

Practicing Business AI in 2020s with Applications to Manufacturing

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Business AI in 2020s in 10 Points

1. Impressive Performance of AI Applications

- The **primary enablers** for the current AI renaissance are important algorithmic breakthroughs in **data-centric machine self-learning** algorithms that led to impressive performance in a variety of applications, including:
 - **Medical image interpretation**
 - **Natural language agents**
 - **Customer churn prediction**
 - **Fraud detection**
 - **Books, music and movies recommendations,**
 - **Face recognition.**

2. Current AI Applications are Primarily Point Solutions (Narrow AI)

1. They address **limited scope of the user's daily workflow**:
e.g.:
 - **Face recognition for safe city professionals**
 - **EKG interpretation for medical doctors**
2. They are typically closed **black-box** solutions with minimal user interaction
3. **Example**: Clearly a physician's workflow includes many other decision-making tasks before and after an EKG step (see "**Disease Labeling via Machine Learning is NOT quite the same as Medical Diagnosis** "
<https://arxiv.org/ftp/arxiv/papers/1909/1909.03470.pdf>

3.1 AI Solutions Covering Broad Workflows Generate Higher Value (1)

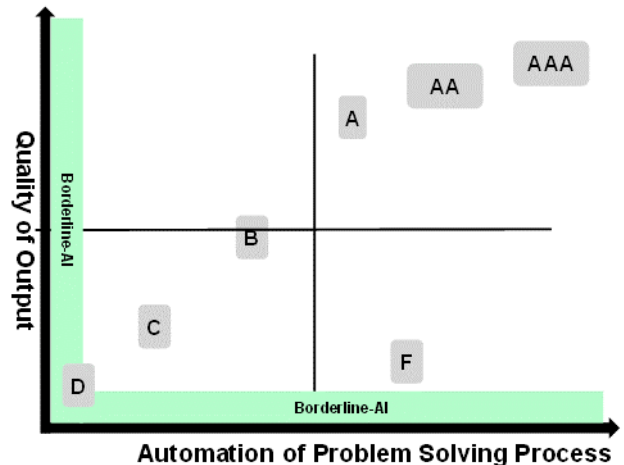
The goal of Business software is clear: **maximize value** in terms of business results.

Business value is primarily derived from two sources:

- **Level of Intelligence (Output Quality):** high quality solutions to problem solving and decision-making challenges
- **Level of Automation:** reducing human involvement in the workflow
- **See my article introducing AIQ:**

<https://arxiv.org/ftp/arxiv/papers/1808/1808.03454.pdf>

Figure 1: AI Quadrant



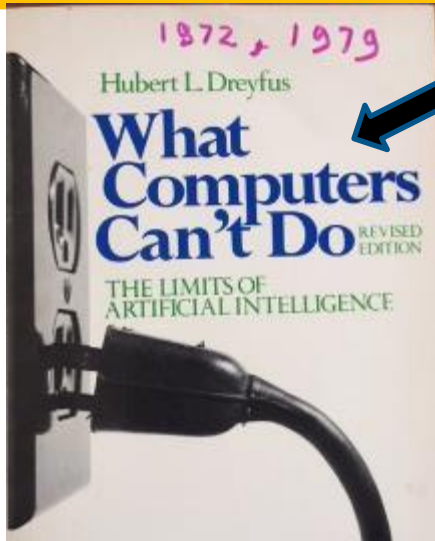
Takeaway Chart:

3.2 AI Solutions Covering Broad Workflows Generate Higher Value

As computer intelligence level increases,

- (a) Dependence on user's skills, domain knowledge and experience decreases
- (b) User-AI team produces better decisions than any one of them individually
- (c) User spends less time on mundane tasks, and gets faster what he needs to do on his job
- (d) Overall productivity goes up for both the user and the resources he manages- while error rates go down

3.3 What Computers Can/Cannot Do- IS THE WRONG QUESTION



This is the wrong question

It's NOT about whether machine can become smarter than human or not. The **focus** should be on building software that enables a man-machine team **to perform faster and better than any one of them individually**

Business AI is all about the **VALUE** it generates!

4. Question: So, why is it that most current (2019) AI solutions are point solutions?

Answer (partial):

1. Because the trend today is to rely primarily on data-only, no human touch, fully self-learning
2. Unfortunately, broad business workflows require deeper domain knowledge and problem-solving algorithms and lend themselves to 'User in the loop'.
3. Many in today's AI world believe that integrating human knowledge is almost 'taboo' and most of today's AI professionals do not know how to do this, see my article on: “[Wikipedia for Smart Machines and Double Deep Learning](https://arxiv.org/ftp/arxiv/papers/1711/1711.06517.pdf)”, <https://arxiv.org/ftp/arxiv/papers/1711/1711.06517.pdf>
4. This may sound easy to fix, but you first need to have AI as a State of Mind

5.1 Watch a demo, and you can diagnose whether the developers had an AI State of Mind

1. If during a demo you keep hearing: “At this point, the user navigates to, ..., the user may now request a dashboard for __, ... the user,...the user, ...” -meaning that the user guides the problem solving dialogue with the software, you know you are watching a traditional data processing software with minimal intelligence.
2. As you hear more about **proactive involvement of the software in the problem-solving dialogue with automatic solution of large chunks of decision problems**, you know that AI is in place.

Let's look at a **product from Plataine that was developed with AI State of Mind,...**

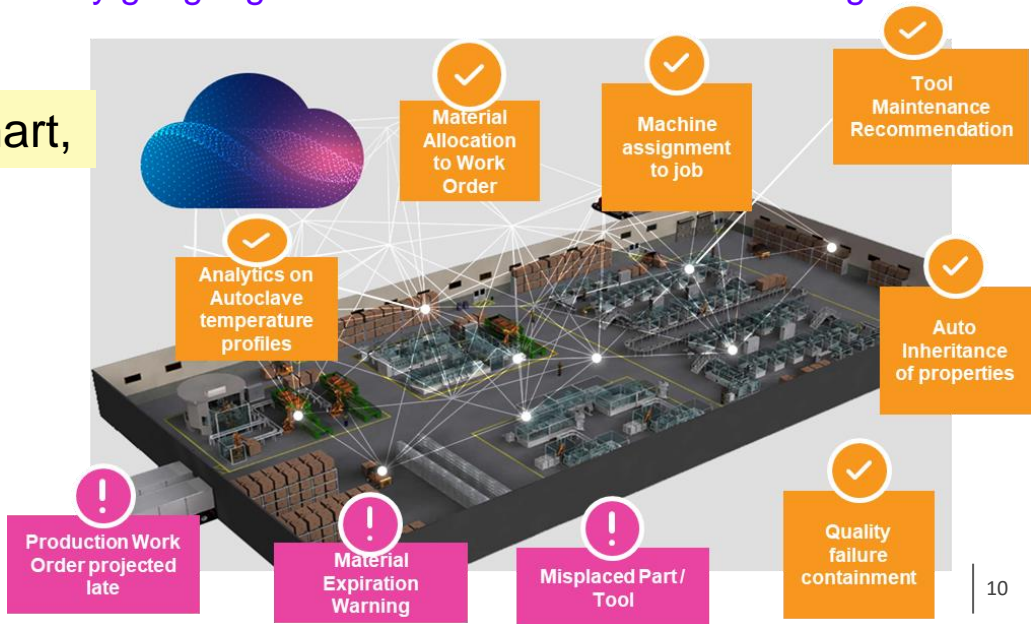
5.2 Watch a demo, and you can diagnose whether the developers has an AI State of Mind (2)

AI State of mind in the development of:

A Fully Connected, Intelligent, Digital Factory (Plataine)

<https://www.wired.com/story/google-glass-is-backnow-with-artificial-intelligence/>

See text next chart,



6.1 AI State of Mind for the Fully Connected, Intelligent, Digital Factory (Plataine) (3)

“...**Wired Magazine (September 2018)** reports a story where existing intelligent digital assistants for factory floor decision-making by **Plataine** are integrated with the current version of Google Glass and its Dialogflow voice-interface service, <https://www.wired.com/story/google-glass-is-backnow-with-artificial-intelligence/>. **Here is a sample dialogue with an AI State of Mind Software starting with the software initiating into the user’s earphone:** “We have just been informed that composite material Roll A784 is defected. We manufactured the following 15 kits from this roll (displayed on Glass) which we now need to remake. The specific rolls to pull from the storage room are also included taking into consideration expiration dates and remnants length. Upon your approval I will also automatically produce the nesting, cutting, and assembly plan”. The user may just say:” OK” to approve as is, or may modify the plan after some what-if simulations.

See point #9 below as to the HOW an AI solution achieves such performance

Value: Managing the situation with close to optimal decisions is done in **minutes not hours.** (see next chart)

6.2 AI State of Mind: Business Value with a Fully Connected, Intelligent, Digital Factory (Plataine) (3)

The Business Value

- **Speed:** Managing the situation with close to optimal decisions is done in **minutes not hours.**
- **Quality of business decisions** is improved
- **Level of automation** is higher leading to
- **overall higher productivity and business results,**
- **taking the AI product's intelligence score to AAA** on the AI Quadrant

6.3 AI State of Mind: Business Value- With IoT and AI, Your Manufacturing will Run on Steroids

With AI as your State of Mind, your supply chain and internal execution function **run on steroids with top quality decisions and minimum errors.**

Combine AI and IoT, and your **MOM (Manufacturing Operations Management) reaches the **ultimate Industry 4.0** which is where the industry world is going**

Takeaway Chart:

7. For AI Solutions, Product Management Methodologies will Have to Change

In addition to User Persona we will also have AI Persona

The workflows will be described as a man-machine team each taking alternate roles in problem solving and in driving the processes as a function of his/its relative proficiency

8. The Time Horizon Plays A Key Role In Almost Every Business AI

The time horizon plays a key role in almost every business role. As your product supports broader and deeper functions in a **day/week/month/quarter/year in the life of a business role**, the value increases and user acceptance increases.

The 777... concept (Execution, Tactical, Strategic):

7 minutes ahead

7 hours ahead

7 days ahead

7 weeks ahead

17 months ahead (7 years would be too far...)

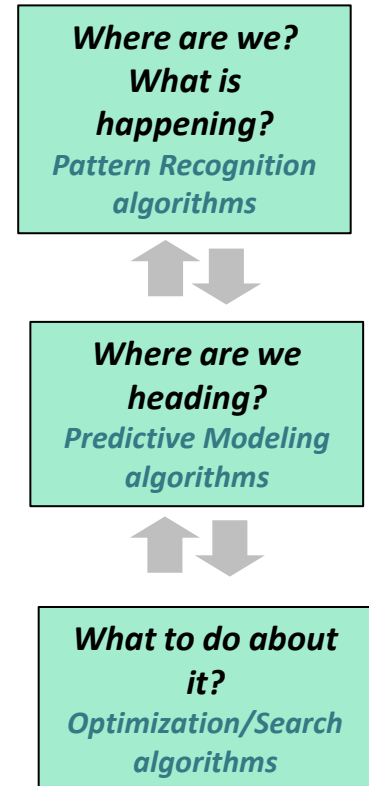
**9. Context And Actions (BenBassat):
A Methodology for Developing Software With
AI State Of Mind,**

9. CONTEXT & ACTIONS FRAMEWORK AND AI ALGORITHMS (1)

Life cycle in the workplace moves constantly through 3 step routine:

1. **Where are we?** (Context recognition)
2. **Where are we heading?** (potential outcomes if we do nothing)
3. **What to do about it?** (including the option of: do nothing)

AI can play key role supporting the user in each of these steps

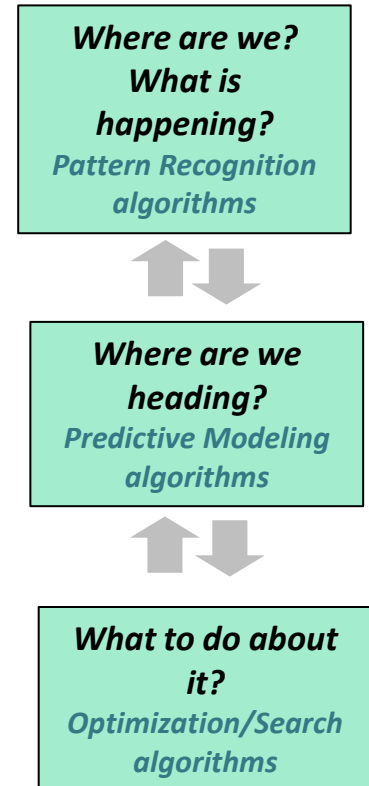


9. CONTEXT & ACTIONS FRAMEWORK AND AI ALGORITHMS (2)

In terms of AI algorithms, each step in the 3 step routine requires different families of algorithms including:

1. Pattern recognition
2. Prediction/Forecasting
3. Search Optimization for the best action

And data-centric Machine Learning algorithms can contribute immensely in each step



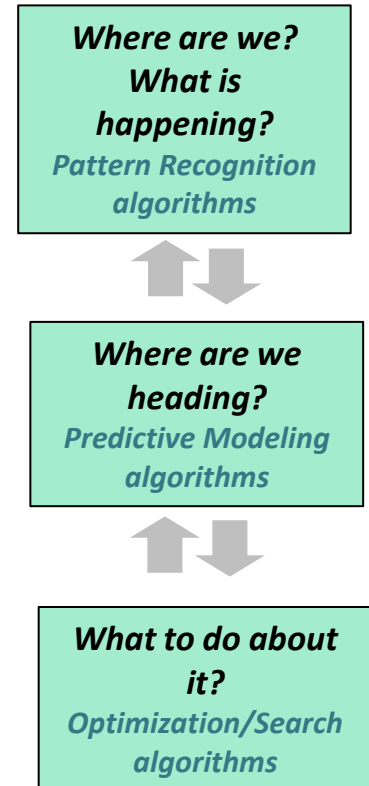
9. CONTEXT & ACTIONS METHODOLOGY: AT A GLANCE(3)

1. **The Context& Actions methodology**, is at the cross-road of **Context-driven** and **Workflow –driven** thinking.
2. You start in the **user’s world** by **listing the Contexts** that a user may encounter through his “Day in a life”. “a month in a life”,...In any order!
3. Then for any given Context, you **list the actions** that the user may take- or needs to take- in the physical world or virtual/software world, including the ‘**do nothing**’ action.
4. List the **new states/contexts** that might arise for **any possible action** or **if you do nothing**
5. Only then you move to the **software world**, and for any given context & actions, you ask **what are the software aids and software behavior we offer to the user**. (From AI full automation to interactive decision support, and manual)
6. A list of **software-aid categories** can help to do it systematically (Software-aid categories include: **Reminder aids, Compliance Aids, Data/Information aids, Collaboration aids, Reporting aids, Coordination aids, Decision aids**).

9. CONTEXT & ACTIONS FRAMEWORK AND AI ALGORITHMS (4)

ACTIONS:

- Actions can be scheduled ahead of time by you in your calendar, or
- May come uninvited e.g. **your spouse calls that she/he is stuck in traffic and will be very late to “pick kid from basketball practice”**.
- They may also be triggered by state regulations, company policies, an external event, or another person/system, e.g. your boss.
- Life cycle moves constantly through 3 step routine:



SUMMARY

Takeaway Chart:

“CAN IT BE BUILT? “ - IS THE WRONG QUESTION

The name of the game in creating a winning AI product is to keep asking:

How to increase participation of the AI software in the solution process of the given business problem, i.e. **Increasing the level of automation**

How to **increase the quality of the end result**, e.g. improved capacity utilization, which is a key source of business value.

Both lead to improved location on the AIQ quadrant indicating higher level of software intelligence (toward the North East corner)

(Then ask how to broaden the spectrum of business problems that the AI software covers, see the notion of 7777)

10. AI IS THE SOFTWARE INDUSTRY OF THE FUTURE

- AI is no longer a specialty on top of a data processing software such as the traditional ERP or CRM. **AI is the software industry of the future.**
- All software will be designed and developed with a **new state of mind by which a man-machine team leverage data and knowledge from **all sources** to make better decisions than any one of them individually.**
- **Business-driven companies are not concerned with the philosophical question whether machines can be made smarter than human. Their primary goal is **intelligent automation with the right labor sharing between man and machine that delivers the best business value** in tangible terms of time, cost, profit, customer satisfaction and market share**

References to Benbassat's Recent Works

1. **“AIQ: Measuring Intelligence of Business AI Software”**, :
<https://arxiv.org/ftp/arxiv/papers/1808/1808.03454.pdf>
2. **“Wikipedia for Smart Machines and Double Deep Learning”**,
<https://arxiv.org/ftp/arxiv/papers/1711/1711.06517.pdf>
3. **“Disease Labeling via Machine Learning is NOT quite the same as Medical Diagnosis “**
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Thank You