The blockchain breakout had about 30 people attending. We reviewed some technical background and some current applications downstream (see slides). We then discussed possible applications in R&D. While the group was not able to come up with any clear high-value use cases, they identified three next steps the Pistoia Alliance could take:

- Group felt that more education was needed, which Pistoia Alliance could help facilitate through webinars, workshops, etc.
- Group wanted to form a blockchain interest group, to discuss and explore further.
- One immediate activity for the interest group is to review the various small startups who are executing on a variety of aspects and use cases today (starting with the list of companies Accenture highlighted in their presentation). Suggestions included 10 minute lightning talks to get at the various applications.
- Work being done at ACRES Global would be educational.

Slides of presentation are available. The following notes summarize the discussion.

**Session lead** by Erik Pupo, Nick Davies, Nicole van Poppel, Carmen Nitsche

**Framing questions/polls (poll word clouds available):**

1. What is the best blockchain example you have seen to date?
2. What value/benefits do you expect blockchain will provide (e.g. traceability)?
3. What data in R&D do you think blockchain could be applied for?
4. What functions in R&D do you think blockchain could be used for?
5. What barriers do you force for applying blockchain in R&D?

**General comments/aspects of blockchain:**

- When you think about applying: IoT and cloud sessions, you discover blockchain is integral part of those discussions.
- Lots of hype, but there are specific benefits, including traceability. Current life science work drug supply chain, track and engage with a patient who is a consumer of drugs/devices.
- Fundamental shift occurring wrt all of the solutions based on traditional technologies. Disruption in blockchain - the protocol itself is with 100 billion etherium protocol is worth 50 billion - there’s a complete flip where the people create the protocol are making the money, nor did it take the capital upfront to get there.

- Just because we can’t map existing use cases onto blockchain, doesn’t mean we shouldn’t work on it - think about it....

- There hasn’t been an “aha” moment .... Pistoia has the benefit of economy of scale (safety in numbers) next step individual companies invest ...

**Known Examples from group:**
- FDA announced clinical trial demo with blockchain
- Blockchain with Watson
- Supply chain: counterfeiting - validating the supply chain

**What is the incentive? Why would anyone want to do blockchain for life sciences?**

- For supply chain, validation is an incentive. (If you need to automate validation)
  - As an immutable ledger you can anonymize a particular aspect of the ledger ... if you have a case where you need to be able show that company A went through distribution channel B to patient C ... A doesn’t need to know who C is ... but if there’s a problem with the drug, we can go from A to tell C what has happened

- Blockchain the asset is data – of which Life Sciences has a lot.

- Get rid of the intermediate set up an immutable trusted system.

- Blockchain good option when parties involved do not trust each other.

- The validation is impregnable - I can’t add to the ledger until everyone on the ledger agrees.

- See value as the immutable record ... (but it could be incorrect)

- Transparency we know that YOU did that

- Blockchain attaches the monopoly (such as SureScripts business model)

- Summary: Immutability, anonymisation, eliminate the mistrust
• Here’s a technology how can we fit it to the problems we have ... maybe we should say where are trust, immutability, etc. problems ....

Possible applications/use cases?

• Patient centered block chain - PHR concept - haven’t been able to get it over the last 20 years .. even with a health vault - crappy formats, large files ... theoretically a blockchain would automatically update... a patient record etc. Those are still being developed. Regarding volume of data- Don’t have to store anything on the blockchain itself - just the pointers live on the blockchain (comment - Probably don’t want to patient data in a blockchain?)
  o Patient data personal blockchain? Need to consider the amount of data you would need to store – for a single person. And then it needs to be mirrored at each site. Perhaps not practical?

• Preclinical study data - the evidence notebook - everything captured as part of the development of a drug goes into this ‘book’ – “I can prove I did all this”- anonymity to say that we’ve done this work – the report itself can be hashed.

• We should think about providers/payers - they want to use blockchain to work with Pharma. How can we work with them more?

• “Smart Contracts” are built into the blockchain network - you can necessarily validate the behavior that is occurring

• There are pilots out there for care planning, but nothing really to scale yet

• Healthcare: counterfeit drugs (Diamond industry is using blockchain to verify that they are not conflict diamonds - it’s a trace)

• Pharmaceutical tracking isn’t super private - they want everyone to see where it was manufactured and where it was shipped, etc. (From Walgreen to patient - how many patients are getting these pills - that’s what IMS sells)

• 340b program has a lot of issues - rebate processing and how that’s done - pilots from Pharma have focused on that

• Use cases – medication adherence - giving them crypto currency for being adherent to their drug regimen

• Clinical trial process - sharing information back, this is trickier , CROs are interested, FDA is some interest, but very vague and high level
• Expose data to CRO, would blockchain help in that process? Micro-contracts for data?

• Attorneys like it for the immutable record longitudinally for a particular researchers work efforts - “who is it that actually came up with this idea” done today as digital signatures - no one has asked to raise that standard

• Small companies send data to big companies - we do that now ... has the data been massaged?

• If you could make auditing redundant - apply blockchain into the process - that would be great

• Can be used in defensive postures ... in cryptocurrencies and distributed ledgers, when there is a fork (someone has changed something) if there was a "double spend" then you can directly intervene

• Diagnostic development company - they need patient data involved for their FDA sub - blockchain looks like a fit

• use cases upstream in R&D Auditing folks need to have training .... HIPPA training, etc.

• ACRES Global use case: Blockchain - exochain - out in the couple of months - identity adjudication so you can enter into a legal agreement with them. Point of blue cloud today is like LinkedIn where people can connect put in their credentials, take courses, get a gold star at the end, using those adjudication points to make an identity score This is validating that physicians/healthcare professions are who they say they are.

• Help to accelerate study start ups - immutable database

• We can’t trust candidates - wouldn’t it be great if blockchain had my degrees, etc.

• Seamless release authority? The VA (e.g.) will release the data and submit the data to a third party of that individual is vetted.

has anyone done a reference implementation?

• Several phases doing as pilot for a specific drug class/medical device ... has anyone done it as meaningful use - not in full production implementation

• Startups and Genentech are working on this
How could Pistoia Alliance help?

1. Education: Pistoia should have an educational role in Blockchain and use cases - should play a rule in sorting out the hype from the reality
   a. Determine what blockchain POCs and test are going on out there among the membership – and have updates on these for the membership
   b. Bring in several of the small startups with blockchain expertise and get presentations from them

2. Interest Group: Pistoia establish an interest group, whose agenda would include
   a. Participating in the educational events to gain more knowledge about the capabilities and uses
   b. Then start thinking about possible use cases
   c. Then prioritize

3. Question to ponder:
   a. As a collaborative organization - are there things that we’re not doing due to lack of trust? Will blockchain give us something we can’t do due to lack of trust?

   b. Blockchain is a technology that handles immutability, traceability and mistrust. What kinds of R&D activities do we have that face those challenges?