

Detailed Appendices for AI Decommoditization Paper



The paper contextualizing these appendices is [here](#).

Summary

Horizontal hour-by-hour labor markets produce unparalleled data. Our appendices below detail key datapoints then outline how they might be processed and made actionable for any user. Obvious usecases for AI that focuses on workforce *development*, not deployment, include:

Aim of the AI	Sample chatbot output
Steppingstones for a worker	<i>You're a courier, you want to be a nurse. I can get you about 6 medical deliveries to hospitals a week. Certification costs \$120, but I expect your hourly rate to go up \$1.12. You will earn it back in 10 weeks. Can I fill out the form for you?</i>
Lateral options	<i>You told me your Dad lives in Birmingham. There is a festival there in two weeks paying extra for hospitality workers like you. I can get you travel for \$82 then 30 hours work at 15% over your average. Stay with your Dad that week? I can book the ticket and the work.</i>
Targeted support	<i>Only 15% of your available hours have been booked in the last two weeks. I am allowed to schedule a Peer Navigator to discuss any issues. Cozy Coffee near your house looks like a good venue. Can I fix an appointment when you are free tomorrow?</i>
Regional/sectoral economic growth	<i>Utilization of scaffolders is 90% across your region. Roofers are currently at 45%. I can find 73 reliable roofers who would earn >20% extra p.h. scaffolding. Training them collectively would cost = \$44,325. Shall I offer training then book a trainer and handle the scheduling?</i>

There are five foundational building blocks to the data generated by a horizontal markets system:

- **Availability:** The hours on any given date when workers or a resource they are offering can be purchased in the market (e.g.: "I want to work between 10AM and 4PM tomorrow").
- **Workers' parameters:** The rules each worker puts around their availability (for example, "I only travel up to 5 miles from my home address for any period of work").
- **Worker attributes:** This briefing uses the term "Badge" to mean a record of *any* attribute of a worker or their resource that enhances the value to buyers in the market, ("I have a badge certifying I hold a valid Bus Driver's License"). A fuller explanation is [in a separate paper](#).
- **Roles/Resource categories:** The market needs a taxonomy of sectors in which workers can offer. Some sample roles: Barista's, Hairdressers, Lathe Operators, Childcare Assistants. Eligibility for any role may be dependent on possession of specified badges ("To sell as a Pool Lifeguard you must be badged with a first aid certificate that has not passed its expiry date, a pass in the city's competent swimmer test, a Live Scan certificate attesting to lack of criminal record, and completion of the American Red Cross Lifeguard training course").
- **Transaction data:** With workers' inputs so granular, buyer's requirements can be equally fine-grained. This allows detailed capture of each requirement and the market's response.

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A) Transactions Data

Storing details of any purchase against common datapoints allows comparison of demand across diverse sectors. So, for example, for each purchase of a person's time or some other resource, the markets system captures fundamental points, some of which need to be meaningfully anonymized¹ in reporting.

Details captured about any purchase can be grouped across three categories:

- **Requirement**: What the market was being asked to provide.
- **Selection**: What the purchaser chose from among the options the market was able to offer.
- **Fulfilment**: The extent to which the buyer's expectations, given their selection, were met.

Thus, a purchase record for one sample transaction might look like this:

	Datapoint	Sample transaction	Notes
REQUIREMENT			
1.	Buyer	Acme Corporation	This detail is of course anonymized before public release of the data, but it can be correlated to other activity by the buyer, for example capturing how much they purchased over the previous year to calculate broad metrics like concentration of demand in the sector.
2.	Sector	Pallet Loader Operators	This is the Resource/Worktype the buyer wants to purchase
3.	Location	Acme Warehouse, address in Birmingham	Some sectors have no location, any remote work for example. But if there is a physical location it can be used for generic mapping of demand.
4.	Hours required	1PM-11PM on June 3rd.	The times when a buyer wants service are vital in tracking broad patterns of demand.
SELECTION			
5.	Number of units	10 workers	Storing this metric allows the relative "Clustering" of a sector to be computed. Is activity shaped by infrequent, huge, purchases or diverse single-unit bookings?
6.	Market headroom	15 workers	Headroom measures " <i>What could the market have provided if the buyer had purchased every option available</i> " when the purchase was made? In this case there were 25 qualified pallet loader operators available, the buyer left 15 in the market for the hours required.
7.	Unit charge/pay	\$27.32 / \$23.14	Charge is what the buyer pays, including markups by any intermediary and the markets system, pay is what the worker gets per hour.
FULFILLMENT			

¹ Anonymization requires setting a balance between users' collective right to see patterns of market activity against each individual user's entitlement to privacy; not having their actions publicly displayed. A crude rule might specify "*If any user's filtering of transaction records produces a dataset in which either one buyer or one worker accounts for >20% of activity, do not display the data. A wider enquiry must be framed.*" A secondary danger is triangulation; inputting multiple, overlapping, enquiries from which a user's data can be deduced. This needs to be blocked.

8.	Fill rate	80% (8 workers)	Two of the 10 workers who the buyer selected did not confirm the booking in time and could not be replaced.
9.	Completion variance	-10% (720 timesheeted hours)	The variance is any gap between what the buyer and workers were expecting after the fill rate is factored in and what the buyer eventually paid for. So, 8 workers were booked for 10 hours. If those workers' timesheets totalled 800 hours the variance would be zero. If some were asked to work extra hours there would be a positive percentage variance, in this case some left early showing a negative variance.
10.	Disputes	1	Completion of the transaction was eventually disputed between the buyer and one of the workers and the issue has not currently been resolved.

B) Competencies data

As a landscaping worker would I increase earnings more with a badge confirming certification to operate a woodchipper or completion of a course in turf laying? In what order should I be trying to get the badges needed to be a hotel receptionist? I am a caregiver for housebound seniors, how much more could I earn if I accepted a badge "I am comfortable working with pets"?

Horizontal markets can routinely compute these kinds of datapoints. This section breaks down the steps:

i) Individual earnings from a badge

For a given worker with a specified badge, how much is being earned by that one badge?

A simple calculation might go like this: *"I have security clearance to go airside at the Springfield Airport which allows me to work as a baggage handler, aircraft marshal and plane cleaner. In an average week I work 20 hours at those three roles for an average \$25 per hour. I could not do any of those roles without the badge, so the badge is worth \$500 a week (20 X \$25). My average earnings in the market are \$750 a week, so that badge is vital to 66% of my income".*

Given the possibilities of working across so many sectors in a horizontal market, the figures above can only represent a rough guide to the "Cleared to Work Airside" badge's value to each worker. If the person lost the badge, to what extent would their other roles pick up the slack from lost bookings at the airport at times they wanted to work? What would the average hourly pay for those alternative roles be relative to airport work?

Activity data (see section below) can partially answer those questions. But the *"How much am I currently earning as a consequence of having this badge?"* enquiry is informative and captures a useful baseline for relative assessments of any list of badges.

ii) Aggregated earnings from a badge

This is simply the datapoint above averaged across all workers who have the badge. If 1,000 individuals are badged as permitted to work airside at Springfield, their average income attributable to the badge is clear.

Again, there is adjacent data that could usefully be factored in. How many people who have the badge are not willing to do the work required, perhaps because they also now have badging allowing access to higher paid possibilities elsewhere? How many cap their weekly hours of work at the airport, because it is so physically demanding perhaps? How many people who have the badge aren't getting work at the airport currently. And so on.

A cleaner dataset would count only workers who have the badge AND list themselves as available for working at the roles reliant on the badge AND count only the maximum hours each person could be booked to work at the airport given their rules and any legal controls. From this a representative monetary value of the badge for a holder can be derived².

iii) Predicted value of a badge

For any given worker, what percentage increase in income could likely be attained from adding a given badge to their portfolio?

A simple system prompt for a user can show an example: *"You are badged with ServSafe food handling certification. You live in south Los Angeles County. Ferry and marine tourism companies locally pay an average \$20 an hour for servers in their on-board food facilities, you currently earn \$15 an hour as a waiter. But boat companies demand an 'I am comfortable working at sea' badge for their roles. If you are happy accepting this badge, your average hourly pay should rise 21%."*

A fuller evaluation of the badge's value would include anticipated utilization for the roles it enables (see below).

iv) Costs of a badge

Some badges are free, others require something from the worker in terms of either:

- **Financial outlay:** *"Certification as a motorcycle courier requires a license costing \$85".*
- **Opportunity cost:** *"To qualify for the 'Acme Inc. Cleaning Shift Leader' badge you must have completed 200 hours as a janitor in one of their premises. That work pays 15% below your current averaged hourly rate from other work types."*

v) Your suggested next badges

This personalized list for any worker ranks the RoI (anticipated Return on Investment) for badges the person could pursue next. (*"Adding a 'Trained in Silver Service Waiting' badge to your range of hospitality credentials would cost \$35 and 10 hours of work at 10% below your average pay, but it should net an uplift of 8% in earnings in the pre-Christmas banqueting season".*)

This metric could inform allocation of economic development funds by public agencies. For example, if a French company is due to open its North America headquarters in a town, the value of a badge signifying *"Basic French Vocabulary"* could be determined for a spectrum of target work-seekers and classes then booked at times those people were available to study.

² Rules on anonymization of a single user's data (see above) may well block disclosure of evaluation of a badge pertaining to only one buyer ("Springfield Airport") but airport managers may wish to see their private data.

vi) Computation of "pathway" badges

Some workers just want to maximize income. Others have a career goal such as becoming a welder and are looking to get on a path towards it through their periods of ad-hoc work. This requires stepping stones of progression, for example someone working as a warehouse operative currently might need to build the badges that opens up manufacturing work locally as a first step.

All the metrics above help to ensure the person maximizes income, utilization and progression while minimizing expenditure or loss of income along the way.

vii) Soft benefits of a badge

Badges have functions beyond creating eligibility for roles. They can track outcomes and be used to target interventions. For example, a hidden (not displayed publicly in a worker's profile) badge might identify people with "*Lived Experience of Homelessness*". Supportive interventions can then be targeted specifically at that cohort.

Interventions might include job interviews, coaching, training, and so on. This can't be quantified but could potentially be graded subjectively by AI and marked on a badge's profile.

viii) Capturing the Value of a worktype

Metrics, and calculation methods, for badges can also be applied to any type of work (role) in the markets system. The usefulness is in allowing workers to choose among the sectors they are eligible to trade in. For example, a person may have the badges required to hold a portfolio of 20 roles. Ranking them by the value they offer, or could offer if turned on, would enable individual's to find their optimal mix of work they enjoy and achieving an earnings target.

C) User data

i) Workers

The trove of data a horizontal markets system can generate about any user wishing to maximize their income can be represented in 10 key metrics. A worker may exploit this reporting as they wish, one option would be deploying AI to achieve outcomes related to each measure.

Section D below outlines how the markets system could use market activity data to help a worker nudge any metric in their desired direction.

	Metric	Explanation	Likely desired direction for the measure
1.	Mean unit pay	This is what the worker achieves in any timeframe for each unit they sell, typically pay-per-hour.	Upwards: nobody seeks lower pay ³

³ Some workers desire to cap their weekly or monthly income, for example to avoid loss of public assistance, but that is best achieved through a cap on overall earnings that result in fewer hours worked rather than brakes on rising pay.

2.	Utilization	What percentage of the resource a worker offers in the market is purchased by buyers? If someone offers 10 hours they are available for work this week but is only booked for 7, they have utilization of 70%	Upwards: If a worker wishes to be available for more hours than they work (to increase chances of bookings at times of buyers' needs) they can apply a cap to weekly hours so, even if they list 50 hours they <i>could</i> work, only 30 can be booked.
3.	Travel area	If providing physical services (rather than working remotely), what is the area in which the worker is traveling for their assignments? (Best displayed on a map.)	Reduced area: if the market can generate the same mix of work and income from closer to the core travel area most workers would welcome that.
4.	Demand concentration	To what extent is a worker exposed to one or a small number of buyers? Someone who only has one buyer of their time has 100% concentration of demand, a person who serves 5 buyers each buying 20% of their time has lower concentration ⁴ .	Variable: Some workers will happily be reliant on one buyer whom they enjoy working with. Others will see diversified demand for their services as good for resilience and opportunity generation.
5.	Regularity of assignments	In any week, for each hour, what percentage of the previous 10 weeks also had a booking for the worker at the same hour? For example, " <i>At 10AM on Thursday I was on a work booking every one of the last 10 weeks, on Saturdays at 8PM I had a work booking on two of those weeks. My regularity on Thursday 10AM is 100%, on Saturday 8PM it's 20%.</i> " The optimum output is a color-coded grid of all 168 hours in a week, each displaying the regularity percentage ⁵ .	Variable: Some individuals want a recurring pattern of work; others may need ad-hoc periods to fit around other commitments in their life.
6.	Averaged Availability	This is the inverse of the assignment regularity grid (above). It shows for each hour of the week, at how many of the previous 10 weeks was the person listing as availability for work?	Variable: the output grid gives intuitive display of how much availability for work switches around. Its value is when mapped against the Regularity of assignments grid to show mismatches: for example, rarely being available on Thursday evenings but getting booked every time when it happens might prompt changing personal commitments to match demand.
7.	Periods of Notice (PoN)	With how much notice are bookings for timebound assignments being received. For example, if a booking is made at 10AM for work starting at 5PM the same day the PoN metric is 7 hours.	Variable: Those seeking predictable patterns, or anyone needing to arrange childcare or other personal commitments before leaving home, will likely want a rising PoN,

⁴ The [Herfindahl-Hirschman Index](#) (HHI) score used in competition policy provides a basis for calculation.

⁵ Any hour where the person did not work in any of the 10 weeks is of course a 100% score for regularity

			individuals with unpredictable availability for work benefit from lower PoNs.
8.	Reliability	A synthesis of two percentages: • Number of bookings offered to which the worker does not respond in time. • Number of bookings the worker confirms then fails to show up for⁶.	Upwards: It is likely workers who chose to release their strong record of reliability to buyers will attract increased skilling and pay.
9.	Completion variance	If the worker was booked for a total of 400 hours work over the last 10 weeks but their signed-off timesheets show they actually worked a total of 440, they have a variance of +10%.	Variable: A high positive points to buyers so enamoured of the worker as to ask them to provide extra services (such as working additional hours) but it also suggests lifestyle unpredictability which some workers will dislike.
10.	Disputed transactions	A booking for which a buyer has withheld payment because of a dispute over completion should not signal a problem initially, there could simply be a misunderstanding yet to be arbitrated. but an ongoing pattern points to a worker making commitments they then dishonor.	Downwards: a history of disputed transactions can raise a red flag for buyers.

ii) Buyers

Analysis for a buyer is largely an inverse of the list of metrics for a worker. Buyers want to know charge rate (including any intermediary markups) rather than an end payrate.

Reporting for a buyer requires identifying a Total Supply Pool (TSP), typically all the workers who have the badges, worktypes and travel area to meet the buyer's needs at this time. Mapping of availability can then be an aggregate of the TSP's inputs with "Your Utilization", a percentage of all the hours available from the TSP that the buyer purchases. The geographic area from which booked workers are being drawn can be represented by coarse-grained mapping of workers' base locations.

D) Sector data

These outputs are a combination of data that (a) can't be collected or has negligible value in a vertical market for labor or any other resource and (b) metrics that could be captured usefully in a vertical market if its operators were willing to share details of activity with users. We use examples from markets for any asset bookable hour-by-hour, not just people but any item they wish to rent.

⁶ In terms of market performance, the second is substantially more serious. It does not leave time for a replacement worker to be arranged. This may be reflected in weighting of a worker's reliability score.

i) Metrics that can't exist outside horizontal markets for hour-by-hour resources

The metrics below either (a) can't be produced by a vertical (single-sector) market or (b) would have negligible value without like-for-like data from surrounding sectors.

	Metric	What the Metric Captures	Example	Value of the Metric
1.	Utilization: Historic ⁷	The percentage of units/hours purchased as a percentage of those offered in any past time period.	<i>"Certified checkout operators had 1,000 hours of availability for work in our town last week, 600 were booked by supermarkets. Our checkout workers had 60% utilization."</i>	A sector with 100% utilization badly needs more workers. and will struggle to accommodate buyers' needs. It has no headroom. One with 10% utilization is over-supplied; policy could focus on developing more demand or helping workers out of the sector, for example by upskilling for high-utilization sectors locally. Utilization will vary hourly and can usefully be output as a grid of hours in any week e.g.: <i>"86% utilization of nightclub bouncers 8-9PM on Friday, 12% availability 10-11AM on Monday"</i> .
	Utilization: Future	The percentage of units/hours purchased as a percentage of those offered in any future time period.	<i>"Next Christmas day, we have 100 of our childcare workers showing availability of whom 50 are have already been booked for the day. Christmas day utilization is 50%".</i>	
	Utilization: Anticipated	This is the above figure but with known future entrants to the market factored in.	<i>"The market system has arranged for 50 hospitality staff to be trained as childcare workers before Christmas, 25 are currently listing availability for that day in lower-paying sectors, so anticipated utilization on Christmas Day now stands at 40% (50 of 125 workers booked)".</i>	
2.	Adjacency	Expressed as a relationship between two sectors: The percentage of workers in one	<i>"In our region, 70% of tractor drivers also offer their time as livestock handlers (high adjacency), while 4% also offer in the market</i>	Adjacency points to parts of a regional economy likely to be influenced jointly by changes in one of them. In our example to the left, new regulations impacting

⁷ Utilization could be measured in a single-sector labor market of course. Higher paid professionals (architects, lawyers, consultants) fare well in single-sector exchanges. but lower-skilled breadwinners typically benefit from offering a range of skills and capabilities in their local economy. Expecting these workers to maintain a meaningful record of their availability hour-by-hour simultaneously in multiple vertical markets is unrealistic. See our paper on [Horizontal v. Vertical Markets](#).

		sector who also offer in another named sector. Adjacency can best be thought of as a "long tail" from highly adjacent sectors to barely adjacent.	<i>covering inventory-takers for property rentals (low adjacency)."</i>	livestock handlers would likely lead to an increase in workers' hours of availability for tractor driving. So, choosing times of peak need for tractor drivers (eg harvesting) to introduce new certification for livestock handling would minimize the impact on household income.
3.	Worker Diversification	The proportion of its workers' income that a specified sector contributes compared to their overall earnings across the market system.	<i>"We have 100 qualified carpet layers locally. Last year only 15% of their income came from laying carpets (85% came from each person's other types of work). The sector is highly diluted compared to certified shopfitters who are generating 80% of their income from that sector."</i>	High Worker Diversification suggests either unpopular, low paying, work relative to the skills of workers or a type of work that is being used as a springboard to better opportunities. Economic policy might specifically cultivate high-Worker Diversification sectors that offer first rungs for labor market entrants wanting to prove their reliability.
4.	Substitution	The percentage of requirements in one sector that are being fulfilled by a worker from another.	<i>"Last month, 4% of our bookings for taxi journeys were actually filled by van drivers willing to also ferry passengers among their delivery journeys."</i>	Likely linked to utilization (above), the town in this example needs more taxis. But the metric is also revealing of adjacency opportunities (also above). If buyers of taxi journeys are willing to travel in a van, encouraging van drivers to include pricing for passenger pick-ups and drop-offs could increase both mobility options and the efficiency of vehicle usage.
5.	Latency ⁸	The percentage of workers who qualify to earn through this sector but are not doing so currently.	<i>"We have 100 qualified dental hygienists in our regional market, 30 of them have turned off their willingness to do that work while remaining active in other</i>	Latency measures the "headroom" in any sector, how many workers might enter the market if earnings or utilization rises in that sector or falls in adjacent sectors (see above).

⁸ A vertical market could produce latency data (number of workers who have stopped being active). But it would be largely meaningless, many could simply have moved out of the area. Horizontal markets can capture workers qualifying for a sector who have switched off that option *while remaining active in other sectors*.

			<i>sectors. Hygienists have 30% latency."</i>	
6.	Prioritization	The ranking of this sector by its workers. ⁹	<i>"Our vending machine replenishment workforce is ranking very low. Only 10% of them have it among their first release availability."¹⁰</i>	Low prioritization is a more subtle indicator of the issues captured by high latency. It points to unpopular or badly paid work being used as a fallback. This should raise concerns for companies reliant on that labor.
7.	Time to Enter	If there is a minimum requirement for activity in other sectors before qualifying for this one, how long does it take?	<i>"To sell as a shift leader for ACME cinemas, a worker must have completed at least 250 hours of work as a ticket worker and parking attendant. The work-type has a 250 hours' Time to Enter measure."</i>	High Time to Enter worktypes, if accompanied by high pay or utilization, will drive adjacency of related sectors. A high figure might explain high latency (above) in the subsidiary sectors; workers are turning off the pathway worktypes after achieving the Time To Enter requirements.
8.	Dwell time	The averaged time period between entry and exit from selling in a sector.	<i>"People who offered in our market for leafleting work typically switch off their willingness to do that work after 6 weeks. Dog walkers typically last 4 years before only being willing to do other types of work."</i>	Short dwell time indicates an unpopular sector or (if coupled with high adjacency, see above) one that workers are using as a rung to reach higher-paying sectors. Buyers in these sectors may wish to create ladders of promotion <i>within the sector</i> to retain talent.
9.	Evenness of Demand	In a sector, within any given timeframe (typically 7 or 28 days), what percentage of hours booked mirrored demand hour-by-hour for the equivalent	<i>"Need for street wardens surges with warm weather. On rainy days, hardly any of them are booked. Of 1,000 hours booked last week, only 200 were at times which aligned with the previous week. The sector has low evenness at 20%. In contrast, manufacturing</i>	Evenness helps workers align with sectors matching their circumstances. Someone needing predictability of work hours around their childcare obligations would be ill-advised to seek training as a street warden for example.

⁹ In horizontal markets, a worker can list all sectors in which they sell by preference, with availability released in phases. For example, *"I really want to work as a classroom assistant, so I am available exclusively to buyers in that sector for any period of work >4 weeks away. For any hours I want to work that have not then been booked by the week preceding, I can also be booked as a hairdresser, cook or gardener."*

¹⁰ The math of [ranked-choice voting](#) will likely inform formulation of rules around condensing workers' diverse lists of preferences into a uniform figure.

		preceding timeframes?	<i>operatives worked 9-to-5 in 98% of bookings over the last 10 weeks"</i>	
10.	Time Elasticity	The extent to which demand in any sector for hour-by-hour labor or other resource will shift to align with times supply is available, captured as a percentage of booking that are strictly timebound.	<i>"House cleaning in our region is highly time elastic. Homeowners tend to have a cleaner they know and will allow the market to schedule a weekly clean when that person is available. 80% of buyer requirements are input with a "anytime within these days" time frame. By contrast our market for school-lunch supervisors has 0% elasticity; hours are fixed and never adapt even if there is enormous supply of qualified workers at other times of day."</i>	Time Elasticity points to sectors suiting workers who have unpredictable periods of availability, for example because of a medical issue that comes and goes day-to-day. The measure is a useful adjunct to Evenness. A sector can have high Evenness ("I need 4 hours of cleaning every week") but also high Elasticity making is suitable for those needing very personalized hours of work.

ii) More granular, real-time data that a vertical market could produce and exploit

These metrics could theoretically come from a vertical (one type of work or a limited range of assets on offer) market, but the data are typically submerged at present.

	Metric	What the Metric Captures	Example	Value of the Metric
11.	Hours booked	In any given timeframe and geography, how many hours were purchased in this sector?	<i>In our city center last week, 1,438 hours of pest control officers were purchased.</i>	Enables assessment of the overall relative worth of the sector. If only small numbers of hours are ever booked, it may not matter what the utilization or adjacency (above) is.
12.	Unit earnings	What is the mean pay per hour, rental charge per hour or unit cost paid to the current owner in sale of an item?	<i>"Rental of X-box gaming consoles locally commands \$3.38 an hour on winter weekends."</i>	A crucial datapoint for anyone thinking of entering a sector on the supply side.
13.	Overheads	What percentage of the unit earnings appear in any mark-	<i>"Our childcare workers must be vetted and employed through a certified agency. Agency</i>	This information helps new intermediaries decide if a sector is worth entering.

		ups paid by the buyer?	<i>charges plus the system's mark-up total on average 29.3% of workers' earnings."</i>	
14.	Rate elasticity	The extent to which an increase in the unit cost (e.g. an hour of a worker's time) has diminished utilization (see above) in that sector over time, expressed as a ratio.	<i>"Pay per hour for pick-and-pack workers rose 4% on average last year. But utilization fell by 8% as more workers added the worktype to their portfolio and warehouses reduced their staffing. Rate Elasticity for the sector was 1:2, for every 1% rise in pay, utilization fell by 2%."</i>	A high historical ratio suggests workers should limit their exposure to this sector or aim to keep it diluted (above) in their portfolio. Any increase in earnings will likely be followed by a drop off in bookings.
15.	Clustering	A measure of how big bookings are in this sector.	<i>"A single booking of assembly line workers tends to cover 50 workers at a time, childcare assistants are being booked individually, one person per booking."</i> Clustering is best displayed as a line graph of number of units, or number of workers per booking.	A highly clumpy market (few bookings but big ones) is bad for workers seeking to differentiate themselves. Reliance on clumped sectors suggests a worker who is being commoditized, lacking differentiation and therefore market power.
16.	Transaction duration	If a purchase is for the hours of a person or item, what's the mean length of each booking?	<i>"Rental of tents is averaging 6.2 days locally. Scaffolders are being booked for a mean 82 hours spread over 27 days."</i>	Sectors with long transactions suit workers wanting predictability, short transactions are good for those wanting to maximize opportunity and connections with different buyers.
17.	Buyer cancellation rate ¹¹	How many of the purchases in a dataset were cancelled before they started by the buyer or their agents?	<i>"Hotels are booking extra room attendants in expectation of busy weekends but then cancelling the bookings when the weather disappoints. Last week 42% of booked hours</i>	High cancellation - if allowed and uncompensated - suggests workers should be commanding a pay premium across the sector to reflect the opportunity cost of being out of the market while other buyers possibly in other sectors could have booked them.

¹¹ Truncation of bookings should also be reported; the rate at which a person is booked for 10 hours for example, but then their timesheet shows they only worked 6 hours. This metric is less clear cut because the system doesn't necessarily know which party instigated truncation, it could be a worker feeling sick.

			<i>were cancelled by the buyer."</i>	
18.	Worker cancellation rate ¹²	How many bookings were cancelled by workers?	<i>"Our city beautification crews experienced a 27% worker cancellation rate last year."</i>	High cancellation, particularly if paired with low passivity (see above) and a high PoN (see above), points to opportunistic workers treating bookings in this sector as a fallback to be abandoned if the market shows something better is available. It's one more measure of a sector's unpopularity, a concern for firms reliant on workers with the relevant competencies.
19.	Period-of-Notice (PoN)	The mean hours and minutes that a worker is informed of a transaction before the first minute of the assignment.	<i>"Our gardeners are being booked with only 98 minutes' notice of each assignment. Furniture restorers are being booked 23.7 days in advance on average."</i>	This metric helps identify what types of work are right for a person. Someone with unpredictable availability for work ("because of recurring back pain, I won't know if I can work tomorrow until the day") could profitably focus on short PoN sectors. A lone parent needing to make childcare arrangements in advance should aim for higher PoN worktypes.
20.	Travel distance	Within any dataset, how far are workers or goods transiting from where they are based to the location of the transaction?	<i>"Our workers aged 18-26 are travelling an average 5.4 miles to each work assignment currently. In our market for local delivery, pizzas are travelling 1.3KM on average from takeaway to the buyer's doorstep."</i>	A high travel-to distance points to a financial, and ecological, case for skilling more local people to meet the needs of the sector, particularly if earnings are low.
21.	Cost of entry	What would it cost, from a standing start, to acquire any certification required to enter this sector as a worker?	Renting a room to overnight guests is predicated on having a fire certificate for the home, average cost \$120. Work as a residential care assistant demands a LiveScan certificate, costing \$25.	Coupling Cost-of-entry with adjacency (above) can inform construction of steppingstones between sectors (see below)

¹² This could include no-shows; workers for whom a transaction doesn't proceed to payment because they didn't cancel but didn't provide either.

22.	Income passivity	The commitment of a person's time required to fulfil transactions in a sector. ¹³	Janitors have 0% income passivity; they are paid by hours they make themselves available for work. Someone renting their bicycle by the week enjoys near 100% passive income, apart from checking the machine out to a renter they need do nothing to earn from the sector.	A person or business earning in these markets may want to compare their percentage of passive income to averages for peers. A portfolio of both passive and active income will likely boost earnings.
23.	Perishability	To what extent can the resource on offer be sold at any time?	A person's availability for work has 100% perishability, if I want to work from 5PM to 10PM today and don't get booked I can't sell those hours another day. A market for sale of antiques has zero perishability, if a vintage brooch doesn't sell today, it can be purchased tomorrow.	High perishability coupled with low utilization (above) in any sector should raise a flag for policymakers. It shows misaligned resources in the economy. If there is also low Worker Diversification in the sector (above) that shows workers are too reliant on a sector with little prospect of generating income.
24.	Unmet needs	What proportion of requirements entered by a buyer did not produce sufficient workers to meet the need? ¹⁴	<i>"Our buyers trying to rent floor buffering machinery are getting a 'no resources available for your specific requirement' message 38% of the time."</i>	This metric - if it can be trusted, see footnote - is an extreme indication of high utilization.

¹³ The markets system could analyze this over time from activity data, for example computing the rate at which workers sell in one sector at times that overlap their sale in another sector. (*"I can't sell as both a janitor and a truck driver between 2PM and 6PM today, but I could be booked as a janitor and ALSO rent out my bike in the same hours."*) Or the figure will come from the taxonomy of sectors which would categorize between selling labor and other resources.

¹⁴ This datapoint should be treated cautiously. A buyer may just be "window shopping", seeking insights into costs and market depth with no intention of purchasing. Or requirements may be being input in an attempt to skew reporting, for example a provider of horse riding sessions attempting to generate data showing enormous demand ahead of a presentation to local investors. Utilization is more meaningful, reflecting buyers who pay.

E) External data

- Listings of local training courses/costs/times
- Traditional labor market metrics such as [O*Net](#) "hot opportunity" codes in the US
- Transportation timetables (many workers rely on public transit)
- Local business news/trends: e.g. business journals, trade association blogs
- Volunteering opportunities (can be used to create suggestions for steppingstones)
- Job vacancies (can be correlated to a worker's Total Addressable Market for anyone wanting to go full time).
- Weather reports (can correlate to demand, e.g. for tourism workers)
- Demand movers: announcements by a key body that can create need for workers in multiple businesses, e.g. a convention center whose events fill up local hotels and eateries.

F) AI rewards

i) Market metrics generally

- **Utilization management** : This measures alignment in the local labor market. Officials might set a target percentage, perhaps initially 60-75% of hours offered getting booked across all sectors. (100% utilization is not desirable, it leaves no headroom for the market to fill buyers' needs. The balance between capacity and employment levels is a political decision.)
- **Target zones**: AI could identify outliers in utilization defined by worker attributes, geography, sector, or other factors. Rebalancing those outliers is then a "next week" target for the AI. ("Our sector for car mechanics has a young average age, very low Worker Diversification so people are reliant on that one sector, and utilization of only 30%.)
- **Growth**: There may be aims for the increase in market activity (hours booked per week).
- **Diversification and resilience**: Broadening the number of buyers and types of work being traded in the markets system could be a constant quest on the road to a robust economy. ("We remain too exposed to agricultural work, adjacent worktypes need to be boosted.")
- **Effectiveness of proactive proposals**: Users' rate of accepting AI tool's proposals e.g. when it suggests then organizes a reception for targeted workers to excite them about working for a company needing more labor.
- **Value for spending on interventions**: RoI for any funds the AI is allowed to invest (allocation of Peer Navigators perhaps) versus the income/utilization gain for beneficiaries.

ii) Outputs for workers supported by the AI

- **Performance potential realized**: Increases in pay utilization, control over hours, skills gain, new employer relationships or whatever mix of targets matter to the user - see Section C.
- **Efficiency of dialogue**: How much back-and-forth dialogue did it take to achieve the desired outcomes for the person?

- **Qualitative research:** This might include the chatbot periodically asking a person, for example *"A year after we started working together on your progression, how happy are you with your types of work, time of work, travel distances, and so on?"*

G) Data processing

How does AI crunch the vast data resource a horizontal market system provides? Some obvious building blocks are outlined below.

i) For workers: The "Total Addressable Market" (TAM) concept

- Any worker in GoodFlexi has a **TAM** derived - in its simplest form - by looking at demand for that worker's skills (badges) within that worker's travel area, at times the worker is generally available, and hourly pay for bookings. The TAM can be:
 - **Historic:** based on data from [last 3 months] for example
 - **Predicted:** extrapolated from historic but applied to forward looking utilization over, perhaps, the next 4 weeks.
- Scoping of the worker's TAM can involve data that is:
 - **Internal:** derived directly from activity in GoodFlexi
 - **AI sourced:** The AI agent can build information from buyers in the TAM (section 2C).
 - **External:** data sourced from other locations (see section 2E above)
- Understanding of the TAM can then be used to inform discovery of further factors about the worker (section 2C above):
 - **Goals/interests:** e.g. *"There's a lot of need for market research interviewers starting in April each year in your travel area. Could that work be of interest? You have said Yes to the "I will work outdoors" badge"*.
 - **Hidden abilities that could be monetized:** (e.g. informal childcare expertise).
 - **Availability constraints:** could they work Sunday mornings if it paid enough to warrant childcare and they had >36 hours notice?
 - **Travel area realities:** Is the person clearly dependent on a certain subway line or bus route? Can that inform a more precise travel-to-work area (e.g. *"Anywhere within 10 mins walk of a stop on the 158 bus line"*)?
 - **Radical possibilities:** e.g. move to another location, add (or exploit) a completely separate skill e.g. trucker becomes junior soccer coach, shift availability (*"What could the worker theoretically earn in this TAM if willing to do night shifts?"*)

ii) For buyers: Total Supply Market (TSM)

- This is the inverse of each worker's TAM, the universe of workers who could meet the buyer's needs in terms of current travel area, skills, rough times of availability, minimum shift length rules, etc. What can AI deduce as themes and trends in the buyer's TSM?

iii) Predicting market trends

This is base data underpinning decision making:

- Anticipated shifts in each TAM or TSM can be assessed. Simple example: *"What is the correlation between weather actual/forecast and bookings of theme park workers?"*.

iv) Decision making

Ways that AI could seek its rewards (Section F) when parsing transaction, user and sector data (above) could include experimenting with likely outcomes for these paths:

- Construct opportunities:
 - Two types of opportunities:
 - BU: (e.g. a big hospitality event over a long weekend needs waitstaff)
 - BU: e.g. shortage of roofers generally shown by high utilization or rapid pay rises
- Compute latency (workers who could benefit from an opportunity but won't because of their personal parameters for accepting work). Within each opportunity, deduce if any "latent" worker could benefit by:
 - Changed availability hours
 - Additional skills (and other badges e.g. setting *"I will work with pets"* to Yes for homecare workers.)
 - Roles
 - Existing roles that the worker has set at not accepted
 - Additional roles
 - Path to each role (badge gain and Rol)
 - Location change
 - Extend/refine travel area (e.g. *"Within 15 mins walk of any stop on the 132 bus line"*)
 - Radical new location (look for link, e.g. where worker's mother lives for example)
- Evaluate each opportunity for each worker
 - What pay gain could be assumed for worker?
 - Is this gap in the market going to last, or has it been recommended to so many workers already it risks saturation?
 - Based on the above: Is it worth informing worker?

- If so, what actions could be offered (e.g. change availability/register for a course)

H) AI products

Outputs of an AI layer sitting on a horizontal market system could include (a) alerts to an individual user (b) regular chatbot check-ins to offer insights and build an ongoing picture of each user's appetite for the possibilities available (c) reporting, possibly through dashboards that synthesize multiple datastreams to arrive at a simple, unified, verifiable, set of regional economic indicators.

i) Key agentic AI functions to boost user outcomes

This table illustrates potential outcomes that a user might want their AI agent to pursue within the markets system.

	Function	Notes
FOR WORK-SEEKERS		
1.	Increasing utilization	Scaffolders can't work during rain in many jurisdictions. Knowing this, an AI can seek worktypes that historically correlate to bad weather and map steppingstones between them for each scaffolder who might seek higher utilization.
2.	Increasing regularity	Life circumstances can make a worker seek predictability or plenty of notice of commitments. If someone tells the AI their sister is now able to share childcare duties on certain days, a path into sectors with long durations and/or high time elasticity would be welcomed.
3.	Increasing reliability	Someone who is proving unreliable could be helped with lateral moves into a personalized blend of adjacent sectors with high PoN (above) or long durations.
4.	Alignment: availability	Low utilization (above) can be addressed by seeking adjacent sectors that have high utilization at times and in the geography that a person is able to work.
5.	Alignment: geography	Multiple metrics could be targeted by lifting a person's TAM (section G above) onto alternative regions, particularly those where the person has expressed affinity or availability of accommodation, such as people with whom she might stay.
6.	Badge analysis	How big is the jump (in time and cost) to the next level of badging for this person? What badges could increase earnings or propel other targetted metrics for the person? And so on.
7.	Role analysis	As above, but involving crunching of possibilities around their current roles, active or switched off and roles for which they are perhaps only one or two badges away.
8.	Stepping Stones: general goal	A person may want the broadest possible experience, to build a work record that will help most when they move to another area, to increase earnings or countless other objectives. The tools in section G should help once a metric-focused goal is understood.
9.	Stepping Stones: specific goal	Adjacency and sector utilisations are key in plotting paths to an outcome such as " <i>I want to be a receptionist for an opticians</i> ".

10.	Nuanced availability	Suggestions for tweaking times of availability for work might explore a person's tolerance for longer periods of availability, entering availability further ahead, and so on.
11.	Benefits administration	Some workers will qualify for multiple complex benefits regimes which AI can shop using the person's market activity data in search of their best deal.
12.	Shadow selling	This facility allows a person who is not in the markets system, but is considering the possibility to test options ("I really want to leave my job, what could I earn doing nonjob work?") Showing their pattern over last week or next week for example involves subjective counternarratives; given their attributes, location, aspirations, readiness to adapt, what would the person be worth hour-by-hour in the market?
FOR BUSINESSES		
13.	Shadow buying	The counterpart to shadow selling. "How would these markets respond to our entry?" Modelling of supply/demand/utilization changes could inform advice on market-clearing payrates for instance.
14.	Business case for training a cohort	How much income could a widened pool of workers trained in a firm's processes add to their bottom line? Could it allow them to opportunistically trial new business lines, big for bigger contracts, outsmart competitors who haven't noticed a tightening labor market?
15.	Business case for creating a job	At what point does the overheads and risks of on-demand workers merit offering one of them a full time traditional job?
16.	Two-way scheduling	Instead of issuing work rotas, a company might invite it's pool of approved staff to list hours they want to work in the horizontal markets system then allow AI to buy those hours within rules to maximize outcomes for both parties.
FOR POLICYMAKING		
17.	Initiating interventions	A goal such as "Offer anyone with <15% utilization 10 one-hour sessions with a Peer Navigator" is simple. More sophisticated aims might spot underperformance or misalignment across the market before it impacts a person's pocketbook then construct an intervention (eg retraining) with a business case.
18.	Targeting interventions	AI can be given tools like "Ringfenced work", perhaps 1,000 hours of work on city beautification crews to be awarded to people most needing a chance to prove themselves and get on the rungs of a labor market ladder.
19.	Synthesized reporting	This outputs hour-by-hour labor data within other measures of regional wellbeing such as a correlation between increased flexibility for mothers and take up of family awaydays.
20.	Administration of public assistance	Many welfare claimants work and in some cases have to prove activity to continue receiving their funds. AI can help find that work and progress it, see above, it could also absorb specific rules around entitlement and use activity data to make a case. For example showing a person was genuinely available and willing to work but skills mismatch kept them inactive last week.
21.	Impacts of any intervention	If the AI spots local benefits in training a pool of workers for dementia care, what consequences can be spotted elsewhere around the markets? For example, did it suck hours out of home cleaning markets?
GENERAL		
22.	Comparative analysis	This involves AI looking across multiple regions to find matches in circumstances then seeking crossover lessons from interventions trialled either for individual users or at regional level.
23.	Substitution	Can ways to increase workers or providers from one sector to also enter another be found? Can these be counter-intuitive. Might, for example,

		warehouse workers be a good as vaccinators (because both involve working while standing for long periods)?
24.	Proactive market making	The early days of launch of a horizontal markets system in any region are vulnerable. AI could use the gamut of tools above to keep balancing demand and supply in thin markets with judicious interventions until a critical mass of activity is reached.
25.	Achieve grouping	Can workers be usefully prompted to join together, for example in a sector like leafleting where groups of people are typically booked might a bunch of workers want to sell themselves as a team? AI could see the opportunities, offer the suggestion to individuals, create a memo of understanding between them and offer them as a group.

ii) Intake products

AI can take in existing generalized documents then break them into structured information required in an hour-by-hour labor market. Examples include:

- **Worker CV:** Worker dumps their CV into the chatbot which then parses badges they should have plus roles they could do then (a) patterns of availability to maximize earnings (b) likely weekly earnings
- **Text outputs:** Translation or proactive writing of profile text.
- **Pro-active recruitment:** e.g. let users register their Facebook account and agent advises if/when it has a pathway for that person through irregular work, or work to fit around current f/t.

iii) Buyer-specific analysis

- **Suggest candidates:** *"I have 5 fork lift trained drivers looking for work at weekends living within a mile of your warehouse, they can't work for you currently because they haven't done your induction. If you tell me when you have a team leader available, I can arrange a time when at least 4 could be booked for your 2-hour factory induction, becoming accessible to your managers immediately after."*
- **Selection of job candidates:** Similar to above but applied to lists of hour-by-hour workers seeking a move to full time. The buyer dumps a job description into chatbot to get a list of workers that best meet requirements.
- **Proactive approaches to a new user:** *"I see in the local business journal you are opening a contact center. Can I share details of ten local residents who have proven track records as customer agents and want to move into f/t employment, they are currently averaging \$18.52 an hour."* (Data could be passed to the local workforce agency to action.)
- **Rating of workers:** Particularly unbooked ones, based on profile text and reliability record.
- **Anti-discrimination tools:** who was skipped over when ratings applied or bookings made? What characteristics, if any, did those workers share?
- **Data driven marketing to employers:** Armed with the very granular reporting AI could approach employers with targeted propositions, such as:

- *"You have a shortage of pool lifeguards and pay \$20 an hour. We recently introduced a 'I am a confident swimmer' badge and have 40 residents with at least 15 reliable hospitality work bookings, averaging \$18 an hour, who have selected the badge. You could offer them a swimming test, resulting in another badge you issue if they meet your criteria. Then you would have a group worth putting through Red Cross Lifeguard certification whose hours you could book as needed from that point on."*
- *"We have 100 workers who have demonstrated reliability in landscaping or gardening. We are organizing a day with construction firms to share data on this group, hear from some of the workers about why they work outside regular employment and discuss skills gaps the industry might fill with these useful people."*
- *"Social media noted your restaurant had long lines for service last weekend. Next Saturday, we have 350 hours of availability of credentialled, experienced, hospitality workers living within two miles of you. Can we send a login so you can browse details? Maybe introduce you to one of the intermediaries who can set you up on the markets system?"*

iv) Intermediary-specific analysis

- **New business outreach proposals:** (e.g. *"You have a lot of line cooks with proven reliability who need only a basic culinary qualification to be under-chefs, do you want to approach eateries?"*)
- **New badges/roles suggestions:** based either on workforce potential/untapped skills or market data.
- **Partnership suggestions:** *"These are the intermediaries who could solve your skills gaps or grow your workers in new directions."*

v) Triggering and managing market interventions

As market activity develops, a range of low-level, low cost, interventions could be introduced then applied to any worker given the appropriate badge or matching a pattern of activity that merits support. Crucially, AI can be given authority to manage a range of human-centered interventions (rather than just on-screen dialogue). Example initiatives that could be marshalled include:

Anchor Employers	Someone seeking personalized work hours might find a business saying <i>"If you will be available at least 20 hours per week, we undertake to buy at least 8 of them based on our needs that week"</i> . This creates some predictability for both parties.
Guaranteed Work	A budget for tasks such as park cleaning crews could be ringfenced for residents who most need the work. Thus, any enrollee likely to struggle to get their first work bookings in FlexKY could be badged as entitled to 4 mornings' work within a clean-up crew. Getting their timesheets approved then shows initial reliability, earning onward promotion or upskilling. Failure to turn up for a morning that was chosen by the person triggers oversight and additional support.
Group Skilling	Basic, easily acquired, credentials can be transformative for irregular workers. Public workforce funds might be used to incentivize reliability with new badges. For example: <i>"Anyone who reliably completes 10 work assignments in retail will qualify"</i>

	<i>for our next group class on ServSafe Food Handling". With that badge they will become attractive to hospitality businesses as well as shops.</i>
Peer Navigators	An initial pool of, perhaps, 10 reliable workers could be trained to support others struggling in the labor market. A struggler may be allotted 12 hours of a navigator's time, meeting in local cafes or libraries to review progress. Navigators complete case management forms. They are more cost effective and likely relatable than office bound 9-to-5 case managers with rigid appointments.
Work Buddies	Someone already working at a warehouse through FlexKY could, for a pay supplement, be assigned to support an individual scheduled on the same shifts.

None of this undermines higher-level professional support for work-seekers with serious barriers to employability. The aim is just to have a layer of community based, highly accountable, easily expanded, cheap but high impact programs to which nonstandard work-seekers can be assigned.

I) Ethics/risks

We focus on issues specific to hour-by-hour labor markets (rather than generic risks for any system storing user data). Some risks pertain to individual users others are systemic, ways the AI might skew a regional economy.

i) Immediate dangers

- **Privacy breaches**: A skilled user could interrogate our chatbot so it provides successive market datapoints that can be triangulated to establish one person/company's activity. This could have specific hostile intent, for example an anti-union group seeking to establish the monetary value of being badged as a member of a given union.
- **Sensitive personal data**: Some of our people earn illegally. To maximize insights, a person may confide they are undocumented, or cleaning houses off-the-books. Could the AI be subpoenaed by authorities?
- **Diminished aspiration**: It is easy to imagine a scenario where a worker effectively gives up on an eclectic career goal, becoming a jeweller for instance. It is such a thin market and likely to be off-platform in its need for workers, AI would likely not spot it and so could not understand it. A capacity to exploit external data, and sympathetic prioritization of priorities to which it can contribute little must be coded.

ii) Systemic issues

- **Over-intervention**: The AI may deduce shortage of checkout operators locally but suggest the training to too many people, flooding the market. The Anticipated Utilization metric (Section D, above) is key to managing this risk by forecasting new entrants into its view of any sector's value.
- **Unseen events**: A call center might rely on high turnover of call handlers, each using the work as a steppingstone onwards. AI would logically respond by building an ongoing funnel of people moving towards including this work in their portfolio. But an event such as sudden closure of the facility could blindside the AI leaving workers who may have invested in training at its suggestion unable to recoup those costs. Evaluation online speculation by local business commentators as part of the external data intakes could encourage AI to hedge big bets like this. Analysis of concentration of each strata in the local labor market (contact

center work is often a bridge from \$18 an hour roles to worktypes earning \$20+) and Clustering of those bookings (Section D) could also minimize reliance on one buyer.

- **Market manipulation:** Unscrupulous actors may wish to distort market data to trigger unhelpful interventions. As example, a fencing company noticing high adjacency for their workforce with house painting might (a) buy all the workers they need for next month (b) create sequences of failed transactions for higher paid house painters. This could prompt the AI to suggest fencers focus on painting next month, denuding the perpetrators' competitors of qualified workers. Analysis of unsubstantiated market signals (Section D) is crucial to separating genuine market-moving datapoints from manipulation.

There is no silver-bullet mitigation to every risk. Transparency, guardrails, opt-ins, and prompts such as "*Do you want me to forget what you just told me?*", will likely all be needed.