation in various fields. Certain global companies like Beta Batt, Defendec, and Cube Wacs have designed and marketed various products using SDs in the fields of medical diagnostic and treatment, agriculture, manufacturing and inventory management, defence, multi-modal travel safety and security, etc. Large corporations, viz., Cargill, General Electric, Cisco Systems, and IBM have staked substantial investments for conducting research on SDs. Many of which are at different stages of conceptualization to proof of concept. Readers can know more about all these from the paper of Dr. Priyom Bose.[7]

Conclusion

The author dared to write on Digital Dusts and Smart Dusts because knowledge of digital transformation remains incomplete without having some structured inputs about these two. Existence of the former type of dusts are knowingly or unknowingly being experienced by all users of internet. Objective of this article

will be served if readers become more mindful about DDs and to the extent possible avoid leaving digital footprints in websites they visit. One can also be more conscious of better housekeeping as advised by Marie Kondo[1]. This would help improving speed and quality of performance of any computing/handheld device and reduce chances of unethical infringements by other Apps and cybercriminals for extracting data and DDs.

Going forward many readers will have to use IoTs fitted with SDs. Some may be already using those. Knowledge about SDs would help better understanding about the products, and effectively use in compliance with the safety and security measures as advised by product vendors in users' manual.

This article would be better read if taken in similar lines of Socratic method of learning, the objective of which is to foster critical thinking. It may not be considered as reasonably complete in terms of knowledge content. Answers for questions remaining open may be hunted out for more application-oriented knowledge and critical thinking for innovative value creation. **MA**

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