POEMs: Notes on Technical Architecture

Briefing

POEMs (Public Official E-Markets) will have to handle unusually multi-faceted, very low-value, transactions. It will need a suite of trading mechanisms and ancillary functions to be used as required for any purchase by a buyer from a seller. As a regulated public utility, the platform will also require a range of modules for monitoring and structuring its internal processes.

CONTEXT: A Non-prescriptive Mandate

This briefing should not be read as a description of system functionality to be embedded in any concession initiating POEMs for a jurisdiction. POEMs must be designed by the operators who transparently win a concession to offer the service. They will be absorbing the risks and must be free to shape the technology as wished. This briefing offers nothing more than a speculative high-level, starting point schema for discussing system structure.

1) OVERVIEW: Broad List of Functions

At very high level, the core of a POEMs platform should be a range of mechanisms for matching a buyer with sellers who can meet her needs then constructing the price at which each will do so. Other functionality flows from that suite of tools. Everything must be geared to operate at huge scale.

The high-level structure then will likely comprise:

- **Navigation**: The system needs a taxonomy and directories for the thousands of market sectors in which it could operate. Directories could be personalized to each user to minimize complexity of screen displays.

- **Trading mechanisms**: Auctions, catalogues, and listings are examples of mechanisms by which a buyer and seller might be matched with the seller's offering priced. POEMs will need the full range. (See below.) Chain transactions (a purchase pulling together offerings from multiple market sectors) will need to be constructed.

- **Availability**: Resources on offer are rarely available 24/7. People have hours they are willing (and legally permitted) to work, items being sold or rented may only be available at certain times. Management of time-based availability is a core component of POEMs.

- **Financial functionality**: Transfer of payment from buyer to seller, probably via a period in escrow to ensure completion of the transaciton, is the core need. Around that loans, investment, factoring, micro-insurance, basic banking functions, and other tools can usefully be developed.

- **Internal processes**: Assuming franchising of front-end displays to users is compelled within legislation that initiates POEMs, the system will need tools to (a) manage a pool of approved prospective franchisees awaiting a franchise (b) compute when activity in any sector merits offering it as a franchise (c) allowing prospective franchisees to bid for franchises (d) transferring each franchisee's cut of transaction revenues in their sector (e) handling transfers and possible splitting of franchises as activity develops. Application of a Maximum Average Transaction Size formula may also need transparent handling within each transaction.

- **Reporting**: POEMs will have to compile activity records of each user and should allow those records to be exploited as each user wishes. It will need to aggregate metrics on market activity, allowing those records to be searched while preserving anonymity of individual users.

- **Interfacing**: The platform will need to query, possibly update, official databases of individual and corporate identity and licensing. A spectrum of apps needs to be able to access user and system data once appropriate permissions are proven.

- **System integrity**: This is a part of POEMs where users can view the code, check system performance, peruse details of software updates, view lists of operators' interests, see pages for internal whistleblowers and so on.

2) Managing Multiple Mechanisms

Efficient handling of the diverse, and small scale, trades POEMs must handle will demand the full suite of mechanisms for constructing transactions between a buyer and sellers. Vintage teddy bears will be auctioned, groceries shopped in a catalogue to which any user can post their food offerings, tailoring a wedding dress might be best done through a request-for-quotes to sellers of garment alteration services and so on.

How to allocate a mechanism to each transaction? The obvious solution seems to be starting POEMs as a classified adverts service, akin to Craigslist but with rigorous registration and identity checking processes. (This may minimize junk or repetitive posts.) Anyone can list any item, service, or skill and a price. They can also chose any mechanism with automated prompts anticipating their needs ("Do you want to input the hours you are available for gardening and the travel area in which you will work?"). Buyers can then be asked "Do you want to see available hours of gardeners willing to travel to your home?"

POEMs then needs functionality scanning these listings and deciding when each has reached enough activity to merit handing off to a franchisee. That person can access a suite of tools allowing front-end

displays to be assembled to maximize market growth So a franchisee buying the gardening sector might make stored availability (detailed records of when each person is available to work) their centerpiece with auctioning of gardening services, general listings, or requests for quotes around specialist projects available through an "other options" link.

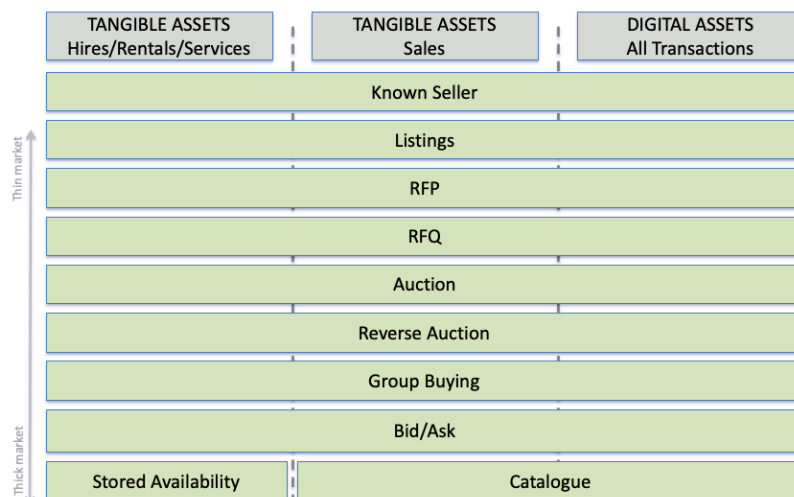The optimal mechanism for any transaction is determined by any combination of:

- **Characteristics of resource being sold**: Trades will be in three very broad categories:

    - **Rental of physical assets**: This includes hire of people and items that have to be returned by the purchaser.

    - **Sales of physical assets**: This is eBay territory, goods that move one way; ownership is transferred within the transaction.

    - **Intangible assets**: Digital documents, audio or video might be pumped out by POEMs. Nothing physical gets transferred. If the transaction is a rental rather than outright purchase, the resource digitally expires rather than being returned.

- **Market thickness**: A poorly defined or thin market (one with little activity) is best served by a less structured mechanism. Buyer and Seller will have to do more work to complete the transaction, but they need to explore compatibility so that is acceptable. Purchase of a bespoke artwork for example is a high-overhead transaction; Buyer will expect to dialogue with Seller. They need a mechanism like listings or an RFP (below) to find each other.

    But a hard-pressed business traveler needing to hire a car may simply want to specify a location and vehicle type to see competitive pricing of available offers from reliable sellers. That requires more comprehensive transaction construction as offered in mechanisms like Stored Availability.

Seller preference: A seller of any service might seek dialogue with buyers even if trading in deeply liquid markets because of special needs ("I only rent my dog to people I decide he will like") or lack of trust.

Anticipated key mechanisms within POEMs:

TANGIBLE ASSETS Hires/Rentals/Services	TANGIBLE ASSETS Sales	DIGITAL ASSETS All Transactions
Known Seller		
Listings		
RFP		
RFQ		
Auction		
Reverse Auction		
Group Buying		
Bid/Ask		
Stored Availability	Catalogue	

(Thin market ↑ / Thick market ↓ shown along left side)

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Notes on each mechanism:

	Mechanism	Explanation
1.	Known Seller	Used when Buyer already knows the Seller they seek. "I want an appointment with Sandy to tattoo my leg sometime this week". Current example: Loconomics.
2.	Listings	This is the most basic of open market mechanisms; classified adverts with a text search facility. Listings are time consuming and uncertain for buyers. But they allow vague, unpriced or hard-to-categorize offers from sellers such as; psychic readings. Useful for innovative services. Current example: Craigslist.
3.	Request for Proposal (RFP)	This is a process initiated by a buyer who has an amorphous need such as "I want a conservatory built". By circulating this to potential sellers, POEMs helps Buyer understand their options and frame their requirements before commissioning a project. Current example: Upwork
4.	Request for Quote (RFQ)	Similar to the RFP, but for buyers able to articulate their requirement precisely; "I need 150 acres of maize harvested this week". Sellers state their price and buyer commissions, typically, the cheapest. Current example: Fiverr.
5.	Auction	Good for price discovery on goods or services for which there is no urgency from buyers. For example: vintage teddy bears. Current example: eBay.
6.	Reverse Auction	Usually used to find the lowest price for a known service such as a party for 15 five-year-olds. Buyer sets a top rate then sellers have a timeframe in which to undercut each other until a winner is found. Current example: JAGGAER.
7.	Group buying	Currently used by consumers for buyers to combine and obtain discounts on high value items such as TV's. Or by groups of small businesses. Current example: Bira
8.	Bid/Ask	Most useful for trading financial assets. Sellers quote a minimum price at which they will trade, say, Apple shares. Buyers quote the maximum they will pay. The mechanism matches buyers and sellers who align. Pre-entered rules can allow users to bid or ask automatically. Current example: etoro
9.	Stored availability	The most convenient, transparent mechanism for buyers in deep markets for rental of people or facilities. The database stores details of each seller's assets, the availability of each and rules for its pricing. Buyers instantly see fully priced, genuinely available, options for their requirement. Current example: Expedia.
10.	Catalogues	Searchable lists of items for sale with a price that is the same for any buyer. Current example: Amazon.

3) Broader System Structure

Around its suite of mechanisms, POEMs will need a range of functions to support transactions and regulation of the system. In overview, they can be grouped like this:
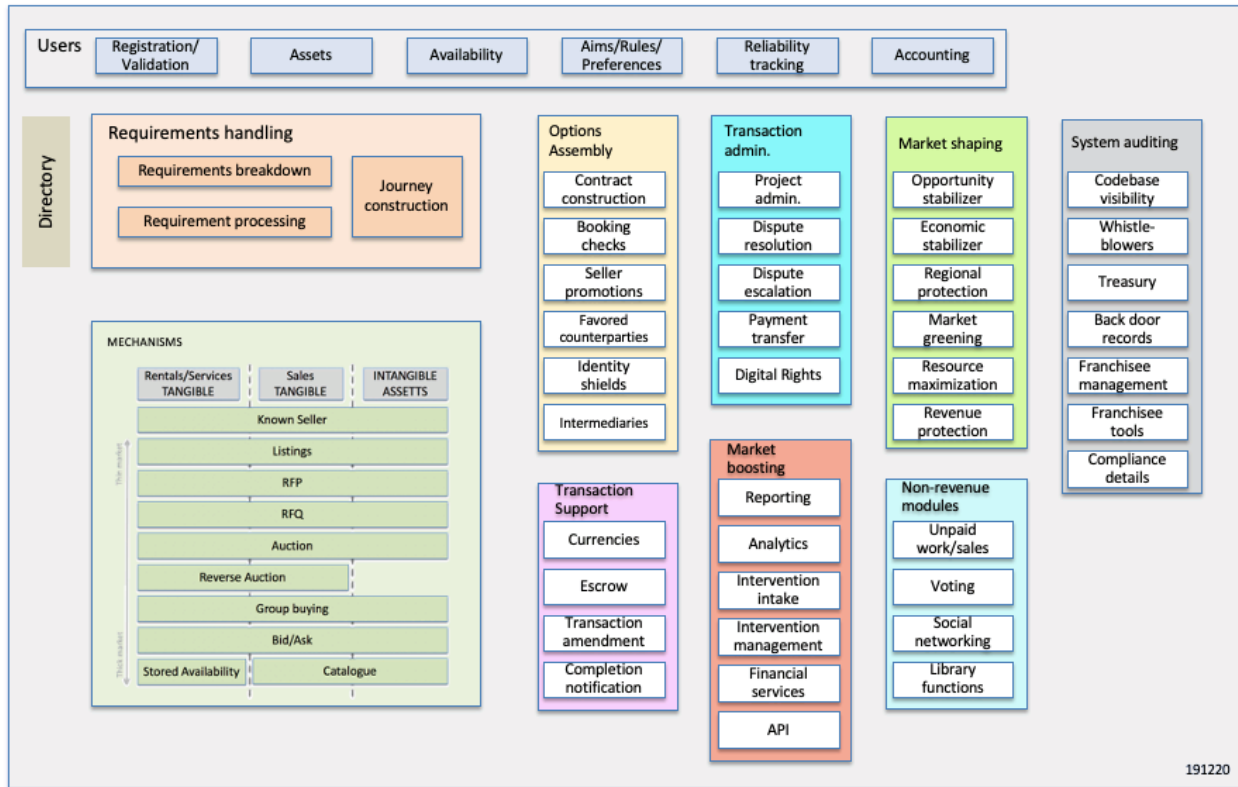
Explanations of clusters/modules

	Cluster/module		Functionality
1.	Users		This group of functions on-boards and serves users, each of whom may be any combination of: (a) seller (b) buyer (c) intermediary (d) intervention owner (e) sub-user, for example a worker using POEMs for their employer.
2.	Registration/Validation		Takes in details of a new user. Checks any skills/entitlements/permission they claim to have by, for example, (a) accessing official databases (b) processing a code offered by user (c) endorsement by suitably authorized user.
3.	Sellers only	Assets	Stores details of what the user wants to sell (skills, possessions, facilities, services, etc.)
4.		Availability	Intake of details of when the person or each possession is available to be procured by buyers.
5.	Aims / Rules / Preferences		Take in user's ambitions (career path, purchases from certain categories of sellers, average earnings, etc.) Also, self-determined. categories: eg vegetarian, Christian. Validates ownership where required.
6.	Reliability tracking		Monitors user's fulfilment of contracts entered into. Allows user to exploit their ranking, corporate or personal.
7.	Accounting		Tallies expenditure/income. Can also administer spending controls, for example on employees who use POEMs on behalf of their employer.
8.	Reporting		Analyses the user's activity and presents its findings for the user to release or exploit as each wishes.
9.	Directory		This is POEMs tree of offerings, akin to the list of departments on Amazon. Every sector is listed with a search box and tools to mask options for under-age users, employees or other restricted users. The directory grows as new sectors are formalized.

10.	Requirements handling	This group of functions receives requirements input by buyers and serves a list of options for purchase.
11.	Requirements breakdown	This module breaks down each transaction to its component parts (eg: a home removal booking may involve (a) van (b) driver (c) delivery of van to driver (d) insurance). Each component in a chain transaction like this can come from separate markets. This module must determine the search order for components, thinnest market first.
12.	Requirement processing	This module takes an individual component in a buyer's requirements and determines what mechanism, transaction functions and display tools to use to show buyer their options. It then assembles the options for each component.
13.	Journey construction	Used for deliveries or getting a person from A to B. Algorithms for routing are established within platforms selling train/bus tickets and motorist's mapping tools. POEMs needs to combine scheduled services (eg a coach) and possible commissioned journeys (eg a taxi or carshare) each option for which may be being sold through any mechanism. This module also needs to trade transfer points between vehicles for passengers or parcels.
14.	Mechanisms	A mechanism is the method POEMs uses to present options to a Buyer who has input their requirements for a transaction. (See earlier section.)
15.	Options Assembly	POEMs can use these software tools to refine construction of options for a buyer regardless of mechanism(s) used for a transaction,
16.	Contract construction	Every POEMs transaction has to involve a contract between the counterparties. By default, they should be standardized but Seller or Buyer can mandate changes and counterparties have to show acceptance. This module needs to manage and ensure legality of amendments.
17.	Booking checks	Within any mechanism each Seller's price for each option offered to Buyer will be calculated. But there may be specific legalities, tax rules or eligible interventions that override that eligibility or pricing. For example: Bartenders in California must be >21. So this module applies a rule: "If this is a bar booking in a CA. business, eliminate any seller <21."
18.	Seller promotions	This module feeds Booking Checks. It allows POEMs to – as one case study – generate codes for a hair stylist who wants to print them out and offer them to friends who can then book a cut at a discount in POEMs. The system overrides the calculated cost once ownership of a voucher is proved.
19.	Favored counterparties	Sellers and Buyers can tell POEMs the counterparties they particularly favor. This can include arrangements like Anchor Employers. This module supports these arrangements, for instance by shifting a company's Anchor Employees to the top of their lists of options. Ringfenced markets (walled-off sub-exchanges for vulnerable users) are run by this module.
20.	Identity shields	Some options for a given Buyer may require concealment of the Seller's identity. This kind of "brand shield" was a feature of services like Priceline, allowing airlines to dump unsold seats into the market without their normal customers' awareness. Identity shields could also be used by undocumented workers or anyone who doesn't want it known they are working through POEMs.
21.	Intermediaries	Buyer, Seller or both may want to transact through a third party. Rules and pricing for each intermediary need to be inserted into each option. Intermediaries should be encouraged to partner with each other through split mark-ups and mutual rule enforcement.
22.	Transaction support	Once Buyer has committed to one or more options for their purchase, these tools ensure fulfilment.
23.	Currencies	POEMs may need to permit transactions in multiple denominations, including potentially its own parallel economy. Exchanges between currencies are integral.

24.	Escrow	To ensure payment and completion of a transaction, POEMs can deduct funds from Buyer's account and release it to Seller when either (a) a given time after the transaction should have finished is elapsed (b) Completion notification is received.
25.	Transaction amendment	Hours of work may be changed, a delivery date re-entered or an item damaged and repriced. This module allows Buyer and Seller to record this and reset the contract between them.
26.	Completion notification	This module offers Buyer a way to confirm she is satisfied the transaction has been fulfilled. For periods of work the obvious device is a timesheet.
27.	Transaction admin.	These modules ensure completion of a purchase and handle any problems or administration
28.	Project admin.	Some purchases involve a multi-part project such as delivering after-death care through to a funeral. This module ensures each step can be signed off by Buyer and funding released to the appropriate Seller.
29.	Dispute resolution	Buyers and sellers will disagree on whether work or goods were satisfactory. Either can temporarily freeze escrow funds. This tool provides facilities like automated affidavit taking, plus structured prompts for resolving a dispute such as lowering the price.
30.	Dispute escalation	If POEMs can't resolve a dispute, it needs a way of passing it on for human judgement. This could be a network of court-appointed mediators. Their work needs scheduling and their judgements, for example downgrading of a Seller for 6 months, must be applied.
31.	Payment transfer	Funds need to be moved from Buyers to Sellers possibly with disbursements to third parties, tax authorities, investors or POEMs' own coffers. All may be dependent on release by an escrow module.
32.	Digital Rights	Sellers will want to offer materials that self-destruct, for example a music track that expires after ten plays or a "hold" that stops a car being sold while a putative buyer evaluates her options over a weekend.
33.	Market boosting	These modules increase attractiveness and efficiency of POEMs' markets.
34.	Reporting	The vast stream of data captured in POEMs' transactions needs to be served for user enquiries. Push-notifications have to be offered. Any search that could reveal an individual user's data, even by triangulation, must be rejected. Separate databases for reporting have to be maximized.
35.	Analytics	Raw data can be turned into graphs, charts, timelines and comparisons. POEMs will need a consistent library of display devices for this.
36.	Intervention intake	Any user can set up an intervention, for-profit or charitable, where they offer to support transactions or users with given characteristics. Each has to be constructed on a series of screens and stored.
37.	Intervention management	Interventions can trigger actions by the Booking Checks module. This module must also allow display of interventions, generate alerts to initiators of overlapping or contradictory interventions, and offer aftermarkets where interventions can be resold or expanded.
38.	Factoring	POEMs needs escrow to be solid in ensuring Seller is always paid for a completed transaction. But many sellers will want their money early and have the track record of reliability to merit it. This module runs a market allowing anyone to offer factoring of demonstrable escrow payments due.
39.	Financial services	Markets within POEMs for lending cash, offering insurance or providing benefits can trade through various mechanisms. But they need specialist tools such as income amortization. Those sit in this module.
40.	API (Application Program Interface)	POEMs has to sit beneath a spectrum of Apps and other websites, each free to select parts of system data, displays and functionality. Integrity must be maintained even when additional platforms are involved. Certification of system genuineness has to be offered.

41.	Market shaping	POEMs could be left to run as a pure market with no aim beyond maximizing utility for each buyer or seller on a transaction-by-transaction basis. But legislation might mandate the overall market be capable of delivering wider economic outcomes.
42.	Opportunity stabilizer	A truly efficient market for small transactions could quickly become exhaustingly volatile, for instance with sellers moving between 5 different types of work in a day's bookings. This market effervescence could be dampened by, for example, artificially lowering costs for a second or third contiguous related booking (by artificially boosting the charges for a first one and transferring the surplus across as subsidy on subsequent related bookings.)
43.	Economic stabilizer	This is the "Keynesian" module. To dampen any move towards boom or bust, it moderates public spending through POEMs in line with trigger data-points. For example, it could incentivize building projects in areas with falling economic activity.
44.	Regional protection	This is the "economic nationalism" module. If mandated in the concession it might, for instance, carry tariffs across to aftermarkets; so hiring or buying a pre-owned foreign bicycle becomes more costly than using a domestically produced one even transiently.
45.	Market greening	This module ensures environmental externalities are captured in pricing. For example, it could build in carbon pricing that was higher in polluted areas, paying it to an offset fund.
46.	Resource maximization	This software trawls POEMs' data looking for low-utilization skills, services and items for rent. It aims to boost utilization of every possible resource. For instance, it might note fishing rods are regularly being offered but not hired in the South. What is going on? What prompts could it offer owners: suggest lower prices? Offer to place rods with holders in the North? Fit them with more costly hooks?
47.	Revenue protection	Even with a transaction mark-up of only, say, 2%, there will be buyers or sellers who seek to move their agreements with counterparties off-platform. This could be to avoid tax or because dialogue between the parties that started in POEMs has moved to other channels that include a payment transfer method. This module looks for this kind of behaviour, issuing warnings and even suspensions if it is persistent.
48.	Non-revenue modules	Legislation enabling POEMs may mandate it includes non-revenue generating functions, as cell phone operators are forced to carry 911 calls or broadcasters have to offer ad-free religious content.
49.	Unpaid work/sales	Volunteering, food donations, recycling; all can be vibrant markets in POEMs using the full range of system tools but with pricing deactivated.
50.	Voting	Validated and constantly monitored users may be permitted to use their system identity to avoid a trip to the polling station. Any POEMs voting module must irrevocably store a user's vote in any given list of choices, then tally those choices verifiably without allowing external access to any user's selection.
51.	Social networking	POEMs can match users based on locality, interests, trading activity or other characteristics. This module can host records of friendships, clubs or schedules at the behest of any user.
52.	Library functions	POEMs will have to store standardized contracts for thousands of transactions, updated tax/welfare data and countless regulatory rules used by the Booking Checks module. All this should be searchable, firstly to allow checking on its veracity and – if mandated in the legislation - to allow off-platform use of these resources.
53.	System auditing	This suite of tools keeps POEMs transparent and accountable. It maintains users' faith in the system and minimizes the need for regulation.

54.	Codebase visibility	POEMs needs to assure users it is doing what it says. This facility allows any user to compare a copy of the code as published by operators with the code actually running the system. It has to highlight changes and protect sensitive functions, such as system security, while allowing as much inspection as possible.
55.	Whistle-blowers	It's one more layer of protection: pages where only someone with a system-staff log-on can anonymously enter text. Anything they write can't then be expunged without leaving a trail. System administrators can post comments in response to any text. It allows staff to highlight any perceived impropriety behaviour directly to users who can check the Codebase (above).
56.	Treasury	This module monitors all cashflow through POEMs. How much is currently held in escrow and what is the transfer schedule? How much is in user accounts? What proportion of loans are in high-risk pools? How much is the system earning this minute? And so on. All this is published.
57.	Back door records	Does POEMs allow back-door access? If it is under the control of an independent judiciary that would seem reasonable. A user may want, for example, emergency services to find where they booked overnight accommodation in case of a medical alert. But POEMs should indelibly publish anonymized details of each tightly-defined back-door access to a users' data for accountability.
58.	Franchisee management	Legislation enabling POEMs may mandate its front-end markets are each run by an individual franchisee. This module maintains a register of approved franchisees, records their franchising history and income then displays it all to users for accountability.
59.	Franchisee tools	This area of POEMs is only readable by authorized franchisees, not system staff. It's their place to trade territory with each other, or just moan about the consortium.
60.	Compliance details	These pages are simply freetext: lists of officers and staff who oversee POEMs, reports to users, renumeration reports, anything that users are entitled to know about POEMs that is not generated by the system.