Transforming Corrections
Using Artificial Intelligence, Design Thinking and Digital

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Executive summary

The number of people incarcerated in the U.S. has increased almost five-fold over the last 40 years to almost 2.2 million. Illinois has one of the top ten largest incarcerated populations in the U.S. Almost 40% of the individuals released from Illinois' custody return in three years. Tighter budgets for programming and treatment and community support present challenges for providing appropriate rehabilitative care.

Facing down these external challenges, the Illinois Department of Corrections (IDOC) is transforming itself to become nation-leading, by safely and efficiently reducing its population, focusing on reintegrating individuals with their communities and improving safety within correctional facilities. IDOC has deployed machine learning techniques and design thinking to transform its core, emphasizing rehabilitation and addressing operational challenges, ultimately driving reductions in recidivism and violence.

Leveraging design thinking principles, IDOC completely re-framed the correctional ecosystem from the viewpoint of the incarcerated individual. This perspective allowed IDOC to develop a strategy focused on identifying the specific needs of the custodial population and ensuring that resources and operations are optimized to serve those needs.

The Classification, Assessment, Rehabilitation and Engagement (CARE) tool was built to enable this transformation. It improves efficiency of critical processes along the individual journey and leverages machine learning models to improve classification, placement and treatment decisions. The CARE model predicts the violence propensity and urgency of rehabilitative care required for each individual. The models leverage a vast amount of data and have significantly higher accuracy than traditional scoring systems. The models were also rigorously and independently evaluated for accuracy and fairness across protected groups.

CARE was built iteratively in collaboration with stakeholders, features an enhanced user interface to improve process efficiency, and resides on a fully scalable and secure technology stack. CARE helps IDOC:

- Place the individual at the center using insights from the models
- Leverage machine learning models to objectively classify, place and house over 39,0000 residents throughout 28 correctional centers and treatment facilities statewide
- Reduce dependency on paper through digital front end
- Start re-entry at intake with individual rehabilitation plans
- Share data with other agencies to enable continuity of care for individuals
- Support staff decisions, wellness and well-being

With CARE, IDOC can deliver a positive material impact to the ~65,000 (historically underserved) population under its purview, improving their treatment and custodial experience to successfully reintegrate with their communities. IDOC staff can feel safer, are more engaged and have higher job satisfaction and wellbeing. In addition, the financial impact could be significant. Getting to best in class would mean a 10-15 percent reduction in recidivism and could translate to IDOC productivity gains and reduced taxpayer burden.

Concept

BUSINESS PROBLEM

IDOC faced two main challenges with addressing the issues of high recidivism and improving safety by reducing violence in facilities:

- **Legacy tools that weaken decision making and are geared more toward punitive programs and interactions.** Legacy tools have shown limited efficacy in promoting rehabilitation with staff overriding over thirty percent of decisions. Staff also express difficulty and confusion in using these tools, expressing lack of clarity of roles and responsibility and lack of transparency and accountability in outcomes of decisions being made. This leads to sub-optimal classification, placement, and treatment of the custodial population.
- **Manual processes and access to data.** Staff spend a lot of time reviewing data, which is often unstructured and subjective, from multiple paper and digital systems. Lack of data sharing among agencies also prevents delivery of continued care. For example, despite intake processes in jails and prisons being similar, efforts are still duplicated. As a result, staff have less time to spend on more rehabilitative interactions, such as one-on-one counselling.

STRATEGIC APPROACH

To overcome these challenges, IDOC set an ambitious goal: To become nation-leading in reintegrating incarcerated individuals, while simultaneously improving public safety and lowering the burden on state resources.

Figure 1: IDOC transformation strategy to achieve its correctional goals

SOLUTION ARCHITECTURE

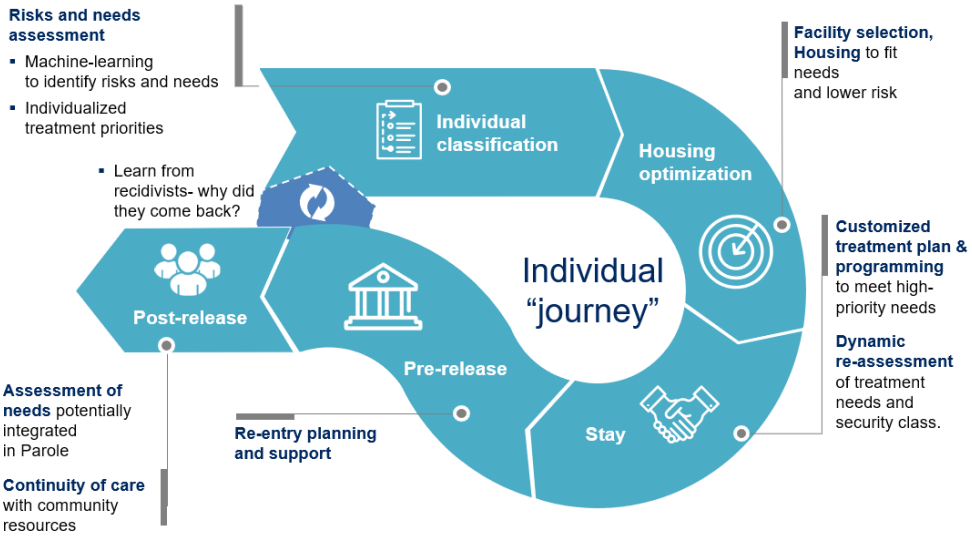
To address these challenges, IDOC embarked on development of the CARE tool. CARE is a major enabler across the entire transformation and helps IDOC:

- **Place the individual at the center.** Models provide deeper understanding of individual needs
- **Start re-entry at intake.** Needs-based rehabilitation plans for each person at intake
- **Realign resources efficiently.** System-wide view of demand for programming and treatments, identifying high-risk population clusters to prioritize
- **Share data to enable continued care for individuals.** Secure cloud infrastructure helps create data bridges with other agencies to enhance data and reduce duplication of effort
- **Support staff decisions and wellbeing.** Intuitive interface supports better decisions and reduces time spent on manual tasks; allows staff to focus on fulfilling/rehabilitative activities

Together, the design and insights from the CARE tool support staff to make more rehabilitative decisions for the individuals in custody. CARE development involved several important elements.

- **Design-thinking:** CARE was carefully designed to focus on an individual's journey through the correctional network. IDOC leadership hosted and led multiple workshops and ideation sessions with members across the organization (administration to front-line staff) to better understand the needs and perspectives throughout one person's stay. In iterative sessions, IDOC segmented the journey, identified critical pain points, and developed analytical and operational strategies to optimize an individual journey from intake to release. CARE's design and business functionality was built on this design thinking approach, to serve a specific role in each step of the journey.

Figure 2: Analytics and design thinking embedded across the entire "individual journey"



- **Machine learning models:** At the core of CARE, six important machine learning use cases were identified as key decisions being made by staff during the individual journey through IDOC and these were implemented to help IDOC achieve its goals:
  - **Risk assessment** – Initial/re- classification of offenders to identify level of violence propensity
  - **Needs assessment** - Individualized rehabilitative assessment of treatment needs giving overall needs urgency and categories that require most attention (e.g., substance use, employment)
  - **Housing** – Ranked assessment of facilities and galleries for placement of each individual based on programming available at the facility and group dynamics within the gallery
  - **Cell pairing** – Side-by-side comparison of cell pairs based on propensity of violence
  - **Segmentation** - Identify clusters of need among the population to allocate resources
  - **(Future) Intelligence** – Relationships (e.g., influencers) and networks within the population

  IDOC partnered with technology and strategy vendors to build these complex machine learning models; oversight and decision-making was performed by IDOC leadership. The models were trained with large amounts of data from multiple systems (e.g., Illinois' CRM platform, various intelligence/ops PC-based applications) that included over 400K demographic and assessment records (as far back as the 90's), ~900K incarceration records, more than 3M rows of disciplinary incidents and almost 400K intelligence reports.

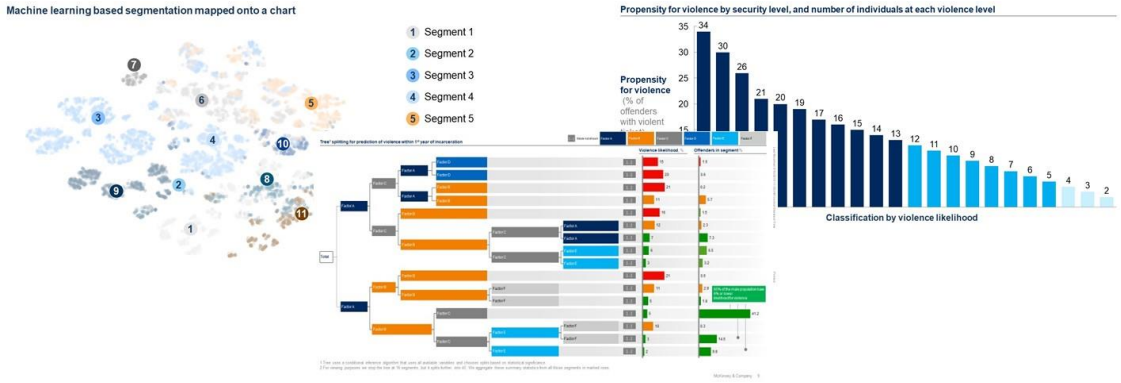
  IDOC used the latest machine learning techniques (e.g., decision trees, random forest) to build gender-specific models and rigorously assessed them for:

  - **Accuracy**–Defined accuracy measures within the IDOC context (e.g., accuracy of detecting high violence, inaccuracy in classifying as low violence)

- **Explainability**–Invested in visualization of decision trees, and deploying interpretability models to give users insight into the key drivers of predictions
- **Stability**–Tested model over several time periods to minimize drift over time
- **Fairness & bias**–Independent review to test accuracy across protected classes

By using cutting edge technology, a rigorous build-test approach and more data, these models significantly outperformed traditional scoring systems across all metrics.

Figure 3: Machine learning output charts



- **Scalable technology infrastructure:** Prior to 2018, IDOC migrated its legacy mainframe technology to a secure cloud-based infrastructure which enabled greater process digitization and data sharing. CARE is built on top of this cloud-based CRM, providing many benefits.
  - The cloud-based CRM **enables high degree of data quality**, serving as the consolidated center of all IDOC offender data and having multiple built-in back-up and storage procedures.
  - CARE **leverages** many of the existing technologies in the **cloud-based ecosystem to build** in a **security-first approach** to ensure safe operation of the tool.
  - Finally, the **scalability and ubiquitous availability of the cloud-based infrastructure** support seamless statewide roll-out of the CARE tool within a short time period.

  Within the CARE tool, the machine learning models are carefully integrated using specially developed APIs. IDOC understood that the models may serve purposes elsewhere in IDOC systems and, thus, set-up an infrastructure to allow the models to exist and be updated separately from the user-facing application.

- **User-centric design:** IDOC built CARE iteratively through agile sprints, in which collaborative teams of users, designed, built, tested and deployed features every three weeks. The team adopted agile and continuous improvement design principles to improve execution outcomes and enable staff adoption. CARE's user interface was enhanced for:
  - **Interpretability of models** with a visualization of key prediction drivers; and
  - **Streamlining of critical business processes** showcasing a one-page view of all the information needed to complete risk and needs assessments.

  Users and other stakeholders were involved through several design workshops and ongoing user-panel discussions to set the vision and test/improve the design during delivery. To support rollout, IDOC also conducted in-person training and several weeks of role-based training. IDOC created a comprehensive communication plan and adopted a train-the-trainer model (with change champions) to help staff adopt the new technology and support a mindset shift to rehabilitation. This resulted in a 100% adoption of CARE across 28 facilities and 500+ users.

Significance

SCOPE AND KEY STAKEHOLDERS

Justice reform and public safety is a growing concern at the local, state, and federal facilities due to high levels of incarcerated individuals, high rates of recidivism, and the resultant economic burden. Today, more than 65,000 people are incarcerated in Illinois or under released supervision[1]. Incarceration costs Illinois state tax payers $30,000 to $50,000 per person each year[2].

From a state-wide perspective, IDOC's vision and transformation, using CARE, aligns with previous gubernatorial administration's priorities of reducing population by 25% by 2025, and aligns to the new administration's priorities to "effectively re-integrate formerly incarcerated persons into society".

Diving deeper, the responsibility for this issue is shared among many agencies and counties. Still, IDOC, naturally, has the most central mandate. Improving correctional outcomes, through CARE, impacts the entire agency, from staff to all the 65,000 individuals in IDOC custody.

DISTINCTIVENESS AND IMPACT ON KEY STAKEHOLDERS

CARE is uniquely suited to address IDOC's challenges while improving outcomes for all stakeholders due to two innovative elements:

- **A design-thinking enabled, individual-centric approach to tool usage**: By building the tool to think holistically about an individual in custody – as opposed to traditional approaches that are purely functionally-based – CARE enables staff to ensure that every decision about an individual is made through a rehabilitative lens. Furthermore, the structure and development of the CARE tool supports the broader cultural and operational transformation throughout IDOC.
- **Machine learning models for predictive analytics:** CARE models have a significantly higher prediction accuracy for violence propensity and needs urgency than legacy scoring systems. Insights from these models now support key decisions, and equip agency staff to appropriately classify, place and treat individuals. Better decisions lead to less violence and more efficient resource utilization, providing individuals more access to programming to reduce the likelihood that they return to custody

These elements drive significant impact for all stakeholders. For staff, the CARE tool streamlines the processes in IDOC, simplifying their jobs and ensuring that better decisions can be made. Streamlined processes also mean additional time is saved for staff to spend on more rehabilitative efforts (e.g., one-on-one counseling). Consequently, individuals in IDOC custody benefit from more tailored assessment and treatment; these individuals have the opportunity to receive a more rehabilitative experience and prepare themselves for productive exits from IDOC custody.

Overall, CARE positions IDOC to deliver material impact in Illinois, directly improving recidivism rates, and safety in its facilities. In addition, the financial impact and social benefit will be instrumental in reducing Illinois' custodial population and helping historically underserved individuals reintegrate with society.

1 Illinois Department of Corrections, Annual Report FY2017

2 *The Price of Prisons: What Incarceration Costs Taxpayers*, Vera Institute for Justice, February 2012, vera.org.

Impact

OVERALL TRANSFORMATION IMPACT

Transformation pillar	From	To
Individual-centered rehabilitation	Static, score-based violence risk	Dynamic, data driven predictive analytics that consider how factors interact to predict violence and 'Needs Urgency'
	Different tools and manual processes across reception, transfer office, and facilities	Single, integrated tool across classification, Transfer coordinator, housing and reclass on the cloud CRM platform
Resource alignment and optimization	Inefficient allocation of resources (e.g., programming)	Optimized allocation of resources by identifying high risk offenders early (at intake)
	Security based operations and classification of facilities	Mission focused facilities that focus on rehabilitation
Transform culture and operations	Staff culture and actions based primarily on punitive and security mindset	Empowered staff and mindset that focus on rehabilitation

IMMEDIATE AND LONG-TERM IMPACT

IDOC's transformation and CARE will help prepare individuals for reintegration with society, while improving socio-economic conditions and public safety for citizens across Illinois. Impact levers include:

- **Reduced violence amongst individuals** by reclassifying and rehousing: CARE's machine learning models have shown, in testing, that they may be able to improve identification of people with high violence propensity by 10-40% and avoidance of misclassification of people with low violence propensity by 0-10%
- Deeper **insight into what drives individual needs** and what's needed for rehabilitation across their entire journey: Improved identification of individuals' needs could be the primary driver of reduced recidivism as individuals are returned to the community better prepared for re-entry. Successful implementation of programs and operations in support of CARE tool usage could support the stated goals of 10-15% reduction in recidivism
- Significantly **improve resource allocation and productivity** for all the staff: The amount of time spent on initial classification by staff could be reduced by 40-60%, totaling 8-13K staff hours. Reduced staff time on administrative tasks could mean significant re-allocation of that time towards rehabilitative interactions with the custodial population.