

#CONCEPTCOMPUTING:

BRINGING ACTIVITY-CONTEXT
AWARE WORK & PLAY SPACES
INTO THE MAINSTREAM

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This is a keynote presentation from the Association for the Advancement of Artificial Intelligence 2012 conference (AAAI 12) in Toronto, Canada. It discusses the vision and principles of "concept computing;" how this paradigm shift impacts different aspects of software functionality and value; and examines how one software company, Be Informed, is successfully applying concept computing to mainstream enterprise class applications.

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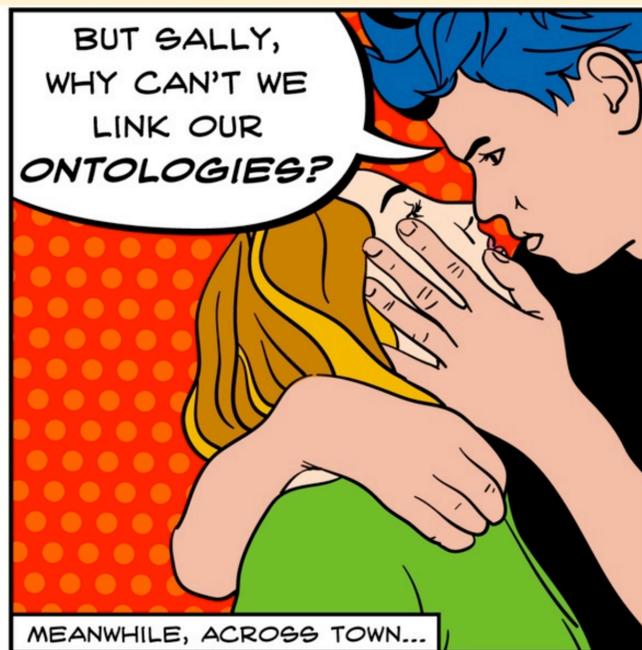
WARNING!

#ConceptComputing makes Forward Looking Statements

Any statements in this presentation that are not historical facts are forward-looking statements that involve risks and uncertainties; actual results may differ from the forward-looking statements. Sentences or phrases that use such words as "believes," "anticipates," "plans," "may," "hopes," "can," "will," "expects," "is designed to," "with the intent," "potential" and others indicate forward-looking statements, but their absence does not mean that a statement is not forward-looking. Factors that could have a material and adverse impact on actual results are described in Project10X's Semantic Wave Report. No Form 10-K has been filed with the Securities and Exchange Commission under the heading "Risk Factors." The presenter undertakes no obligation to publicly release the results of any revisions to these forward-looking statements that may be made to reflect events or circumstances after the date hereof or to reflect the occurrence of unanticipated events.

This is the entrepreneur's cautionary "forward looking statements" slide. I prefer to show it as a road sign.

ROY LICHTENSTEIN MEETS THE INTERNET OF THINGS



This triptych is from a hypothetical comic strip entitled "Roy Lichtenstein meets an Internet of Things" (1) A young woman at the left pines over which approach and investment to make to realize her dreams. (2) The

scene in the middle depicts difficulties we currently experience trying to share meanings and link knowledge models together so that both people and machines can reason with it. (3) The woman to the right depicts consumer

expectations in the near future, when almost everything we encounter has some intelligence and communicates spontaneously -- we'll be very angry if the computer doesn't understand what we mean.

Source: Project10X

Setting the stage...

TOPICS

- **WHAT IS "CONCEPT COMPUTING"?**
(IT'S TIME FOR A MAINSTREAM LEXICON. (ACTIVITY CONTEXT IS MORE THAN INTERPRETING SENSOR FEEDS, & MORE THAN A SEMANTIC WEB OF DATA))
- **HOW WILL CONCEPT COMPUTING IMPACT SOFTWARE FUNCTIONALITY AND VALUE?**
(IF IT'S A PARADIGM SHIFT, THEN "WHAT WON'T BE AFFECTED?")
- **WHERE IS CONCEPT COMPUTING ALREADY MAINSTREAM AND PRIME TIME?**
(A REAL WORLD CASE EXAMPLE...)

Three topics in this talk about concept computing: what it is, how it will impact us, and where is it already happening.

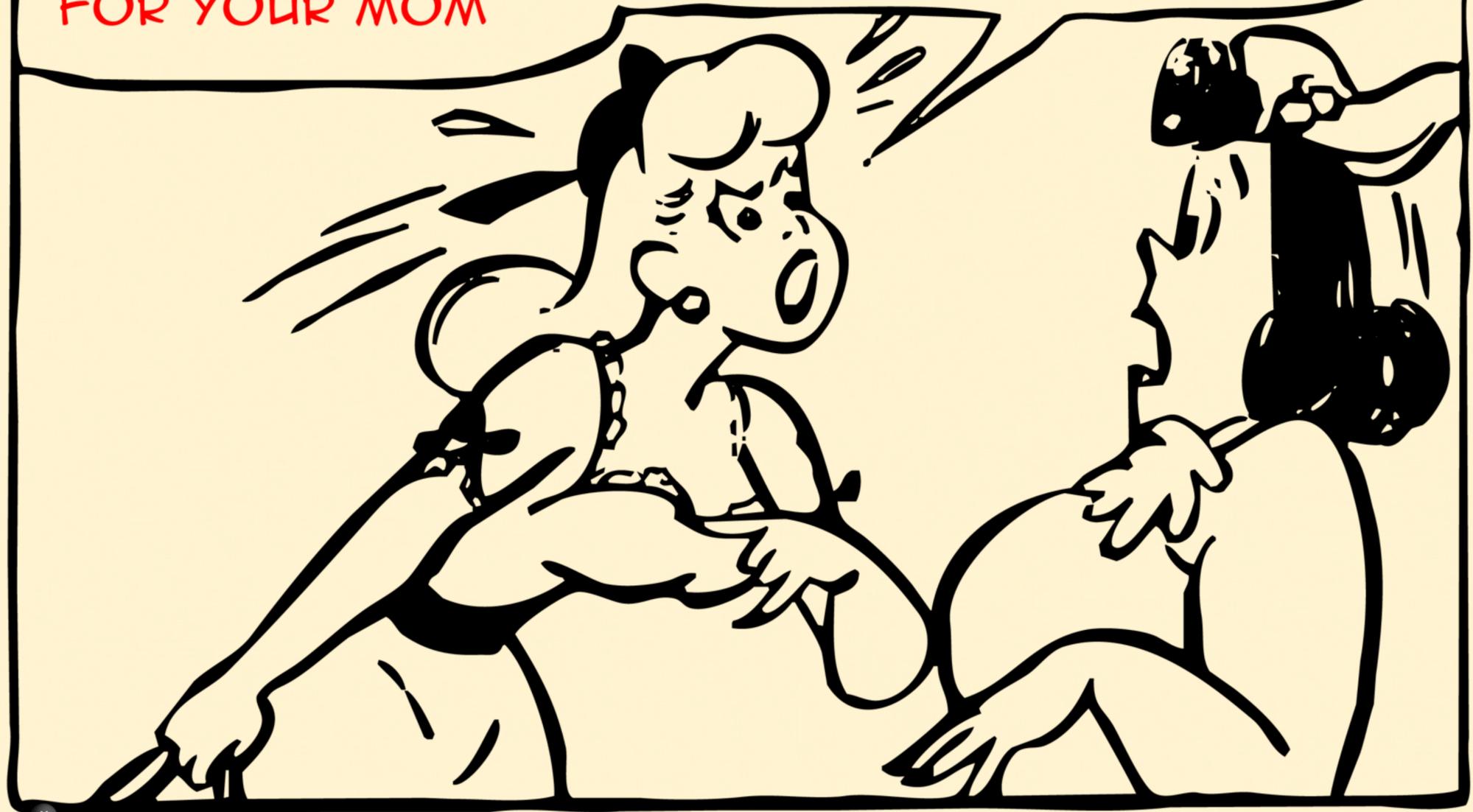


Let's travel the yellow brick road. First the vision of concept computing; then discuss the impacts; then I'll précis a company that's already taking concept computing into the mainstream.

WHAT IS CONCEPT COMPUTING?

- A BETTER LEXICON
- PARADIGM SHIFT FROM INFORMATION TO KNOWLEDGE-CENTRIC PATTERNS OF COMPUTING.
- SPECTRUM OF KNOWLEDGE REPRESENTATION, FROM SEARCH TO KNOWING.
- ARCHITECTURE WHERE EVERY ASPECT OF COMPUTING IS SEMANTIC, ACTIVITY-CONTEXT AWARE, AND DIRECTLY MODEL-DRIVEN.
- DEVELOPMENT METHODOLOGY WHERE EVERY STAGE OF THE SOLUTION LIFECYCLE BECOMES SEMANTIC AND MODEL-DRIVEN.
- A NEW DOMAIN WHERE VALUE AMPLIFIES

#CONCEPTCOMPUTING WILL DRIVE THE NEXT INTERNET. IT'S ACTIVITY-CONTEXT COMPUTING FOR YOUR MOM



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Source: Project10X

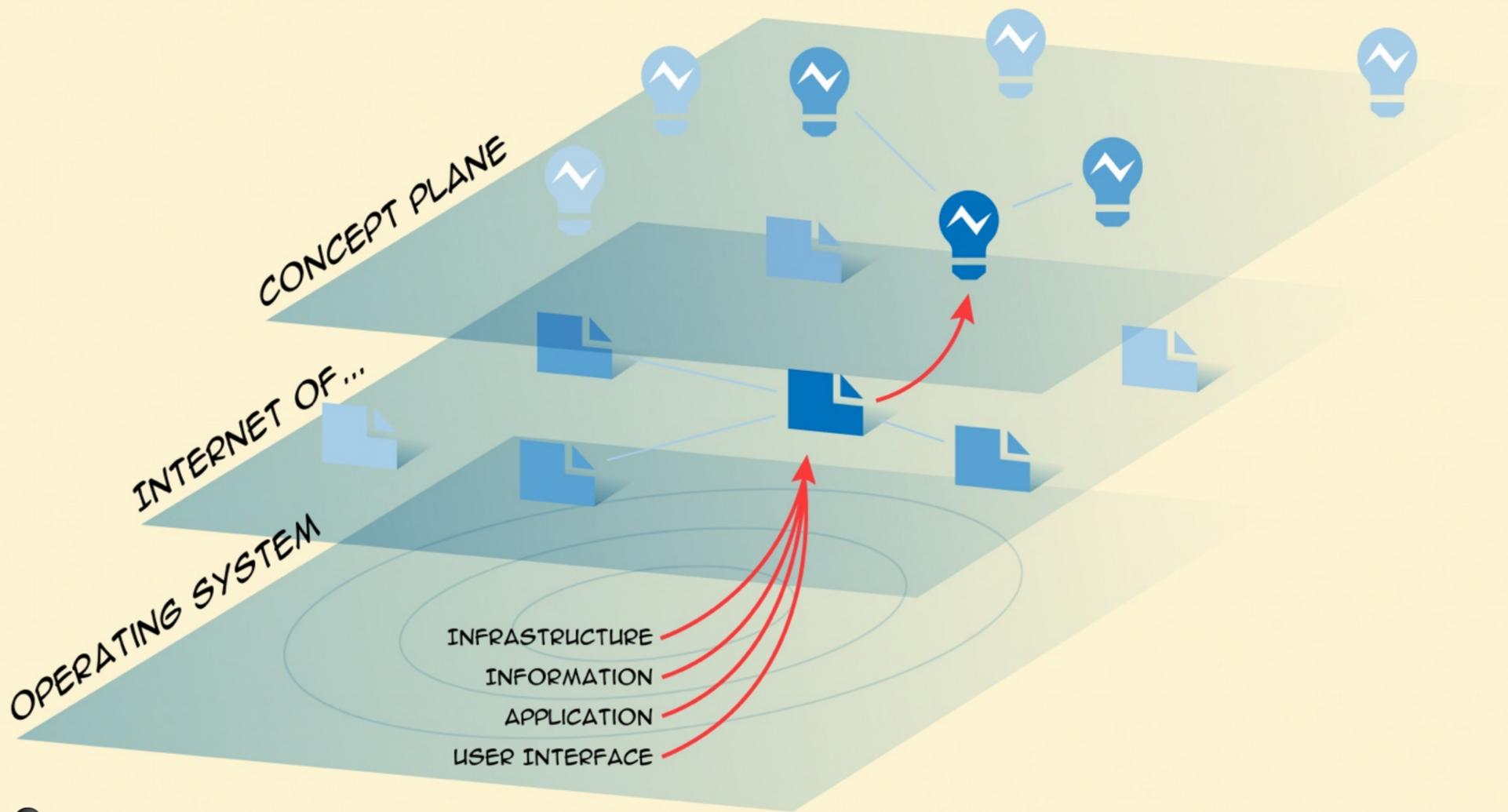
Concept computing will drive the next internet.
It's mainstream-ready, semantic, model-driven, activity-context aware technology for both consumer and enterprise markets.
But, most important, concept computing is something that broad audiences can understand.

HOW DO WE DEFINE CONCEPT COMPUTING?

- CONCEPT COMPUTING IS SEMANTIC MODEL-DRIVEN COMPUTING THAT IS ACTIVITY AND CONTEXT AWARE.
- A CONCEPT IS SEMANTIC MODEL.
- ITS MEANING DERIVES FROM A NETWORK OF RELATIONSHIPS TO OTHER CONCEPTS.
- THE BASIC IDEA IS TO MODEL CONCEPTS, RELATIONSHIPS & CONTEXTS SEPARATELY FROM THE SUPPORTING IT SYSTEMS AND THEN TO COMPUTE WITH THIS KNOWLEDGE.

Source: Project10X

#CONCEPT COMPUTING = PARADIGM SHIFT FROM INFORMATION- TO KNOWLEDGE-CENTRIC PATTERNS OF COMPUTING



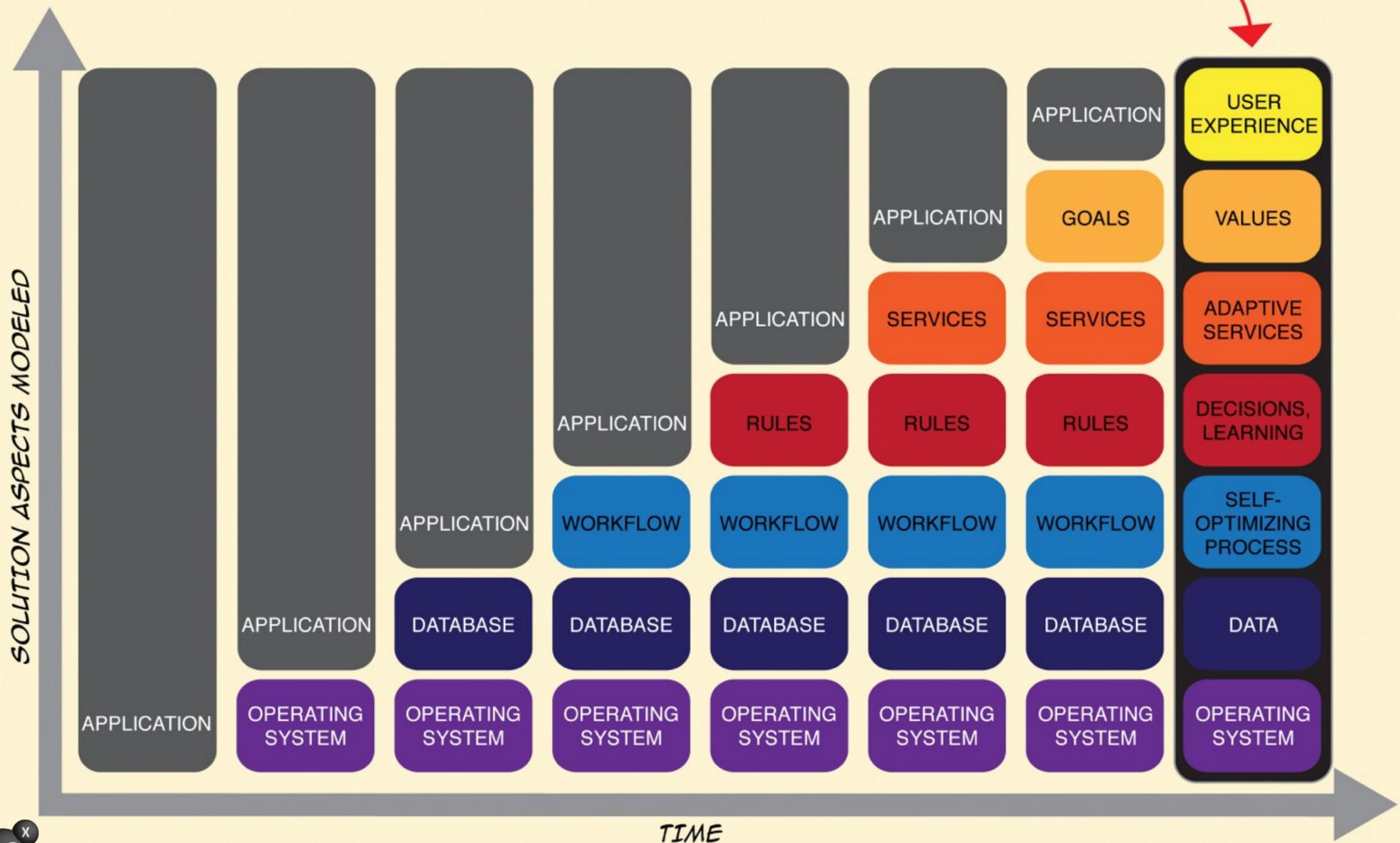
Source: Project10X

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The basic IT stack has user interface, application, information, and infrastructure layers. The internet has overlaid this with point and click network access to subjects, services, and things. Concept computing goes further. The concept plane interconnects and enables reasoning across all layers of the IT and internet stack.

Concept computing represents and processes knowledge about domains, user interface, application functionality, processes, information, and infrastructure separately from the underlying IT systems and other artifacts so that both people and computers can interpret concepts and put this knowledge to work.

**#CONCEPT COMPUTING =
EVERY ASPECT OF THE SOLUTION IS MODEL-DRIVEN,
ACTIVITY CONTEXT-AWARE, AND SEMANTIC**



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Concept computing every aspect of the solution is model-driven, activity context-aware, and semantic.

How is this different? Historically, lots of things have been modeled. But, modeling has only seemed cost-effective for individual aspects of software applications.

Going back to the beginning of IT, there was only an application program. It was a deck of cards that gave instructions to a computer. It was low-level code.

Over the decades, we began model knowledge about some things separately and take this functionality out of the application, so that multiple programs could share it.

The sequence was something like this: operating systems, then data, workflow, rules, services, and goals.

As modeling evolved, different kinds of concepts required separate tools to model them.

With different kinds of modeling tools came different formalisms and standards.

For example for: data schemas, decisions using business rules, processes flow-charted with BPMN, services accessed through APIs.

Different formalisms and standards result in tools that don't know about each other and don't share semantics.

That's a problem when you want to combine multiple types of models in an application. It gets complicated.

Often you are obliged to write some code. Other times, you import or export models into other tools, which adds a layer of complexity.

With concept computing this ceases to be a problem.

Concept computing provides a unified environment for creating, managing, and executing all types of models.

Further, there is new hardware designed for concept computing at scale.

MODEL = DESIGN = DOCUMENTATION =
APPLICATION = UX = #CONCEPTCOMPUTING



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With concept computing, the model is the design, is the documentation, is the application, is the user interface.

This is what happens when every aspect of the solution and every stage of the solution life cycle is semantic and model-driven.

The model is the application.

At every stage of development, the model executes.

The model self-documents. it's just another way to express the model.

And the model can explain its every decision and action taken.

Moreover, the model drives the user interface.

Change devices, channels or the underlying model itself and system behaviors change automatically.

You don't write program code.

You don't draw flow charts in swim lanes either.

You don't compose a waterfall of documents that translate requirements to designs to specifications to code and so on.

Business logic is packaged in knowledge models, and delivered as knowledge-as-a-service, where it can be reused by external applications.

One interconnected knowledge model directs activities and decisions dynamically towards the goal.

Under the hood, it's all RDF & RDF/S.

All system knowledge updates quickly, without your having to rebuild databases or compile new program code.

#CONCEPT COMPUTING REVEALS A NEW DOMAIN WHERE VALUE AMPLIFIES!



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A previous slide that showed a concept plane being abstracted from the IT stack and the Internet network. This doesn't tell the whole story.

When every aspect of the solution is semantic and model driven, then a new world of value opens up. A vista or landscape in which innovations build on each other, and amplify in value.

HOW WILL CONCEPT COMPUTING IMPACT SOFTWARE FUNCTIONALITY AND VALUE?

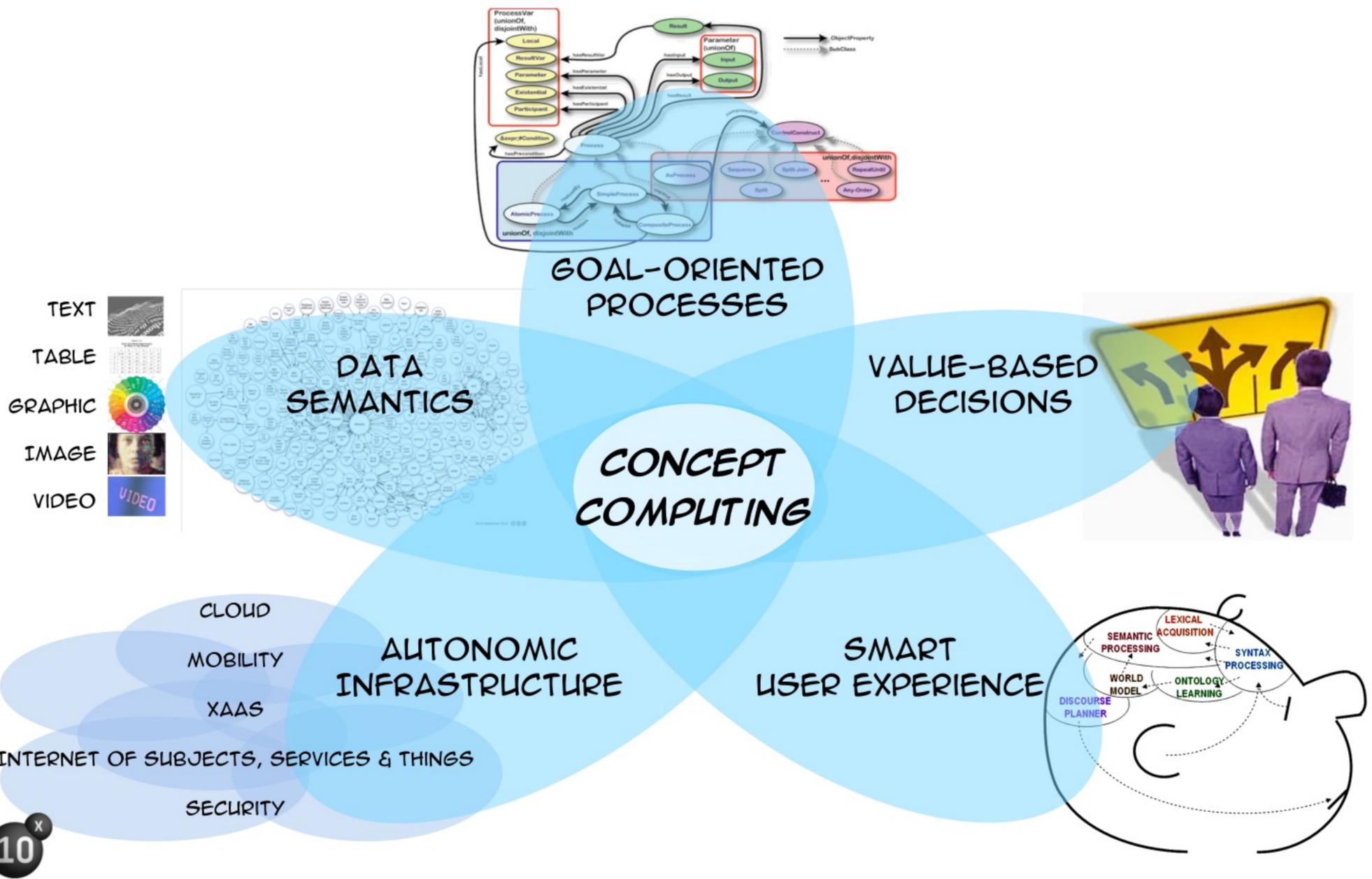
- SMARTER USER INTERFACE
- SEMANTIC DATA
- PRAGMATIC PROCESSES
- VALUE-BASED DECISIONING
- AUTONOMIC INFRASTRUCTURE

Concept computing is a paradigm shift.
It does things differently.
It's capabilities are game changing.
It's a value dynamo.

Here are four impacts of concept computing:

- 1) It delivers a new user experience that people find compelling. No UX. No market pull.
- 2) Concept computing "democratizes" new social concepts of work, play, sharing and communicating where computers understand language, social interactions, and the way people collaborate.
- 3) It synthesizes functionality into capabilities, standards, and higher-level solution concepts that encompass and go beyond what was previously possible. The direction is toward systems that know, learn, and reason as people do. The upside is that concept computing can solve problems that are intractable with previous technologies.
- 4) Concept Computing is a breakthrough in value and life cycle economics as measured by gains in capability, user experience, performance.

#CONCEPT COMPUTING IMPACTS EVERY ASPECT OF SOFTWARE FUNCTIONALITY



Concept computing impacts every aspect of software functionality. In the following slides we will discuss five areas.



*MAKE MY DIGITAL
LIFE EASIER,
MORE USEFUL,
AND MORE FUN.*

SMART USER EXPERIENCE

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Concept computing makes user experience simpler, smarter and more helpful. Semantic and model-driven user interface design allows implementation of different types of “smarter” user experience. The progression is from fixed tools, to appliances, to advisors, to virtual assistants that can complete tasks, to expert agents. More about this in a moment.

IN THE APARTMENT UPSTAIRS...

WHY DOESN'T
THIS PHONE *KNOW*
I *DUMPED* BRAD
LAST WEEK?

Source: Project10X

10^x

Meanwhile, remember that consumer expectations are changing.

Before long we'll all be very angry if our computing devices don't understand concepts.



Siri. Beta

Your wish is its command.

Siri on iPhone 4S lets you use your voice to send messages, schedule meetings, place phone calls, and more. Ask Siri to do things just by talking the way you talk. Siri understands what you say, knows what you mean, and even talks back. Siri is so easy to use and does so much, you'll keep finding more and more ways to use it.



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Mobility is all about new user experience. Make no mistake about this. Mobile internet user experience demands computers that understand concepts. One illustration of this is Apple's SIRI. What happens when semantic models enable computers to understand concepts? Computers that understand concepts are systems that know. That is, they are more than electronic pencils, more than calculators, and more than search appliances that retrieve information. Think about it. Systems that know can advise you. They can help you. They can simplify complex, knowledge-intensive tasks. They can adapt and optimize their behavior when events happen and something changes. But that's not all. They can become virtual assistants that get something done for you.

IN A PENTHOUSE ON THE OTHER SIDE OF TOWN...

#CONCEPTCOMPUTING MAKES EVERY
APP YOUR PERSONAL ASSISTANT



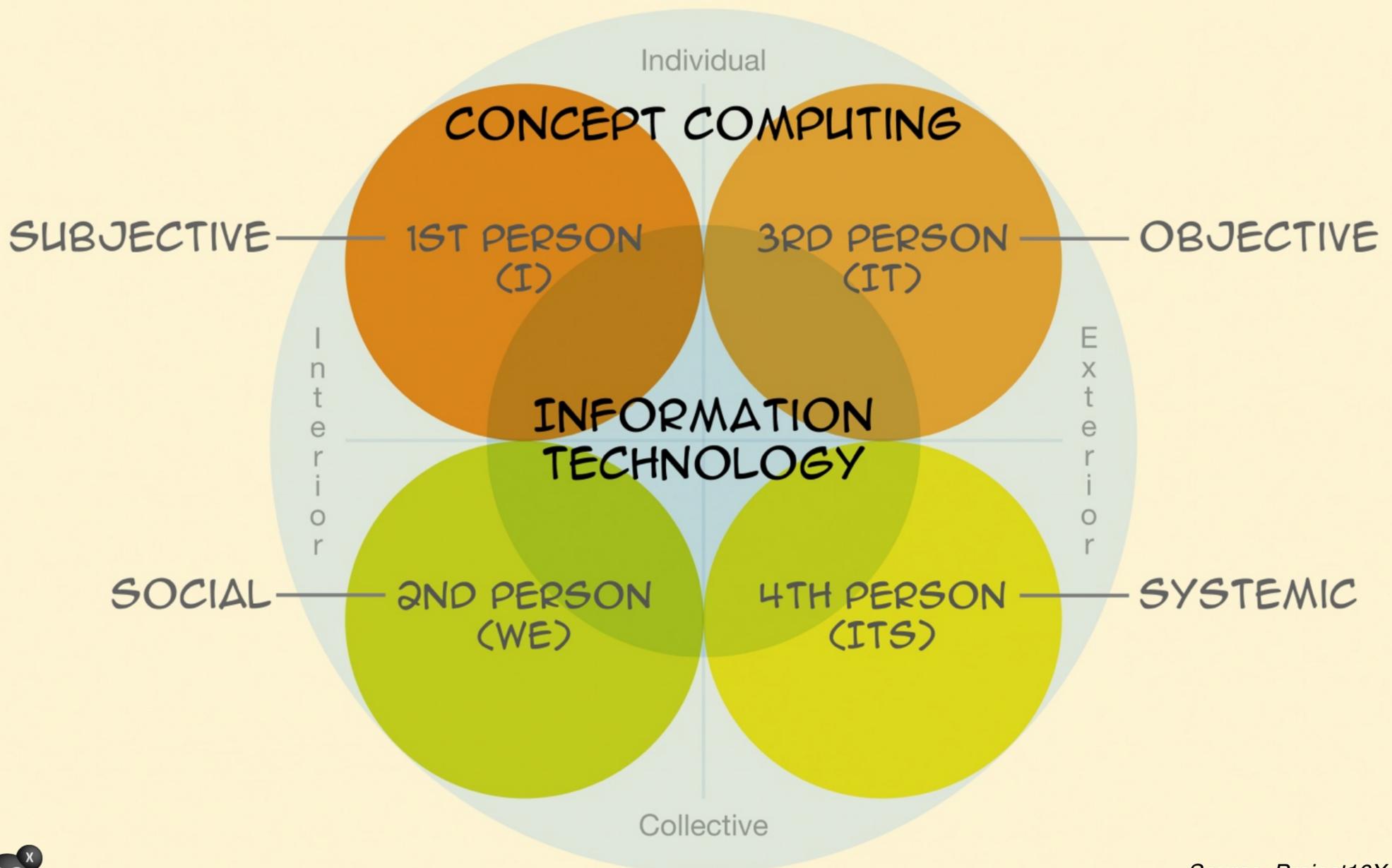
Source: Project10X

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Go girl!

Enterprises and governments too are getting this message. They're asking for a SIRI behind the firewall -- a smart agent that knows and can help you get things done.

#CONCEPT COMPUTING OPENS UP NEW DIMENSIONS OF USER EXPERIENCE



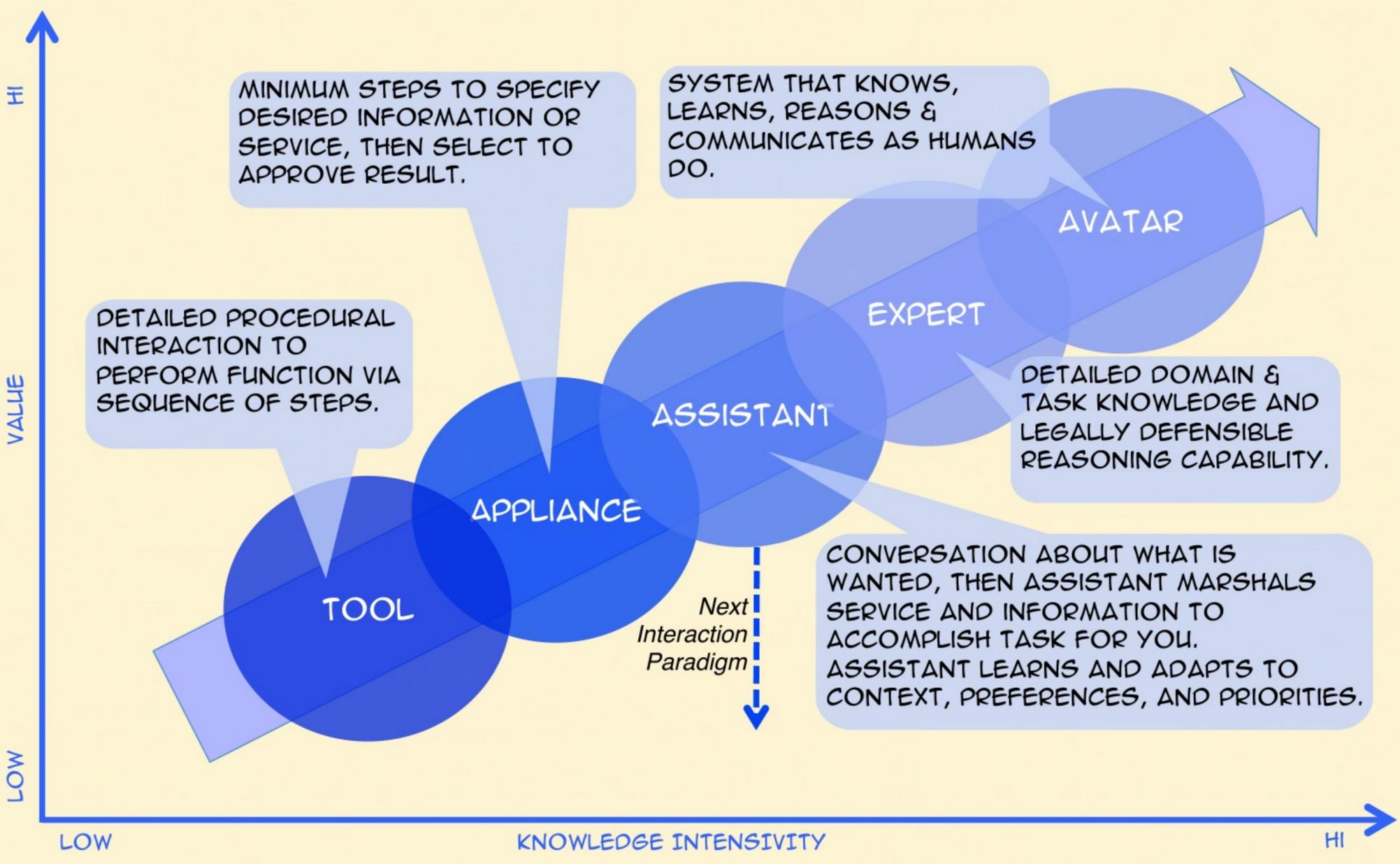
Source: Project10X

The transition from IT as we've known it to concept computing impacts multiple dimensions of user experience.

Four person view of user experience:

- 1. I – Subjective:** the “I” in UI, how I experience things, the demands on my attention, focusing on my personal values, thoughts, emotions, memories, states of mind, perceptions and immediate sensations. Trend towards exploiting higher bandwidth content dimensionality, multiple sensory modalities, context awareness, and reasoning power in the user interface.
- 2. WE – Intersubjective:** the “we” in web, social computing, our lived culture, shared values, language, relationships, cultural background, & how we communicate. Trend towards collaborative work and play spaces where computer understand, integrate, reason with, and communicate multiple forms of content and language, models, services, and behaviors.
- 3. IT – Objective:** The world of individual things viewed empirically, anything you can see or touch or observe in time and space; like product structure & behavior. Trend towards hi-bandwidth, intelligent, autonomic, autopoietic, and autonomously communicating digital products, services, things, and intellectual property.
- 4. ITS – Interobjective:** the systemic world of standards, laws, systems and ecosystems, networks, technology, government, and environment(s). Trend towards, everything self-aware, somewhat intelligent, connected and socially autopoietic, and capable of solving problems of complexity, scale, security, trust, and change management.

#CONCEPT COMPUTING = SMARTER USER EXPERIENCE



Semantic and model-driven user interface design allows implementation of different types of "smarter" user experience.

The progression is from fixed tools, to appliances, to advisors, to virtual assistants that can complete tasks, to expert agents.

SEMANTIC DATA



#CONCEPT COMPUTING USES SEMANTIC MODELS TO LINK SOURCES; CONNECT KNOWLEDGE AND DATA; ENHANCE CONTEXT; & MOST IMPORTANT, INTEGRATE DATA, DECISIONS & ACTIONS.

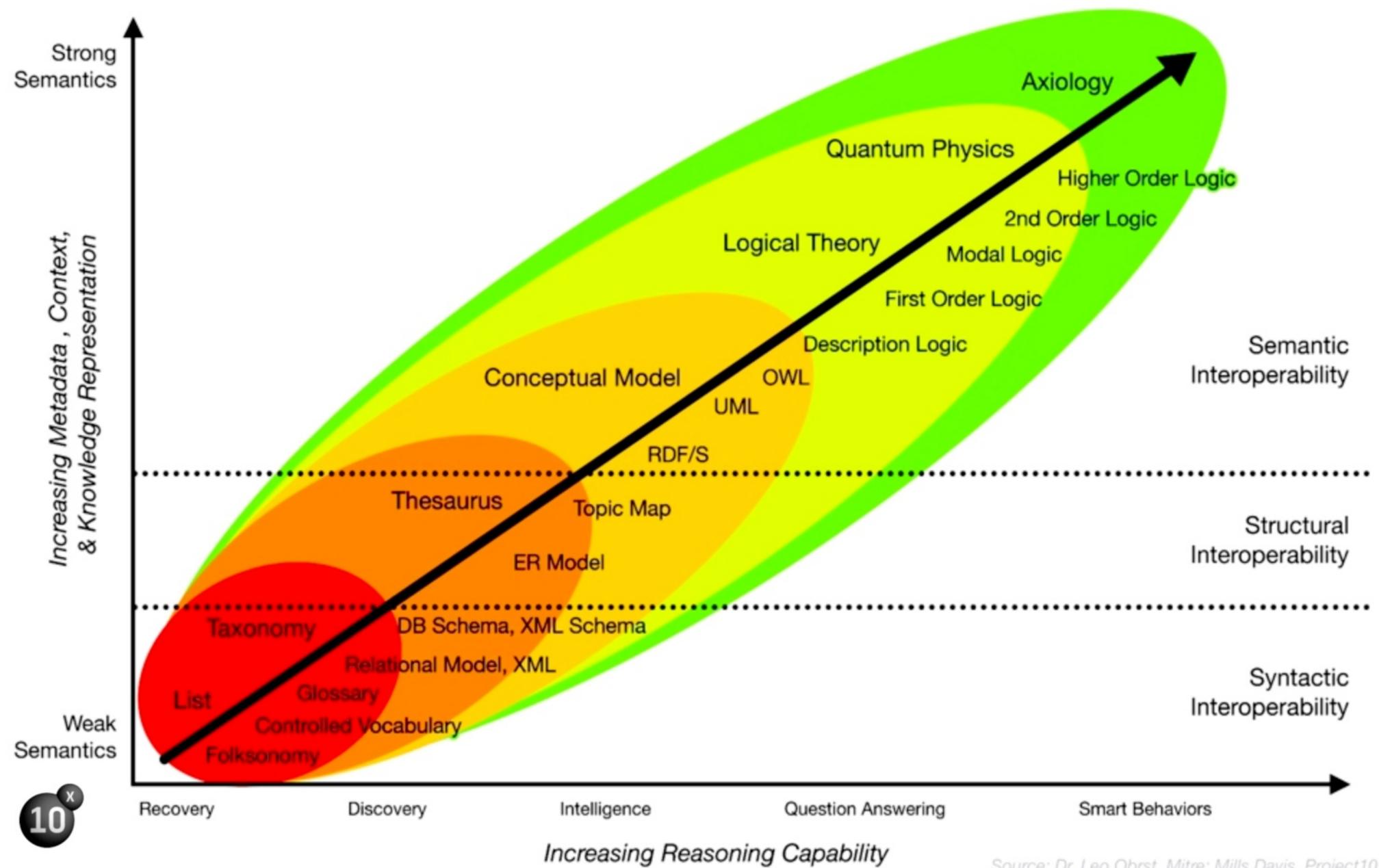
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If you want to connect and integrate information, the first thing you have to do is integrate what you know about it.

Semantic web standards are gaining traction as a way of describing different data sources, structures and metadata so that they can be linked together.

Concept computing goes further to put data to work.

#CONCEPTCOMPUTING = SPECTRUM OF KNOWLEDGE REPRESENTATION FROM SEARCH TO KNOWING



Source: Dr. Leo Obrst, Mitre; Mills Davis, Project10X

Concept computing spans a comprehensive and expressive spectrum of knowledge representation (KR). More expressive KR powers greater reasoning capability.

This figure shows a spectrum of executable knowledge representation and reasoning capabilities. As the rigor and expressive power of the semantics and knowledge representation increases, so does the value of the reasoning capacity it enables. From bottom-to-top, the amount, kinds, and complexity, and expressive power knowledge representation increases.

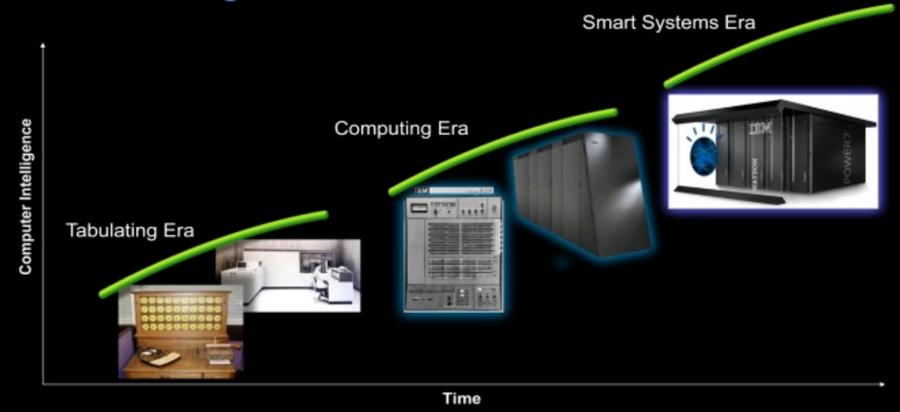
From left-to-right, reasoning capabilities advance from: (a) Information recovery based on linguistic and statistical methods, to (b) Discovery of unexpected relevant information and associations through mining, to (c) Intelligence based on correlation of data sources, connecting the dots, and putting information into context, to (d) Question answering ranging from simple factoids to complex decision-support, to (e) Smart behaviors including robust adaptive and autonomous action.

Moving from lower left to upper right, the diagram depicts a spectrum of progressively more capable forms of knowledge representation together with standards and formalisms used to express metadata, associations, models, contexts, and modes of reasoning. More expressive forms of metadata and semantic modeling encompass the simpler forms, and extend their capabilities. In the following topics, we discuss different forms of knowledge representation, then the types of reasoning capabilities they enable.



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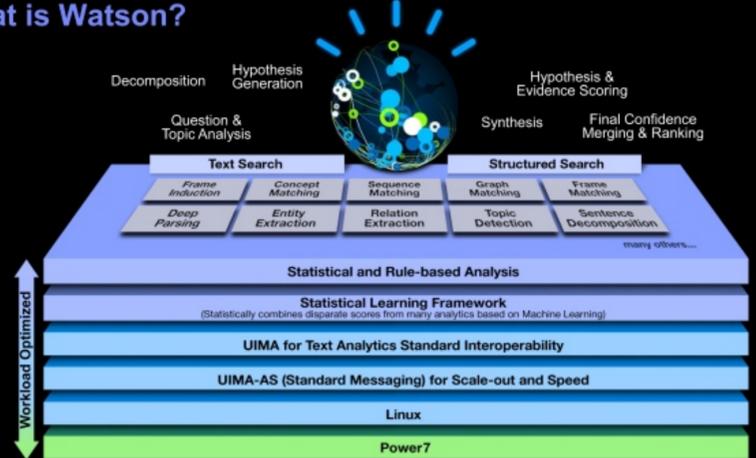
We Are Entering a New Era



4 Technologies that Will Change the World – and IBM Will Lead



What is Watson?



Here is an IBM' vision of concept computing.

Notice the three slides to the right. The first says we are entering the era of smart systems. The second identifies four technologies that have a 1000X impact on capability and performance. The third shows a concept diagram for IBM's WATSON.

Many Current Approaches Miss The Point

It's Not About Big

It's Not Really About Data, Either

Using ~~Big~~ ~~Data~~

And "big" is often not as big we might think it is

If there's no process for **applying information in a specific context** then we are producing and storing expensive trivia.

The real data revolution is in business structure/processes and how they use information for decision-making



For Citations or References to This Material: Vikas Agrawal, "Next Generation Digital Workspace and Consumer Playspace", Infosys Limited, 2010.

Building  Tomorrow's Enterprise

I like this slide from an Infosys manifesto about next generation work and play spaces.

It says: "The real data revolution is in business structure and processes and how they use information for decision-making."



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I sum it up this way:

Concept computing puts semantic data to work.

Concept computing uses semantic models to link sources; connect knowledge and data; enhance context; and, most important, integrate data, decisions, and actions.

Semantic models encompass:

- goal-oriented activities to perform
- pre-and post-conditions for these activities
- decisions required to take action;
- rules and conditions to be met for choosing
- data and calculations required.

All model(s) are managed in one environment.

Models are compact and integrated. For example, business rules always appear in context of their use.

Schemas, ontologies, models, and business logic can be imported, exported, or updated using open standards.

Concept computing can import linked data and ontologies in RDF/OWL and connect these to analytic, decision, and process models.

Concept computing can combine natural language understanding with semantic models to extract and apply knowledge and information from unstructured sources.

PRAGMATIC PROCESSES



*SEPARATE THE
"KNOW"
FROM THE "FLOW."*

IT'S GOAL-ORIENTED!

10^x

Concept computing is about pragmatic processes.

Semantics are about meanings. Pragmatics go further. Pragmatics encompass goals, intentions and purposes.

When pragmatic models power everything, you get to think differently. New capabilities and solution concepts become practical.

SHE WHISPERED TO HERSELF AS SHE SPED OFF IN HER LITTLE RED CORVETTE...



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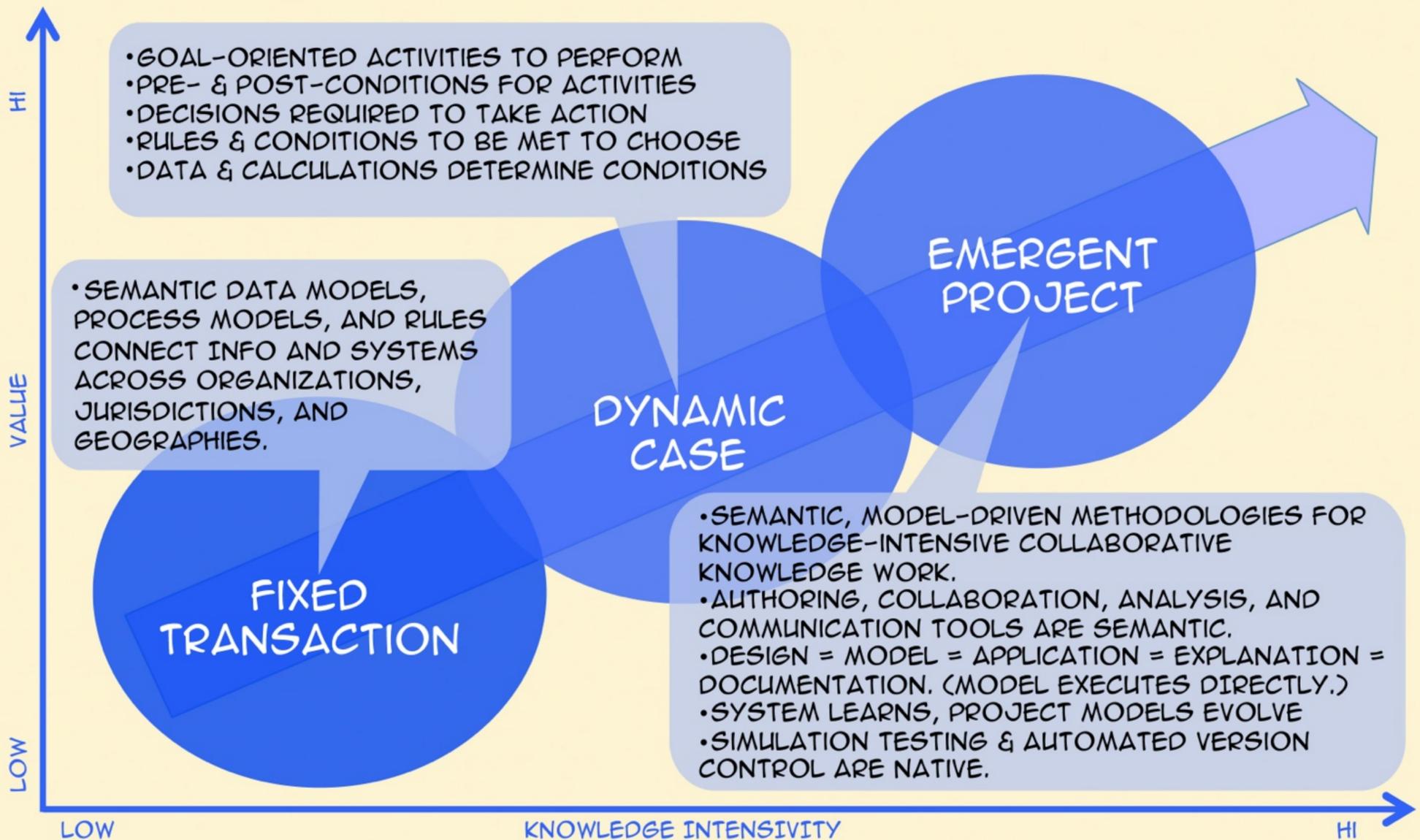
With Concept computing, every aspect of a process and every stage of the solution life cycle becomes model-driven and semantic.

What's game changing is how comprehensively this is happening:

- By aspect of a solution I include: user interaction, data, decisions, processes, and infrastructure. Everything.
- By stage of a solution life cycle I include: development, operations and ongoing evolution.

#CONCEPT COMPUTING PROCESSES ARE GOAL-ORIENTED & EVENT-DRIVEN.

PROCESSES ADAPT & SELF-OPTIMIZE WHEN EVENTS HAPPEN, EXCEPTIONS OCCUR, OR NEEDS CHANGE



This diagram shows how concept computing impacts a spectrum of process types.

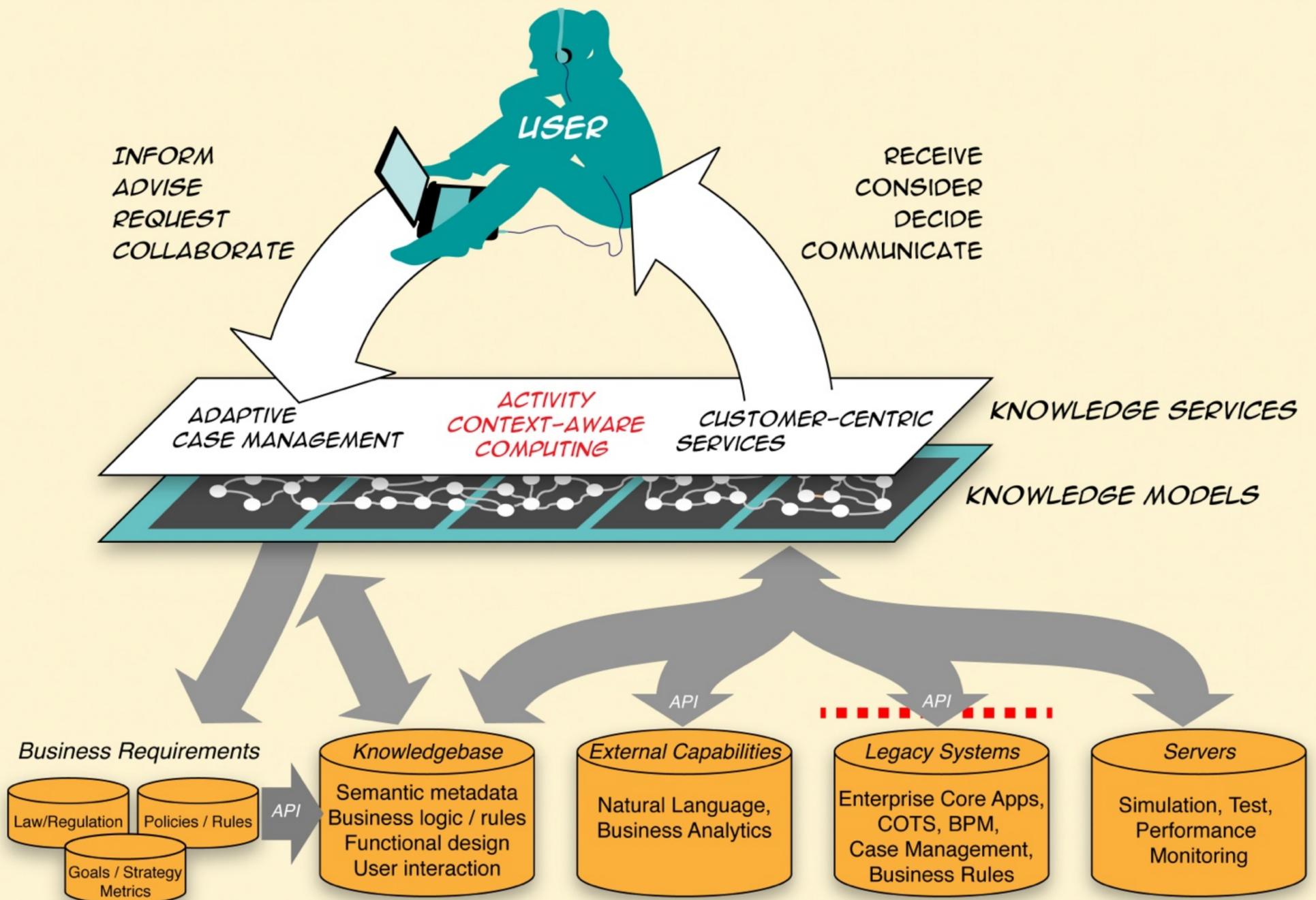
- 1. Fixed transaction** processes follow a preset procedural sequence. Straight-through-processes are like this. So are simple workflows and instruction sequences. Trend is to use concept computing (semantic model driven) approaches when transaction systems need to be connected across boundaries.
- 2. Dynamic case** management systems process events and rules in order to determine the specific sequence of steps to follow to reach a goal in this particular case. Modeling the potential variations can be complicate (for example, like a phone tree), or relatively elegant (like a GPS system) depending on how the process gets modeled. Trend is to use goal oriented, event driven concept computing approaches for administrative, investigative, and customer facing processes that are complex and knowledge intensive. Processes are compact and elegant. They adapt and self-optimize when events happen, exceptions occur, and needs change.
- 3. Emergent projects** (like dynamic cases) have an underlying goal-oriented methodology (process model). However, they address problems for which not conditions can be pre-defined. Events can occur, which demand definition of a new task, methodology and deliverable outcome. The emergent process model evolves (learns) as well as adapts and self-optimizes.



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Concept computing processes become goal-oriented, event-driven, and context-aware.
Goal-oriented processes adapt, self-configure, and optimize when events happen, exceptions occur, or needs change.
Like a GPS navigation system, the process interprets events and computes the next best action based on the current context, system knowledge, and content of the case.
A dynamic activity plan continuously tracks and updates the status of actions taken in the system.
No difference exists between straight through processing (STP) and exception handling.
What can be automated is. What can't, isn't. It's still the same process.

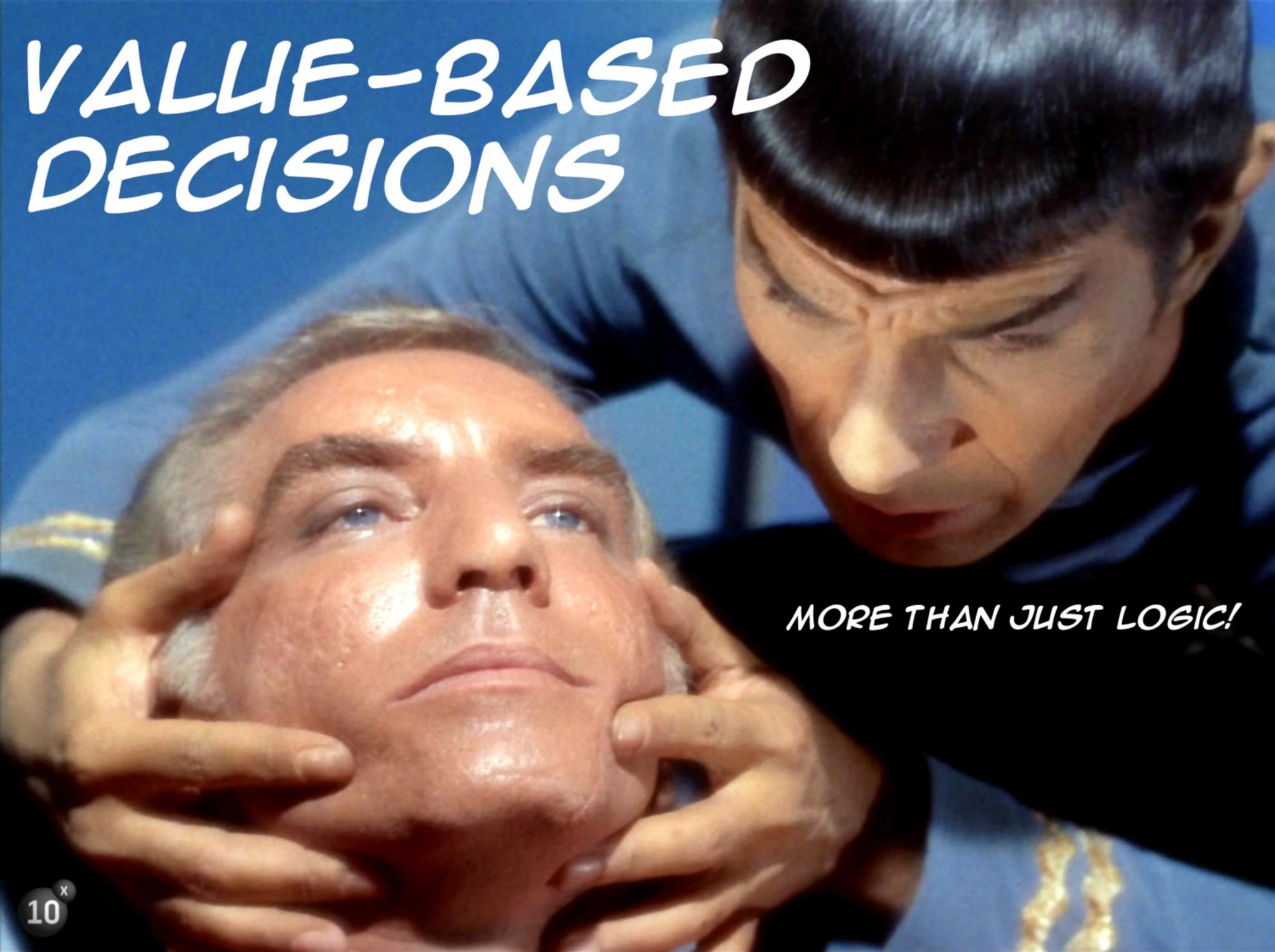
#CONCEPT COMPUTING PUTS THE USER AT THE CENTER OF THE ACTION



Source: Project10X + Be Informed

Imagine a multi-benefits solution that puts the user in the center of the action:

- A system knowledgebase integrates all legislation, regulation, and policies needed to guide the administrative process.
- A core business process pattern defines common high-level functions.
- These might include to inform, advise, apply for benefits, answer questions, decide eligibility, track status of cases, resolve exceptions, explain decisions, and communicate actions taken.
- Specific requirements of individual benefits programs are modeled as specializations.
- Every exception is just another business rule.
- Meanwhile, the user experiences a single interface where s/he can access information, advice, and obtain services for all benefit programs.
- Similarly, the caseworker has only to deal with actions actually needed for the specific case.
- Dynamic case management can reduce clicks and keystrokes required by a factor of ten.



VALUE-BASED DECISIONS

MORE THAN JUST LOGIC!

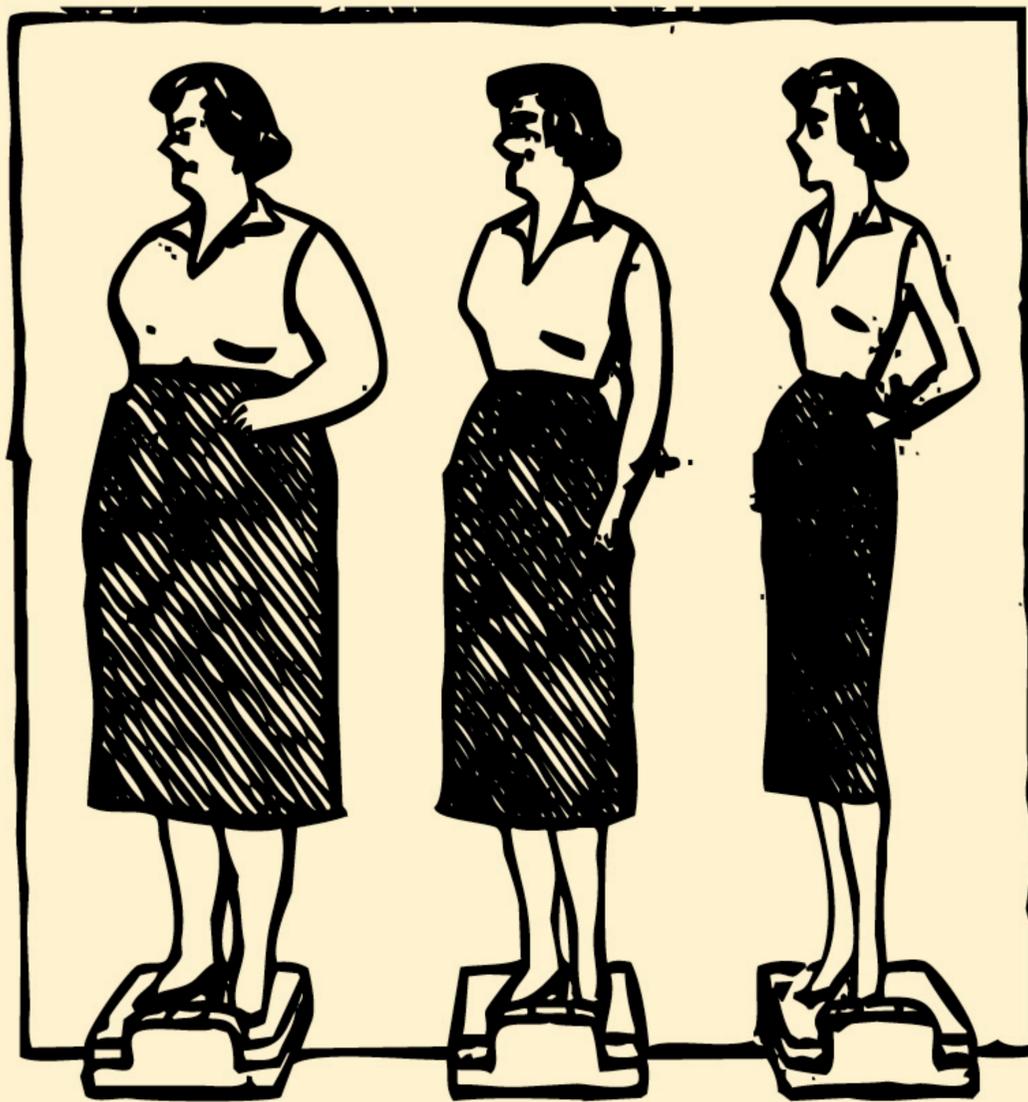
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Concept computing empowers deeper reasoning that can deal with questions involving more than just logic.

Value is the foundation of meaning. It is the measure of the worth or desirability (positive or negative) of something, and of how well something conforms to its concept or intension. Value formation and value-based reasoning are fundamental to all areas of human endeavor.

Theories embody values. The axiom of value is based on "concept fulfillment." Most areas of human reasoning require application of multiple theories; resolution of conflicts, uncertainties, and competing values; and analysis of trade-offs. For example, questions of guilt or innocence require judgment of far more than logical truth or falsity.

Axiology is the branch of philosophy that studies value and value theory. Things like honesty, truthfulness, objectiveness, novelty, originality, "progress," people satisfaction, etc. The word 'axiology', derived from two Greek roots 'axios' (worth or value) and 'logos' (logic or theory), means the theory of value, and concerns the process of understanding values and valuation.



WITH THIS DELICIOUS REDUCING CANDY PLAN!
#CONCEPTCOMPUTING = YOGA
FOR EXPERT SYSTEMS AND MODEL-DRIVEN TECHNOLOGIES.
FLEXIBILITY! \$1.00
TRIAL
SAMPLE
SIZE!

Source: Project10X

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Is computing with knowledge only for niche applications?

Concept computing overcomes difficulties of previous expert system, modeling, and model-driven technologies.

Expert systems have been mainstays of AI and business rule driven applications for decades.

But, there have been issues.

The usual concerns cited are technical complexity, brittleness of the knowledge models, poor scalability of the solutions, difficulty to maintain, and lack of fit with mainstream programming paradigms.

These concerns are no longer warranted.

Concept computing is now robust, flexible, scalable, dynamic, and mainstream ready.



AUTONOMIC INFRASTRUCTURE

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With concept computing, run-time semantic models provide a web of knowledge about infrastructure, information, application process, user interface, system behavior, and other domains.

A concept plane cross-cuts and connects resources within and across each layer of the IT stack. It can be queried, interpreted and reasoned over both by people and machines. Semantic model-driven infrastructure opens a different dimension for architecture and development allowing cost-effective, sustainable solutions to problems of scale, complexity, connectedness, mobility, context, security, and interoperability.



SCALE COMPLEXITY

Concept Computing technologies can solve problems of scale, complexity, function, security, performance & agility.

Key drivers of global economic expansion in the coming decade include the build-out of broadband telecommunications, mobility, and the deployment of intelligent services across this infrastructure (Mobile internet of subjects, things, and services). IT has reached the limits of what it can do with stacks, object orientation, metadata madness, fixed knowledge embedded in code (with no run-time learning), and architected development versus emergent solutions.

Concept computing impacts infrastructure because it can enable overcoming problems of integration, interoperability, parallelism, mobility, ubiquity/pervasiveness, scale, complexity, speed, power, cost, performance, autonomies, automation, intelligence, identity, security, and ease of programming.



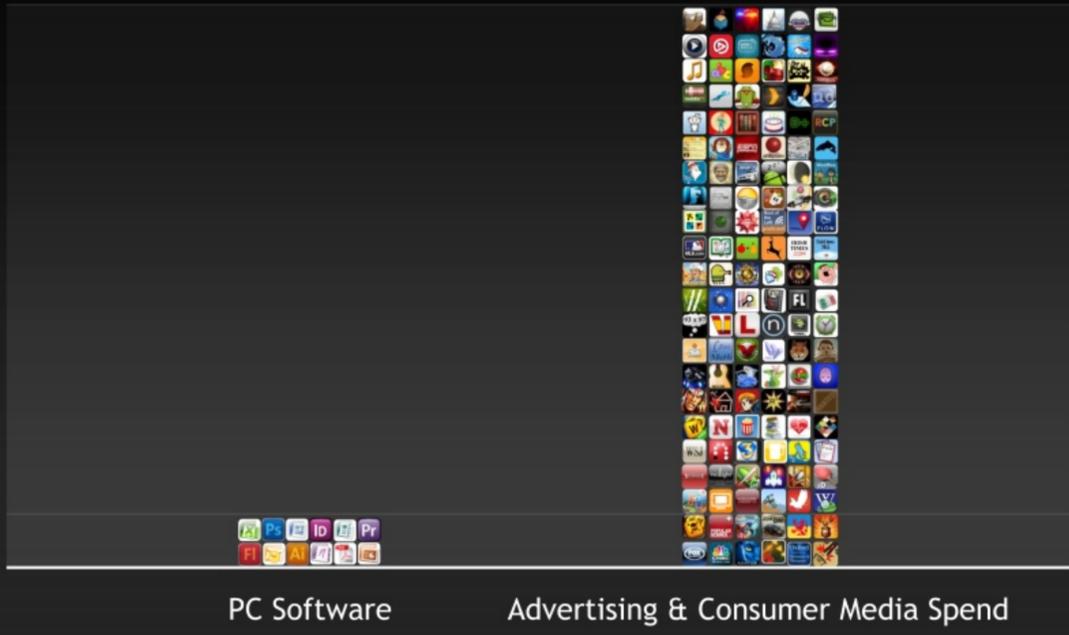
Smart devices are transforming the internet.
Both consumer and enterprise markets.

\$1,000B Media Fuel for Mobile

Movie, Games, Magazines, News, Cable, TV, Books

\$1000B

\$100B
\$0



PC Software

Advertising & Consumer Media Spend

More Media Requires More Performance



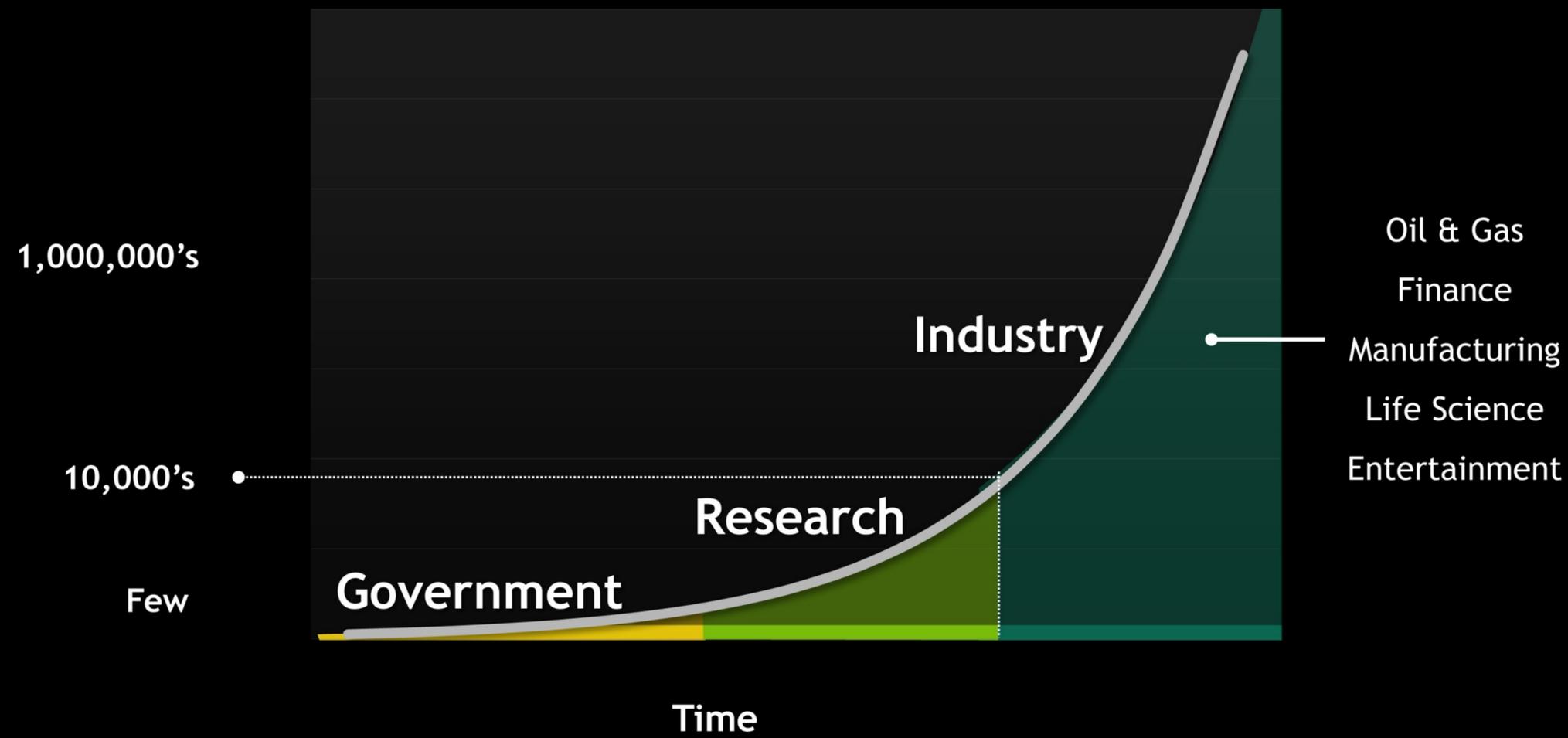
Media growth is a key driver for mobile growth as well as a key driver for growth of bandwidth and capacity.



- Mobile Augmented Reality
- Combines camera, GPS and orientation sensors
- Enables mass market augmented reality
- 36 phones can embed these components

It's not just smartphones and tablets that will play a role. Ambient displays, reality browsing, augmented reality all are coming into the conversation.

#CONCEPT COMPUTING = SUPERCOMPUTING GOES MAINSTREAM



Concept computing demands big think. Energy consumption is being worked on as an issue. Memory is becoming a non-issue. Meanwhile, super computing will be everywhere. Supercomputing at the edge. In smart devices. In the cloud.

Intel. Nvidia. Cray. IBM. And more. All have supercomputing roadmaps and market plans.

SECURITY



ALTONOMIC SECURITY
REQUIRES SELF-AWARENESS
AT THE LOWEST LEVEL OF
GRANULARITY AS WELL AS THE
CAPABILITY TO SEE INTO
KNOWLEDGE EMBEDDED
INSIDE OBJECTS.

10^x

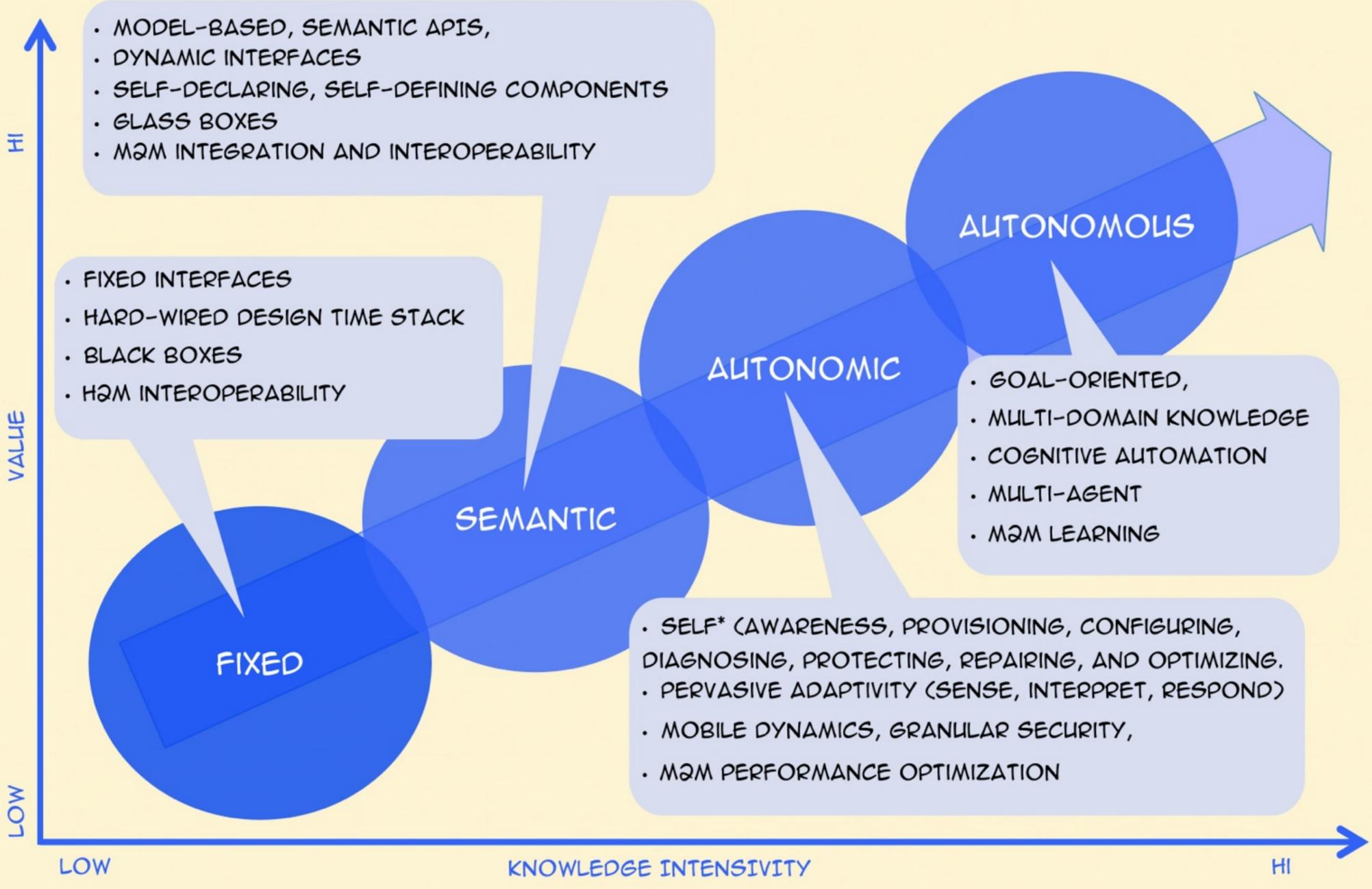
Security challenges are shifting from:

- Predictable, slowly-evolvable threat & risk models, interaction scenarios and behavior patterns to unpredictable and highly-dynamic ones;
- Platform monopolies to massively distributed systems exhibiting unprecedented levels of sw/hw platform heterogeneity;
- Device-and infrastructure-centric security models towards user-context and information-centric ones;
- Predefined to opportunistic interactions with unknown parties in open, inherently insecure environments; and
- Limited and fragmented data to unparalleled level of personal information richness and precision collected/processed/stored and communicated.

Our expectation is for secure, trustworthy pervasive environments where:

- Users control which data is being collected and the manner in which it is aggregated, processed, stored and distributed;
- Information is disclosed only to authorized parties and used for authorized tasks only;
- Individuals are always sure with whom they are interacting;
- Users are surrounded by millions of invisible, data collecting nano-devices building a huge, complex and dynamic system an omnipresent life-recorder; and
- Data are captured continuously with unprecedented precision and completeness, both inside and outside us.

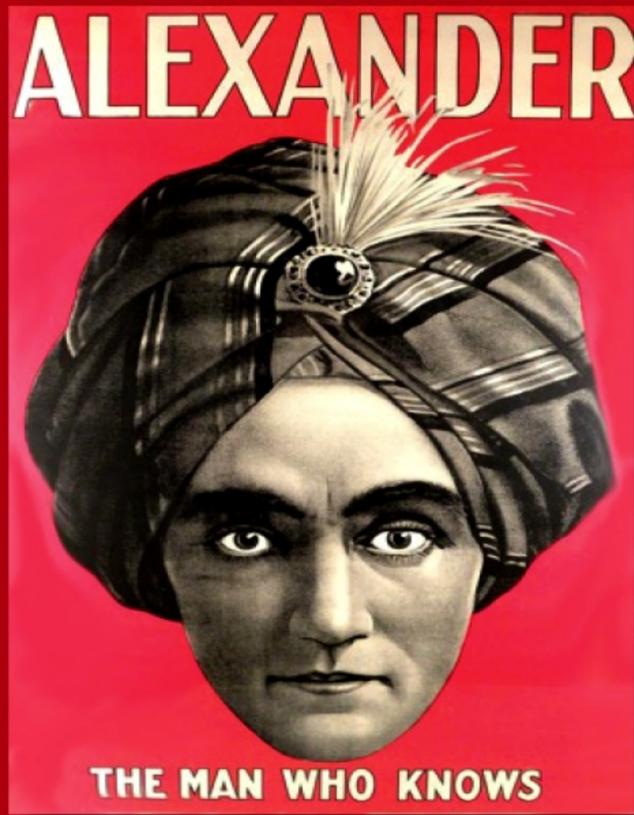
#CONCEPT COMPUTING = AUTONOMOUS INFRASTRUCTURE



Where is it going? Bandwidth explosion. Ubiquity. Mobility means context. Grids move beyond stacks. Knowledge webs. Smarter infrastructure.

WHAT IF EVERYTHING YOU BELIEVE ABOUT BUILDING ACTIVITY CONTEXT-AWARE SOLUTIONS IS WRONG?

WHAT IF THERE IS A METHODOLOGY THAT IS 2-10 TIMES FASTER TO SOLUTION... WHERE DEVELOPMENT IS DECLARATIVE, RAPID, ITERATIVE, NON-INVASIVE, AND LEAN?



WHAT IF CONCEPT COMPUTING SOLUTIONS ARE CHEAPER TO BUILD AND OPERATE ... LESS COSTLY TO OWN, AND ARE EASIER TO REVISE, EXTEND, AND UPDATE BY MODIFYING ITS SEMANTIC MODELS?

WITH CONCEPT COMPUTING, THE DEFINITION BECOMES THE DESIGN. THE DESIGN IS THE MODEL. THE MODEL EXECUTES DIRECTLY. IT IS THE APPLICATION. THE APPLICATION IS SELF-DOCUMENTING, SELF-JOURNALING, AND CAN EXPLAIN ITS EVERY DECISION.

Concept computing, as with object oriented software before it, requires a new methodology, new tooling, and a new definition of "integrated development environment."

ONLY TOO LATE THE COLONEL DISCOVERS...



Source: Project10X

10^x

With concept computing one of the biggest changes is "who does what?"

Business users, subject matter experts, and IT specialists are all involved. Business users shape the business logic. Subject matter experts shape domain knowledge. And IT professionals shape the infrastructure and its operations. Each has the tools and user interface it needs.

Concept computing handles all kinds of modeling in one environment. No more separate modeling tools and file formats.

JUST AS THE CABANA BOY YELLS UP TO HER ROOM...



Source: Project10X

10^x

Concept computing enables everyone to model.

There are multiple choices of user-friendly modeling methods.

Examples include: graphical modeling, forms, spreadsheet style tabular modeling, and writing in controlled natural language.

Concept computing lets users express ideas in ways they find natural. The computer learns how to make sense of it.

EVERYONE CAN PLAY IN THE
DEVELOPMENT SANDBOX
USING #CONCEPTCOMPUTING

AAAAEEEEIII!!!



10^x

Development using concept computing practices is fast and lean.

Business users, subject matter experts, and IT specialists all participate in development and are involved throughout.

Development starts with discovery of requirements.

Then comes definition of the functional architecture and design of the core application.

A small senior team of business analysts and system architects conducts these steps.

A functional design is like a plan view for a building that shows the basic layout and infrastructure, but not all the details of each room.

Plus, the functional design is already a working core application.

From this core application, development builds in parallel, adding details.

Teams are smaller than with conventional IT.

Team roles encompass project leads, system architects, UI designers, knowledge modelers, software engineers, test and quality assurance, trainers, support personnel, and system administrators.

Time to solution is two to ten times faster than with conventional IT development.

Benefits start early. This reduces risk.

Integration with existing systems and infrastructure is non-invasive.

Development is iterative and incremental.

Development can be highly parallel, but is significantly less labor-intensive.

Testing and acceptance is ongoing rather than weighted towards the back end of the process.

Deployment is incremental.

#CONCEPTCOMPUTING 30-60-90 RULE =
CUT OPS COSTS 30%, TCO 60%, EFFORT 90%



10^x

Concept computing lowers operating costs, total cost of ownership (TCO), and cost of maintenance compared to current operations.

Based on customer experience reported by Be Informed, the rule of thumb is 30-60-90:

Operating costs can be one-third less.

Total cost of ownership can decrease by as much as two-thirds.

Time and effort to make changes can decrease by up to 90 percent.

Why? It's much easier to integrate new data sources and interface new services by changing knowledge models than it is by writing code and rebuilding data stores.

WHERE IS CONCEPT COMPUTING ALREADY MAINSTREAM AND PRIME TIME?



be informed

[HTTP://WWW.BEINFORMED.COM](http://www.beinformed.com)

OK...so who has already taken concept computing into the mainstream. BE INFORMED. No really. Be Informed is a software company from the Netherlands. Be Informed delivers concept computing technology that is mainstream, enterprise class, & ready for prime time!

A moment of truth in advertising:

Over the past several months I have consulted with Be Informed and conducted due diligence regarding its software products, solution packages, and customer references.

Be Informed software products embrace concept computing principles, but go significantly beyond what other vendors are doing with semantic web, linked data, business process management, business rules, and intelligent user interface.

Seeing is believing. Everything I've talked about in the first half of this presentation, you can see demonstrated live in a Be Informed demo.

The following slides overview the company, its technology, development approach, and summarize customer experiences in the government sector.



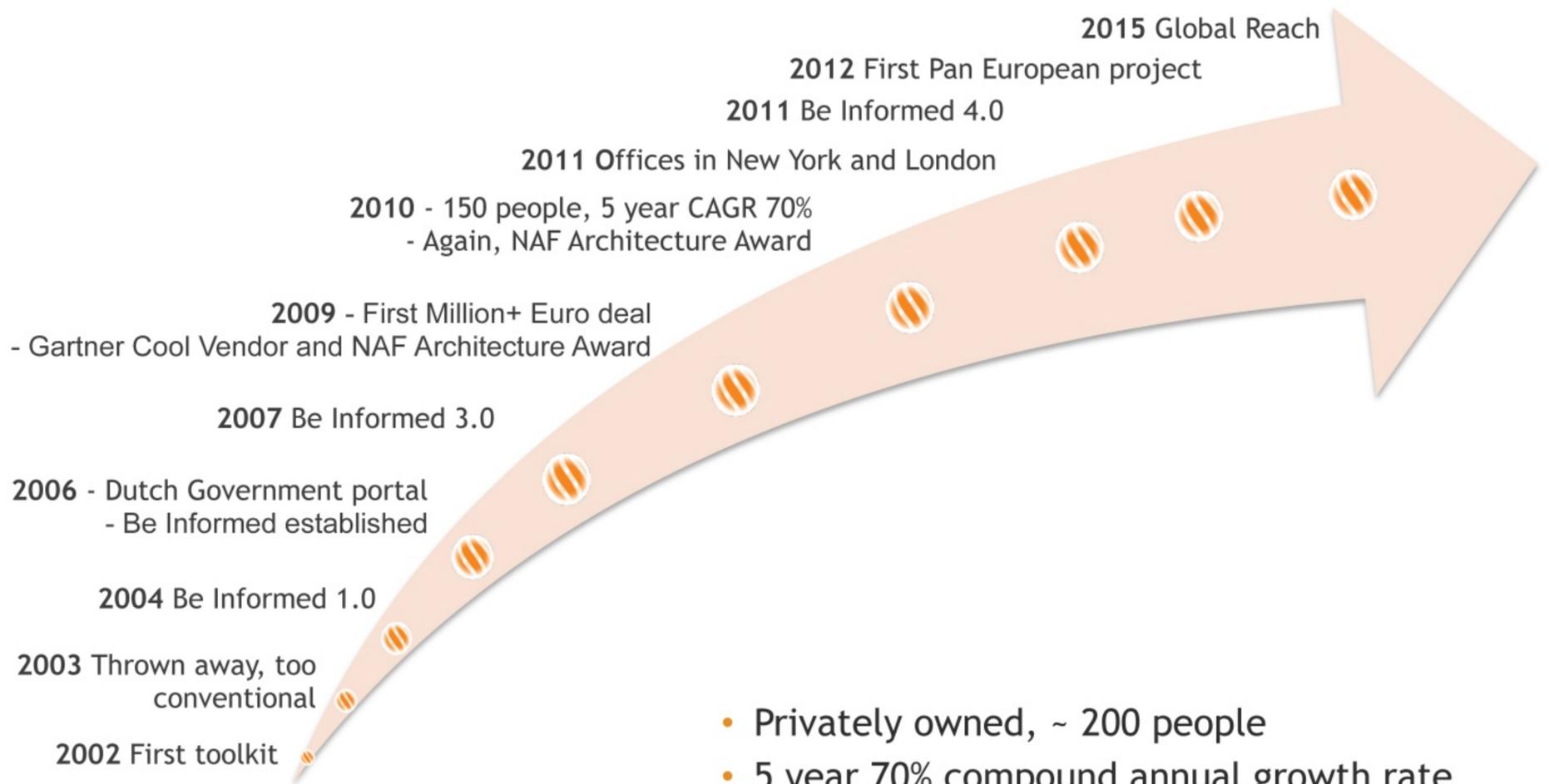
Positioning
Be Informed



be informed

Concept Computing
Platform

Be Structured
Development Environment



- Privately owned, ~ 200 people
- 5 year 70% compound annual growth rate
- Result of a long-running University and Public Sector R&D project



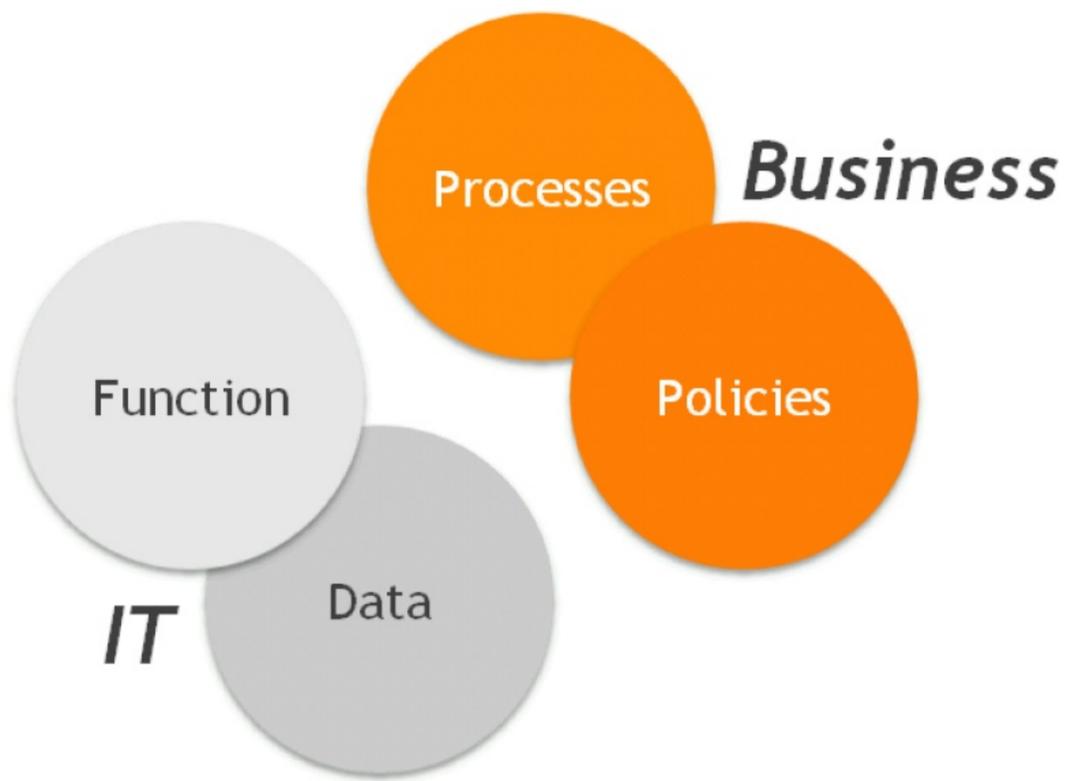


be informed

Be Informed is a model-driven
business process platform.

Organizations can run their primary processes on Be Informed by executing their **business designs**, supporting all aspects of the **policy lifecycle** and providing an ecosystem for **sharing and reuse**.





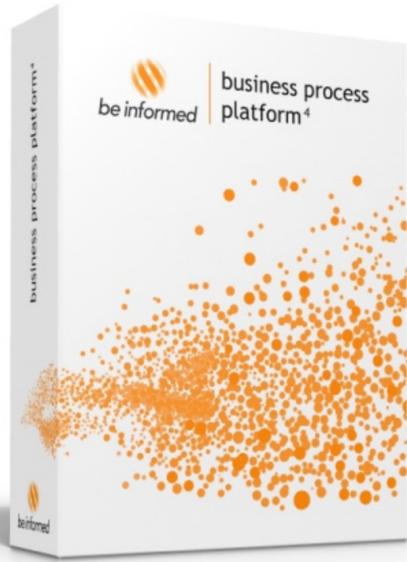
Distinguishing the **generic** from the **specific**.

Market
Market Position
Offerings

- Model driven business process platform
- Model driven business applications:
Tax, Benefits, Permits, Registrations, Life and pensions, Governance and compliance



Be Informed

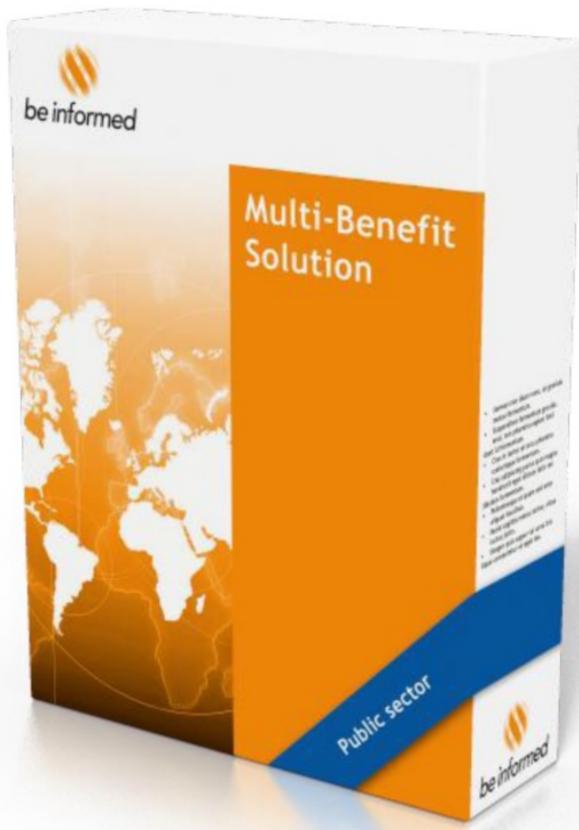


- Studio
- Repository
- Server

- Test
- Analysis
- Workplace

- SDK
- Cluster (roadmap)
- Provision (roadmap)





- Multi Permit Solution
- Multi Benefit Solution
- Multi Tax Solution
- Multi Registration Solution
- Life and Pension

- Smart Government
- Global Governance



Public Service Platform



BENEFITS

PERMITS

TAXES

REGISTRATION

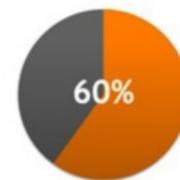
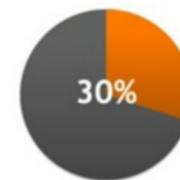
CASE

Be Informed Business Process Platform

Big Impact

- **Solve complexity:**
 - handle tens of thousands of rules, ranging from national to international legislation, and many bi-lateral treaties.
 - treat every customer as an individual.
 - one application covers 1,600 permit types.
- **Fast time to market:**
 - a complete Tax Service in 6 months.
 - a multi-benefits solution in 9 months.
 - licensing and enforcement application in 3.5 months.
- **High productivity development:**
 - Reduce time to implement regulatory changes (from 9 months to 2 days).
 - < 2 hours / function point (full cycle).
 - traditional approach would have cost at least 20 times more (Tax Service).
- **Low Total Cost of Ownership:**
 - up to 70% TCO reduction in permitting.
- **Operational cost reduction:**
 - 30% reduction in administrative burden for police officers.
 - reduce over 90% of all manual labor at a pension fund administrator.
 - 99.2% of all cases handled straight through in government administration.
- **Compliant and correct:**
 - Transparent: “We now know we always apply the correct set of rules.”
 - We now know who decided what, based upon which facts and applying which rules.

2-10X



be informed



Positioning
Be Informed



be informed

Concept Computing
Platform

Be Structured
Development Environment

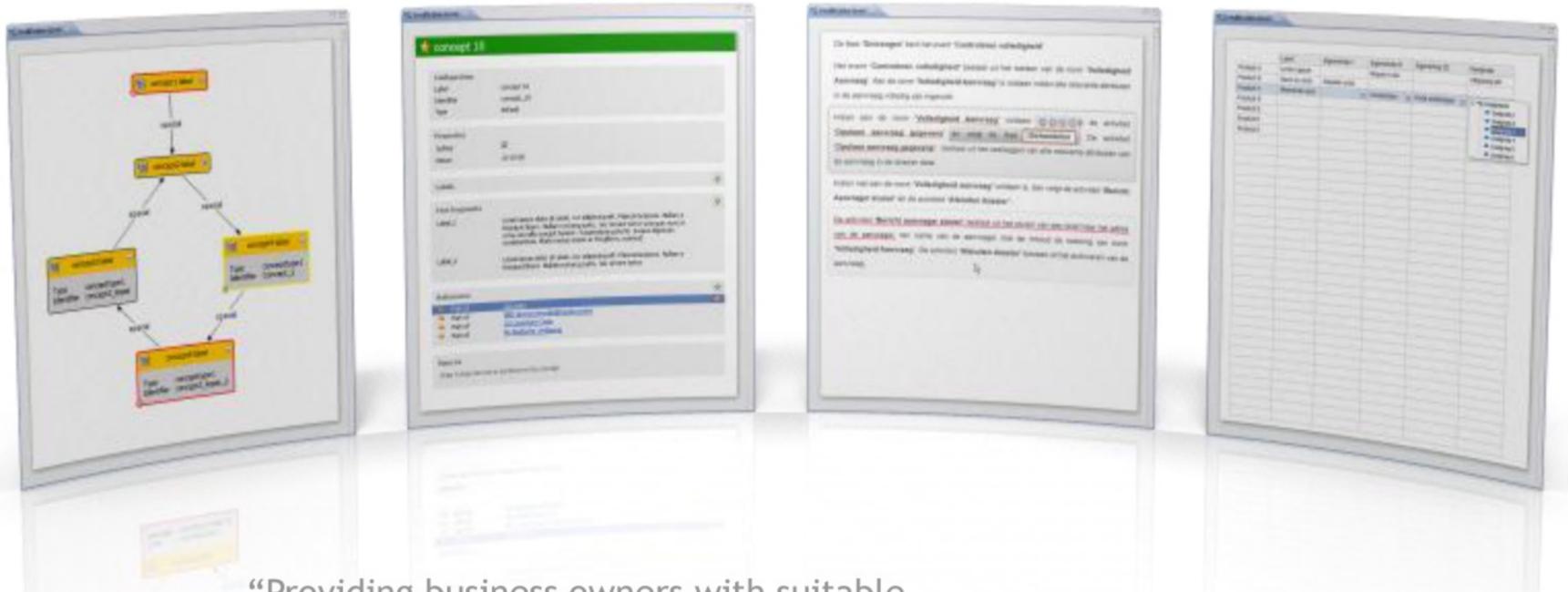
Model-driven

Context aware

Semantic to the core

Above the line

- Business logic created and maintained by business users
- Design = Model = Application = Documentation
- Single model for all levels of abstraction. No translation necessary.



“Providing business owners with suitable languages to describe their business”

Be Informed = Above the Line Architecture

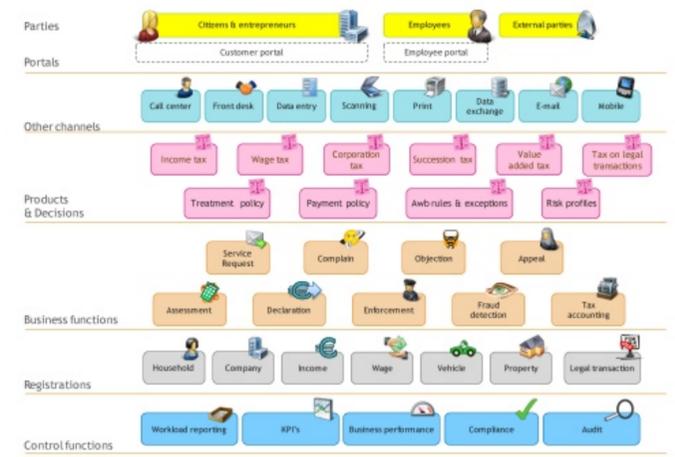
Above the line:

Knowledge modeled goal-, event- and context-driven processes, semantic data integration, knowledge-intensive decision-making and support, “smart” user experience and autonomic infrastructure interaction.

Metamodels



Target Operating Model



Below the line:

Non-invasive, standards-based integration with infrastructure and legacy systems

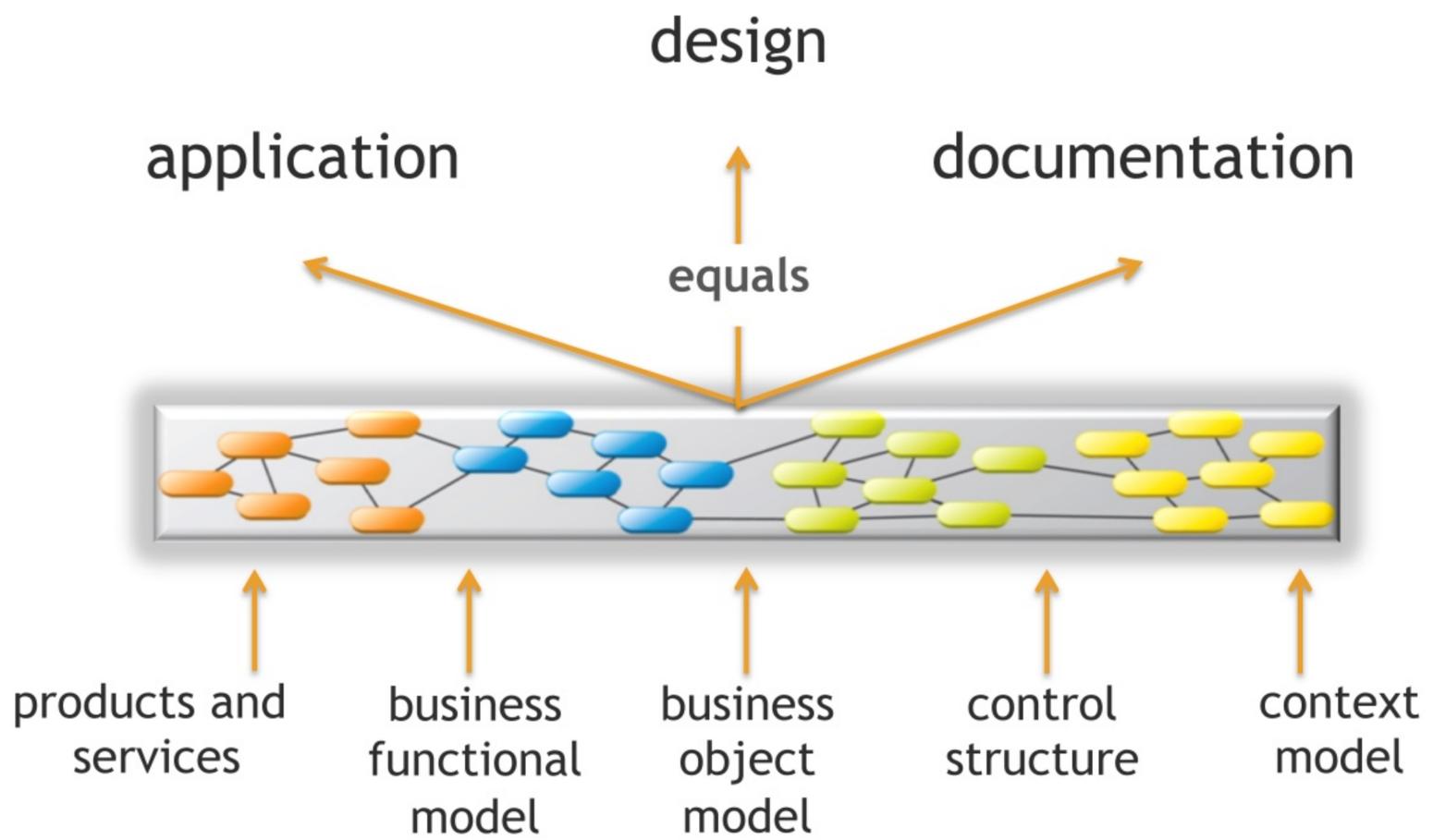
Open Standards

Java, J2EE, Jdbc, XML, WebDAV, Web Services, SOAP, HTTP(S), HTML, LDAP, SAML, BPMN, SQL, BPEL, RDF, OWL, SQL

Enterprise class Infrastructure



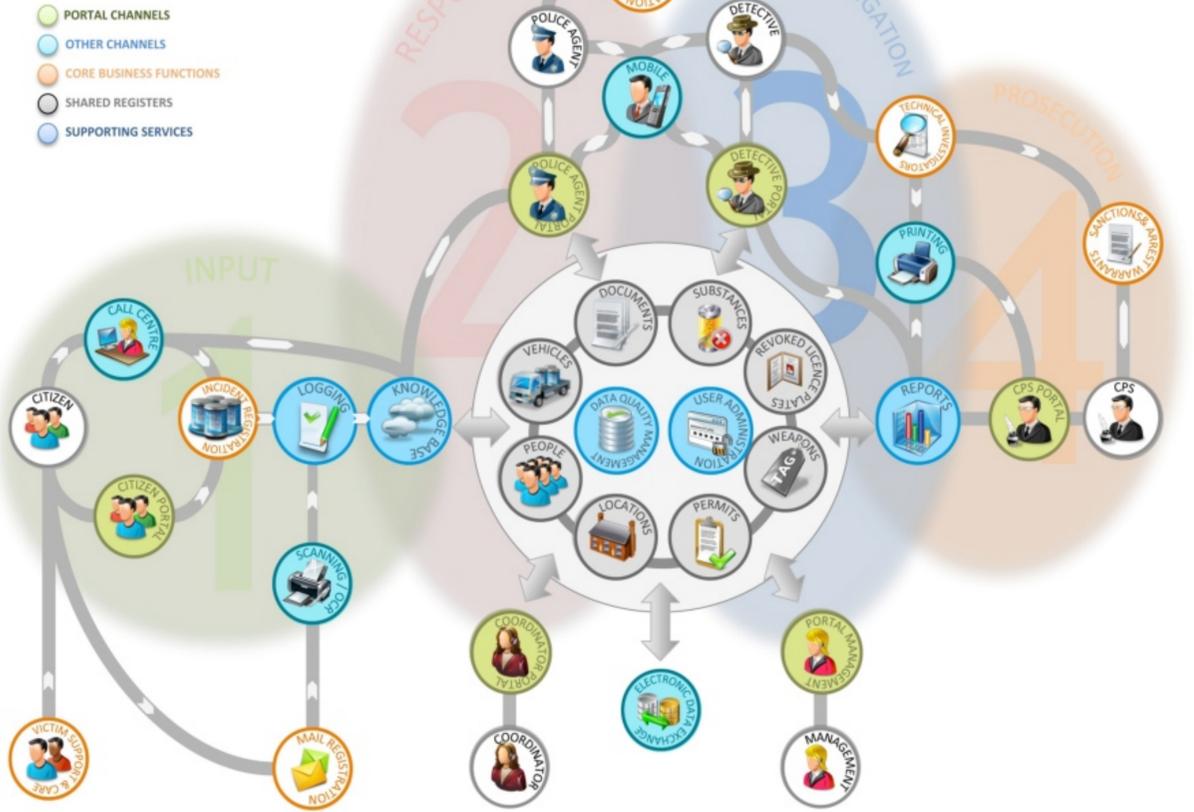
Design = Model = Application = Documentation



Design = model

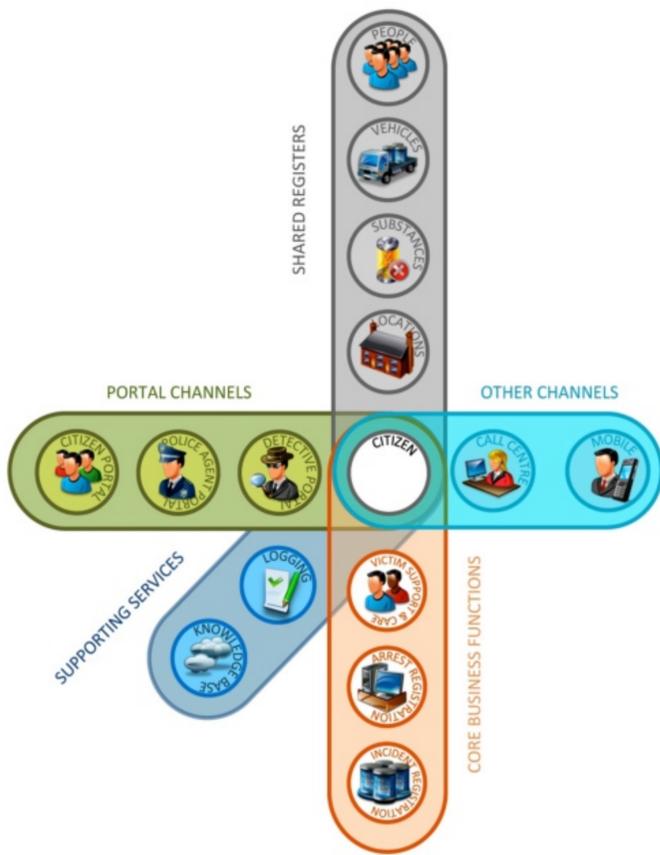


SCENARIO – ALL STAGES

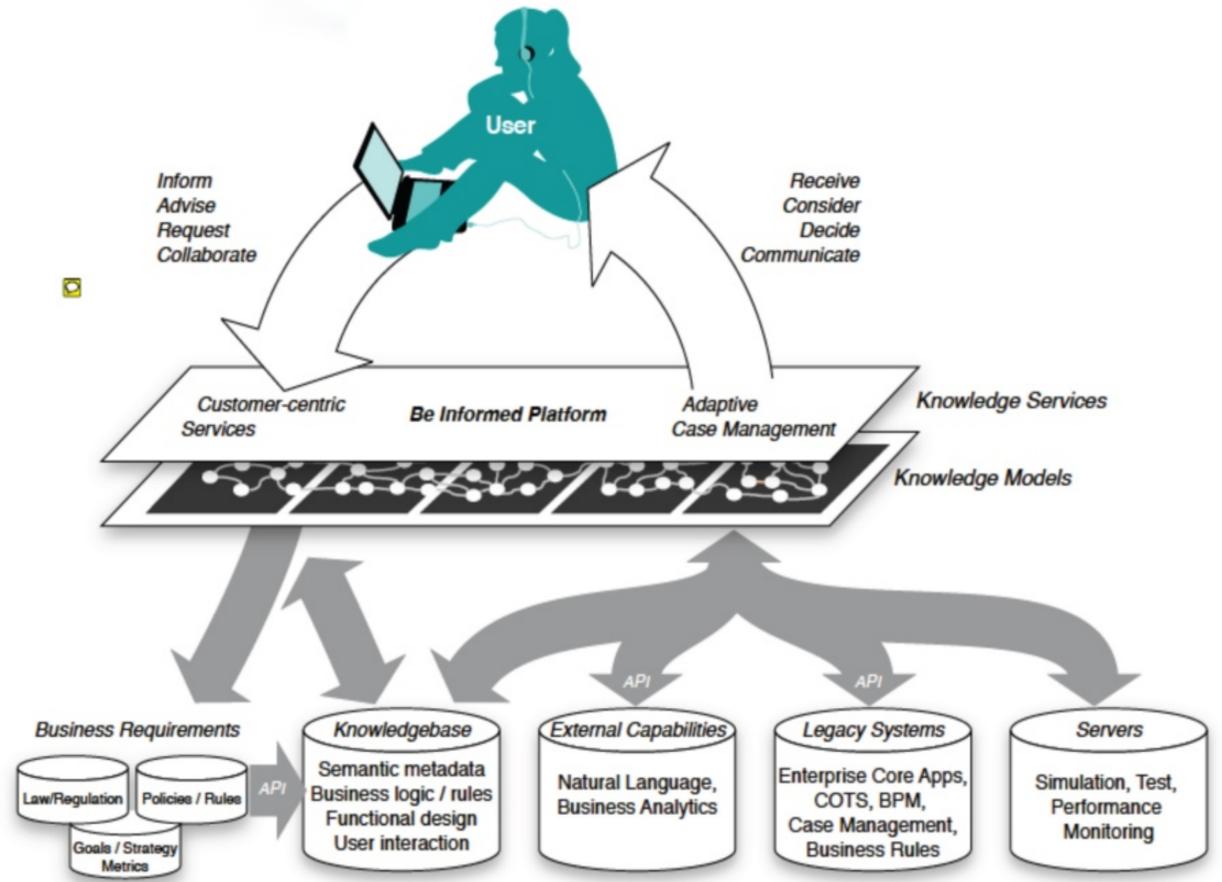


Knowledge support for the administrative professional

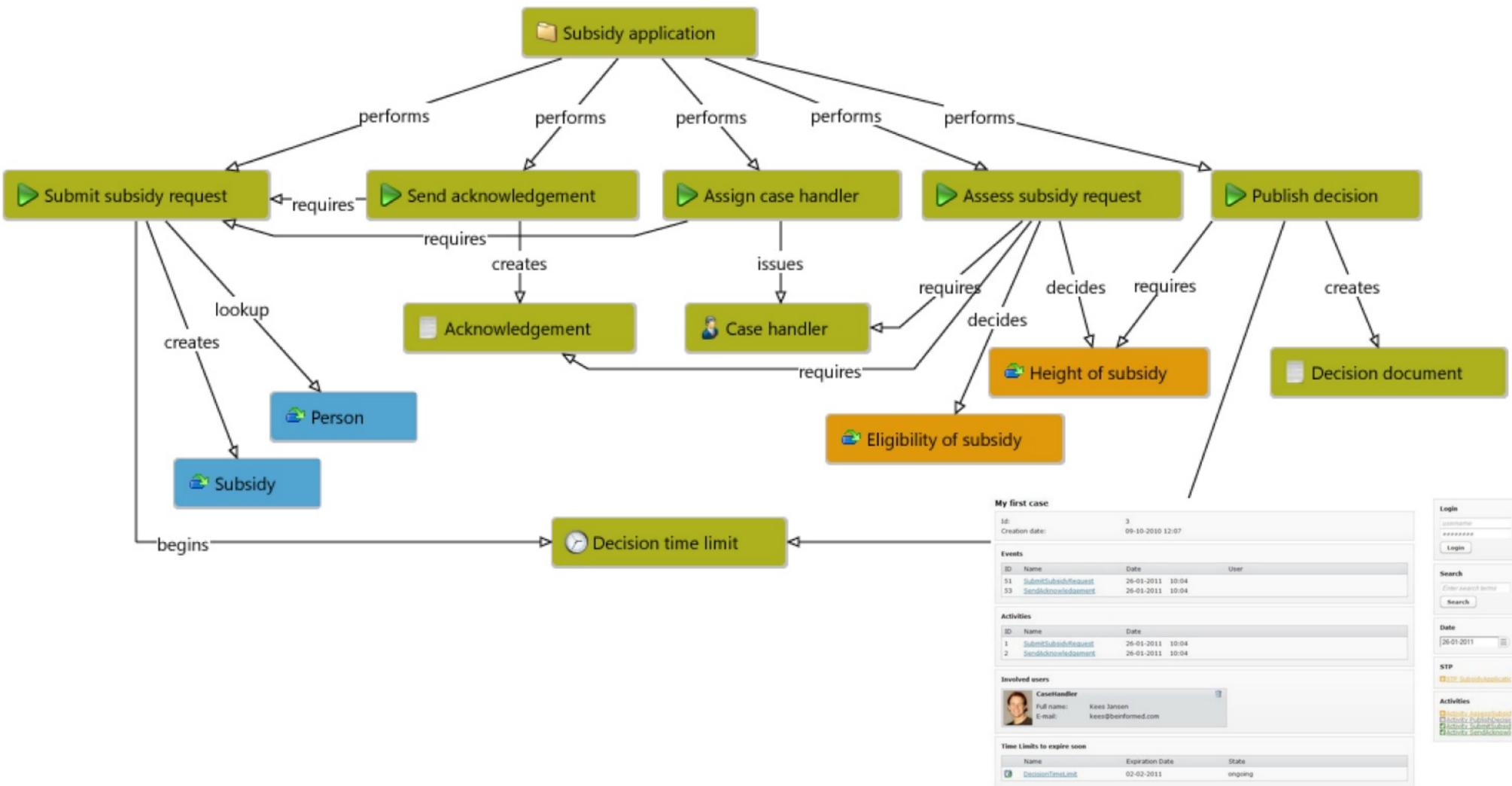
Citizen-centric services



Knowledge Computing Platform



Model = application



My first case

ID: 3
Creation date: 09-10-2010 12:07

ID	Name	Date	User
51	SubmitSubsidyRequest	26-01-2011 10:04	
53	SendAcknowledgement	26-01-2011 10:04	

ID	Name	Date
1	SubmitSubsidyRequest	26-01-2011 10:04
2	SendAcknowledgement	26-01-2011 10:04

Involved users

CaseHandler
Full name: Kees Jansen
E-mail: kees@berformed.com

Name	Expiration Date	State
DecisionTimeLimit	02-02-2011	ongoing

Login

username:

password:

Search

Enter search text:

Date

26-01-2011

STP

STP SubsidySubsidy

Activities

- Activity: AssessSubsidy
- Activity: PublishDecision
- Activity: SubmitSubsidyRequest
- Activity: SendAcknowledgement

Model = documentation

1 Case

To implement their business processes, organisations may handle different types of cases. Cases are completed if all goals or post conditions of the specific case are reached. Typical examples: *Application for a benefit, Insurance Claim.*
Case Management Domain
Metamodel

1.1 Housing benefit request

Description

People who pay too much rent – in relation to their income – can request or apply for housing benefit. The benefit is a monthly allowance.
A Housing benefit request case is only completed if

- the activity Submit the request is completed
- the activity Accept the request is completed
- the activity Publish the decision is completed
- the activity Archive the request is completed

Relations

performs (out)
performs (out)
performs (out)
performs (out)
offers (in)
offers (in)

Labels

Postulation com-
Question c-
Negati-

Submit the request
Accept the request
Assess the request
Publish the decision
Archive the request
Applicant
Case Handle-

Model = explanation



Decision Eligibility of housing benefit

Description

http://www.toeslagen.nl/particulier/huurtoeslag2011/huurtoeslag_wie_wat_wanneer/huurtoeslag_wie_wat_wanneer-03.html#P55_6245

Explain

The condition "Eligibility of housing benefit" is met when all of the requirements "Applicant's rent exceeds the lower limit", "Applicant's rent is less than the upper limit", "Applicant's income is less than the upper limit", "Applicant's savings are less than the upper limit", "Applicant is registered at the address of the housing benefit application", "Applicant (and possible co-applicants) live in an independent rented house" and "Applicant (and possible co-applicants) have Dutch nationality or visa with benefits-rights" are met.

requires

- ✔ Applicant's rent exceeds the lower limit
- ✔ Applicant's rent is less than the upper limit
- ✔ Applicant's income is less than the upper limit
- ✔ Applicant's savings are less than the upper limit
- ✔ Applicant is registered at the address of the housing benefit application
- ✔ Applicant (and possible co-applicants) live in an independent rented house
- ✔ Applicant (and possible co-applicants) have Dutch nationality or visa with benefits-rights

decided by

- ▶ Assess the application

Model = explanation

The screenshot shows the Be Informed Studio interface. The main window displays a translation table for the 'Applicant' context. The table lists source text and target text in Dutch, along with a percentage and a status indicator (green checkmark).

Context	Source	Target	%	S
Applicant	Applicant	Aanvrager	100	✓
	Applicant's age	Leeftijd van de aanvrager	100	✓
	Applicant is younger than 18 years old	De aanvrager is jonger dan 18 jaar	100	✓
	Is applicant younger than 18 years old?	Is de aanvrager jonger dan 18 jaar?	100	✓
	Applicant is not younger than 18 years old	De aanvrager is niet jonger dan 18 jaar	100	✓
	Applicant is between 18 and 22 years old	De aanvrager is tussen de 18 en 22 jaar oud	100	✓
	Is applicant between 18 and 22 years old?	Is de aanvrager tussen de 18 en 22 jaar oud?	100	✓
	Applicant is not between 18 and 22 years old	De aanvrager is niet tussen de 18 en 22 jaar oud	100	✓
	Applicant is between 23 and 64 years old	De aanvrager is tussen 23 en 64 jaar oud	100	✓
	Is applicant between 23 and 64 years old?	Is de aanvrager tussen de 23 en 64 jaar oud?	100	✓
	Applicant is not between 23 and 64 years old	De aanvrager is niet tussen de 23 en 64 jaar oud	100	✓
	Applicant is 65 years or older	De aanvrager is 65 jaar of ouder	100	✓
	Is applicant 65 years or older?	Is de aanvrager 65 jaar of ouder?	100	✓
	Applicant is not 65 years or older	De aanvrager is niet 65 jaar of ouder?	100	✓

Below the translation table, there is a 'Language completeness' table:

Language	% Source	% Accepted	% Draft	% Unavailable
Dutch	0.00	43.61	28.62	27.77
English	100.00	0.00	0.00	0.00

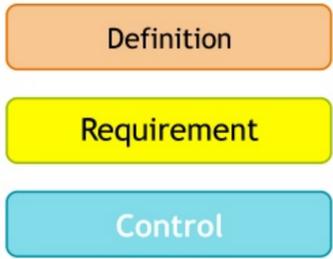
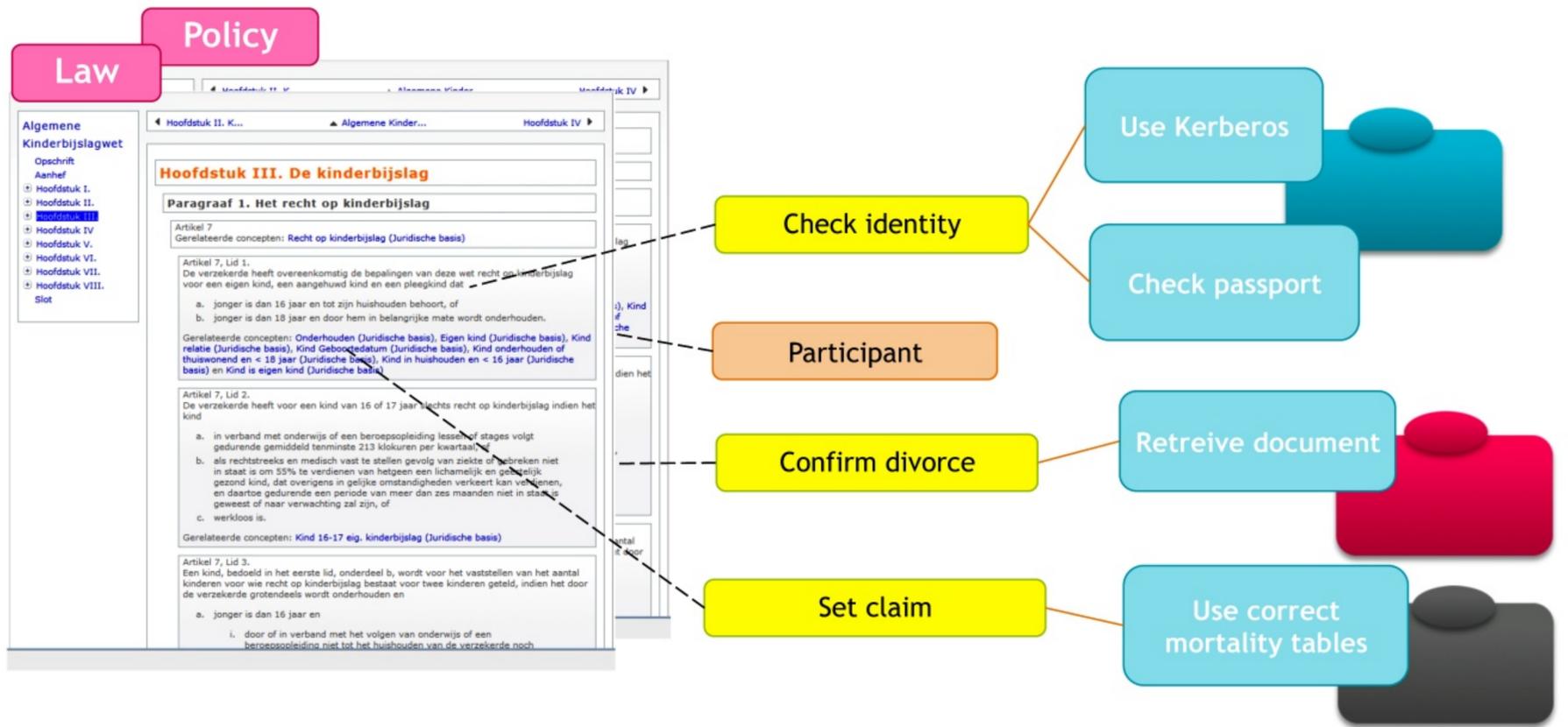
Two translation comparison pop-ups are visible:

- Is de aanvrager 65 jaar of ouder? (BuiltInTranslator)
- Is aanvrager 65 jaar of ouder? (GoogleTranslate)

A 'Language chooser' dialog is also shown, with 'English' selected as the source language and 'Italiano (authorised)' as the second language. A 'Confirm language selection' button is at the bottom.

in different languages

Requirements are traceable



Reference

Is implemented by

Requirements modeled in law and policy models
 Controls modeled in application models
 Explicitly related by control structure

Dhr. A. Arends
Arendsiaan 1
2345AE Lelystad

Subject : Settlement claim 5000363

Dear Mr. Arends,

Below are the payment details on your claim. During the treatment is determined that your claim may be paid partially.

Total will soon be paid to you an amount of: €1150,--.

Current value camera
Purchase price
Purchase date

€1800,--
€2100,--
21-6-2009
€1150,--

Maximum compensation

The following product requirements have played a role.

Product Condition 3 - current value equipment

With respect to payment of amounts claimed equipment is based on the current value. Information concerning the calculation of the current value of a device can be found at: <http://www.berekeningdagwaarde.nl>.

Product Condition 11.a - Maximum compensation

For photo, film, audio (visual) -, computer and optical equipment and instruments, hearing aids and dentures are never more than...

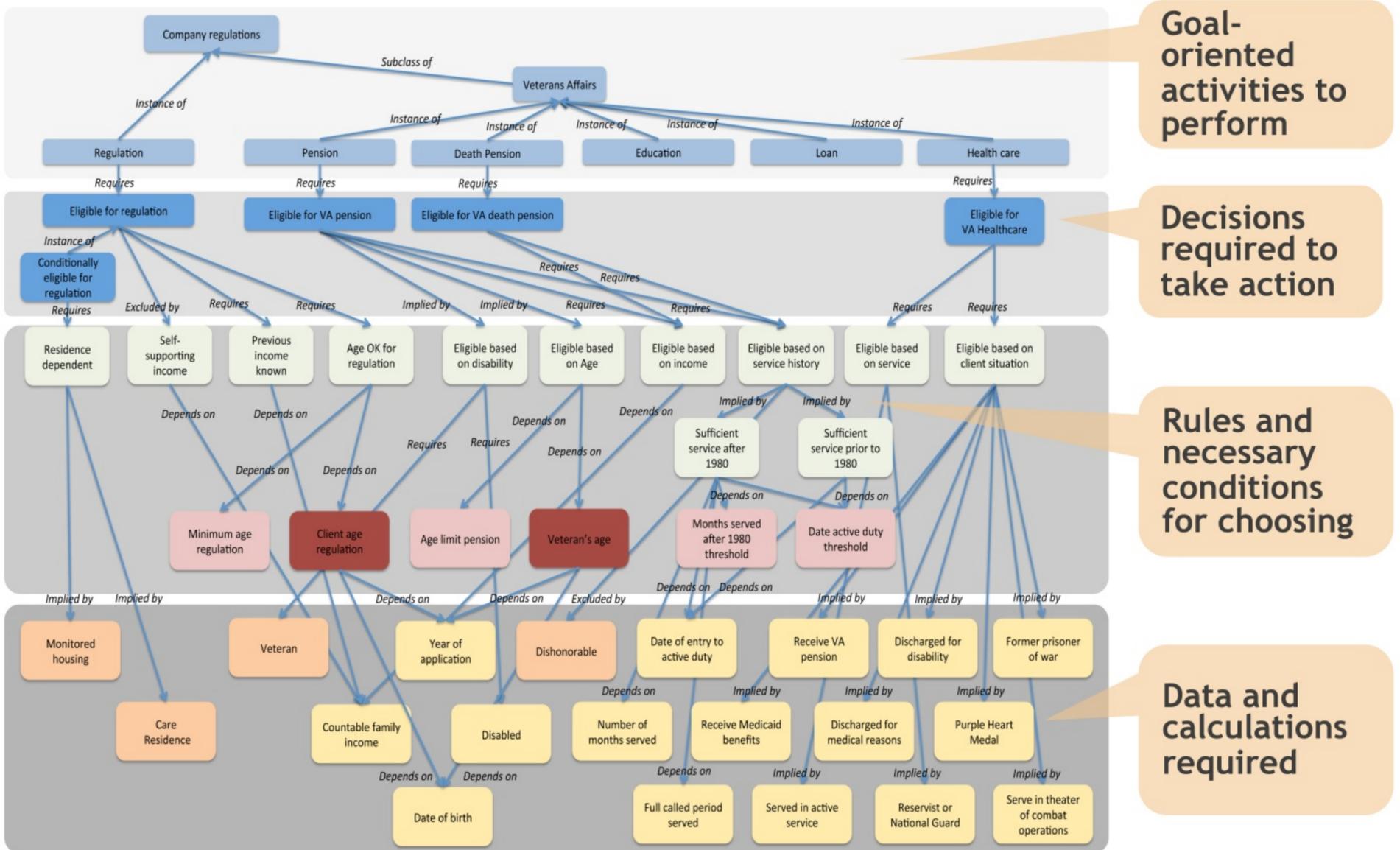
Sincerely,

Your Insurance

Model will generate communication

Be Informed = Systems that Know

- One knowledge model orchestrates every aspect of the solution

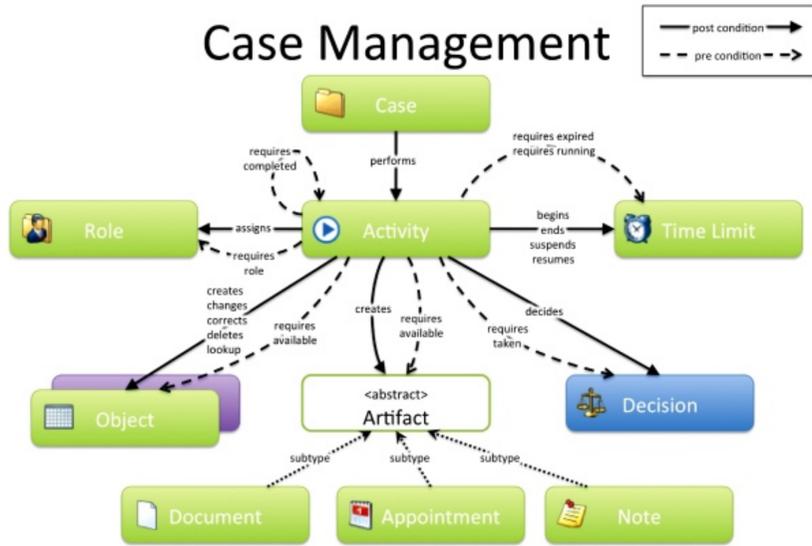




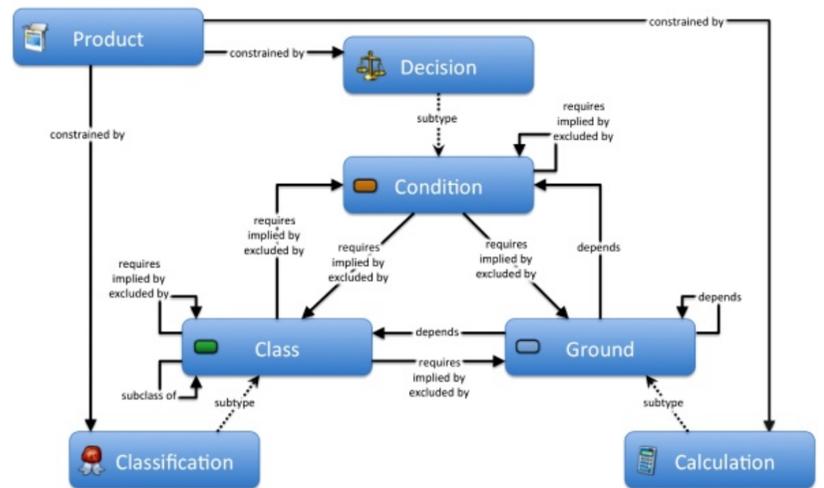
Be Informed = Integrated Modeling Environment

- One environment for all types of modeling. Four basic metamodels.

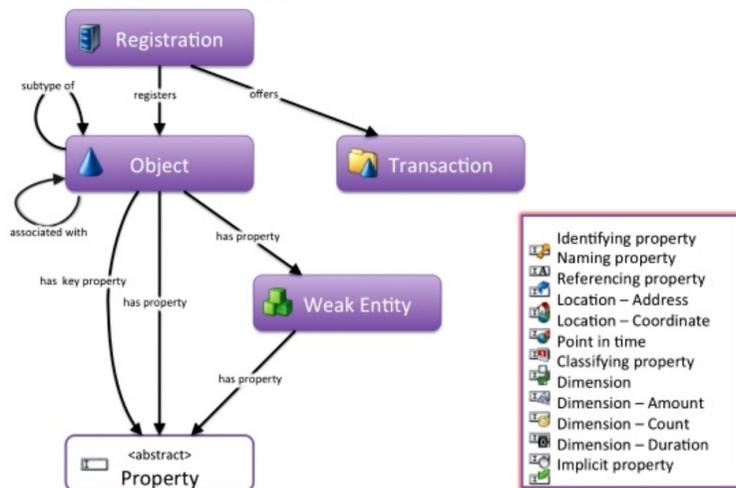
Case Management



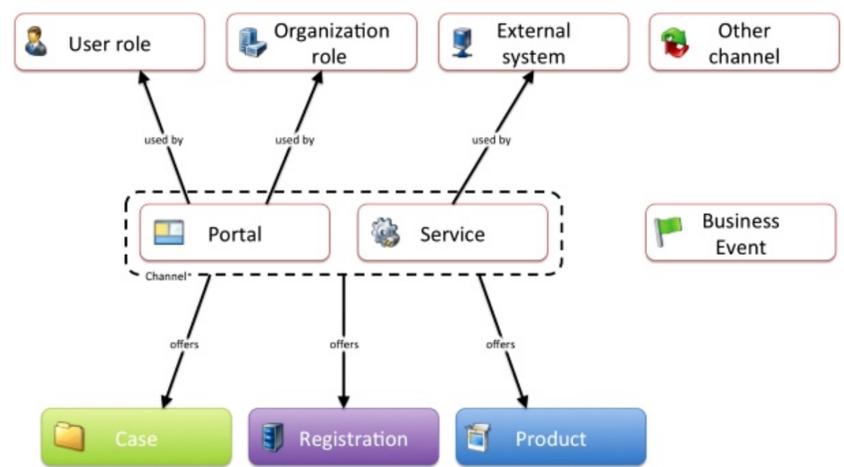
Products And Decisions



Registration



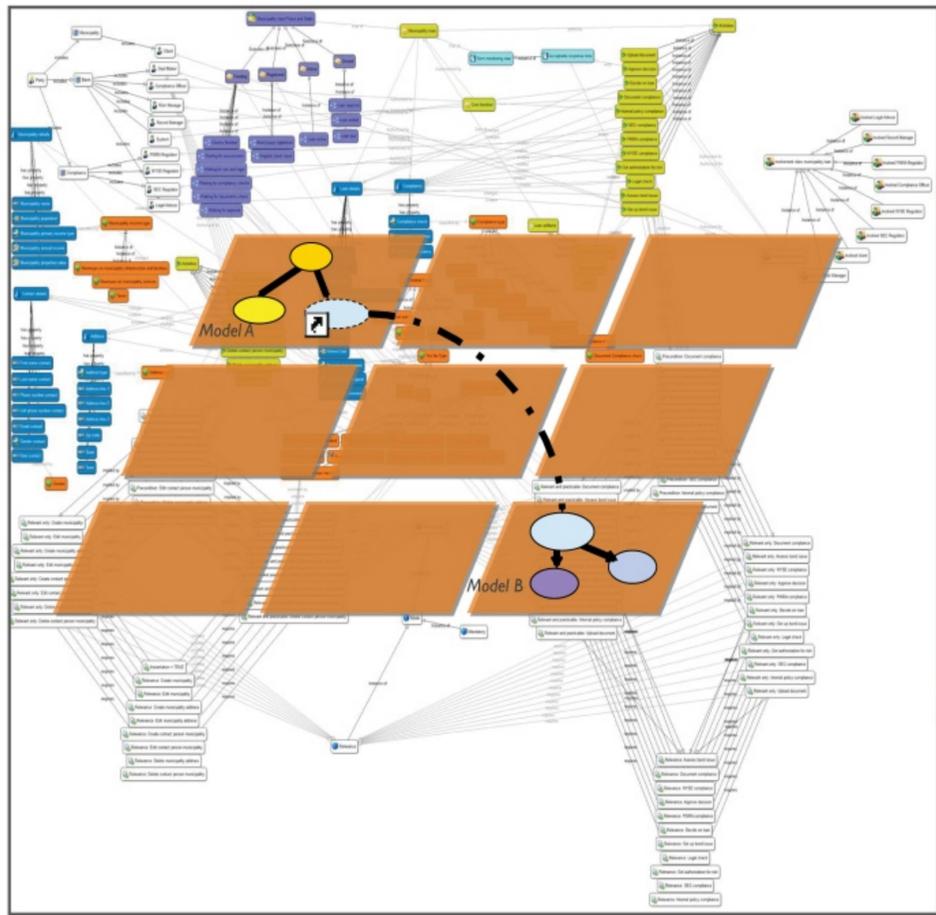
Interaction



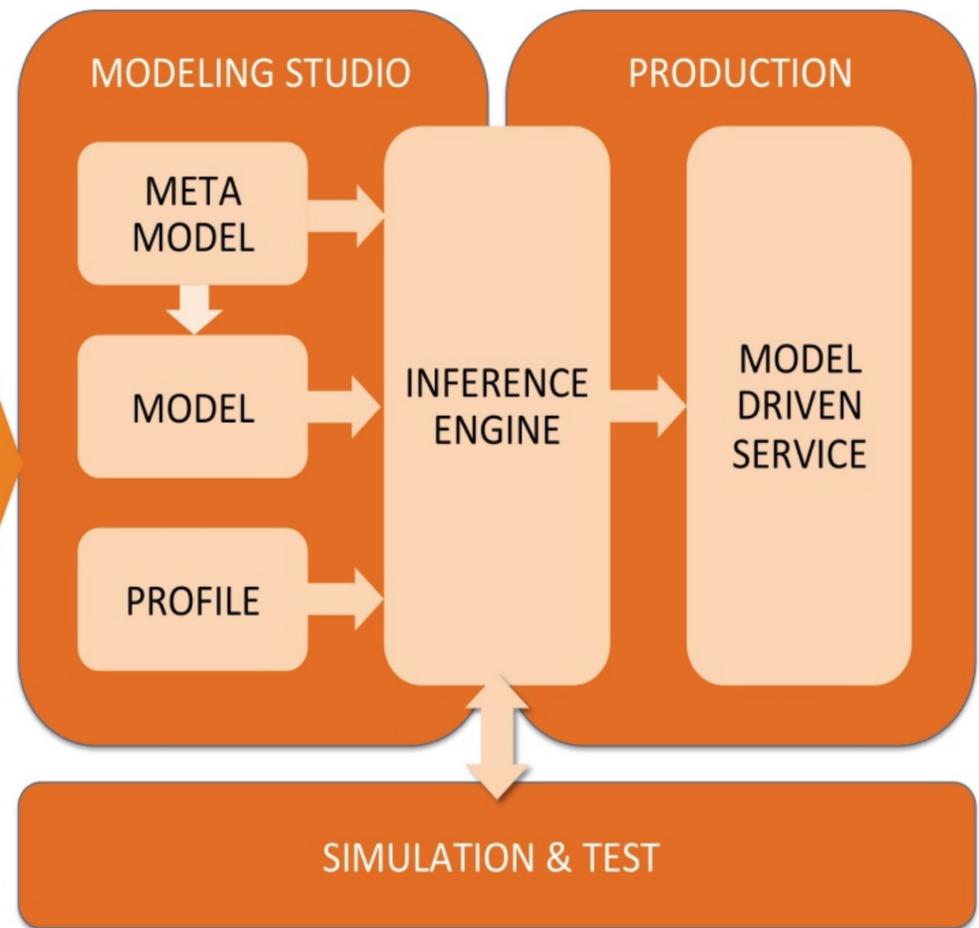
Be Informed = Integrated Execution Environment

- One inference space for all stages of development, testing, and production.

Integrated Knowledge Models



N-ary Inference Space



Model-driven

Context aware

Semantic to the core

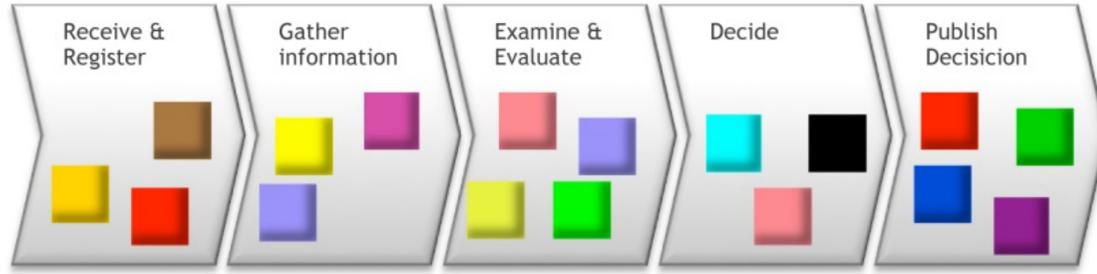
Above the line

- Multiple products routed through same process
- Handling cases through dynamically derived processes: goal-oriented
- Event-driven and stateless processes
- Collaborating across networked organizations



Goal-oriented, event-driven process: *run-time process determination*

Generic process



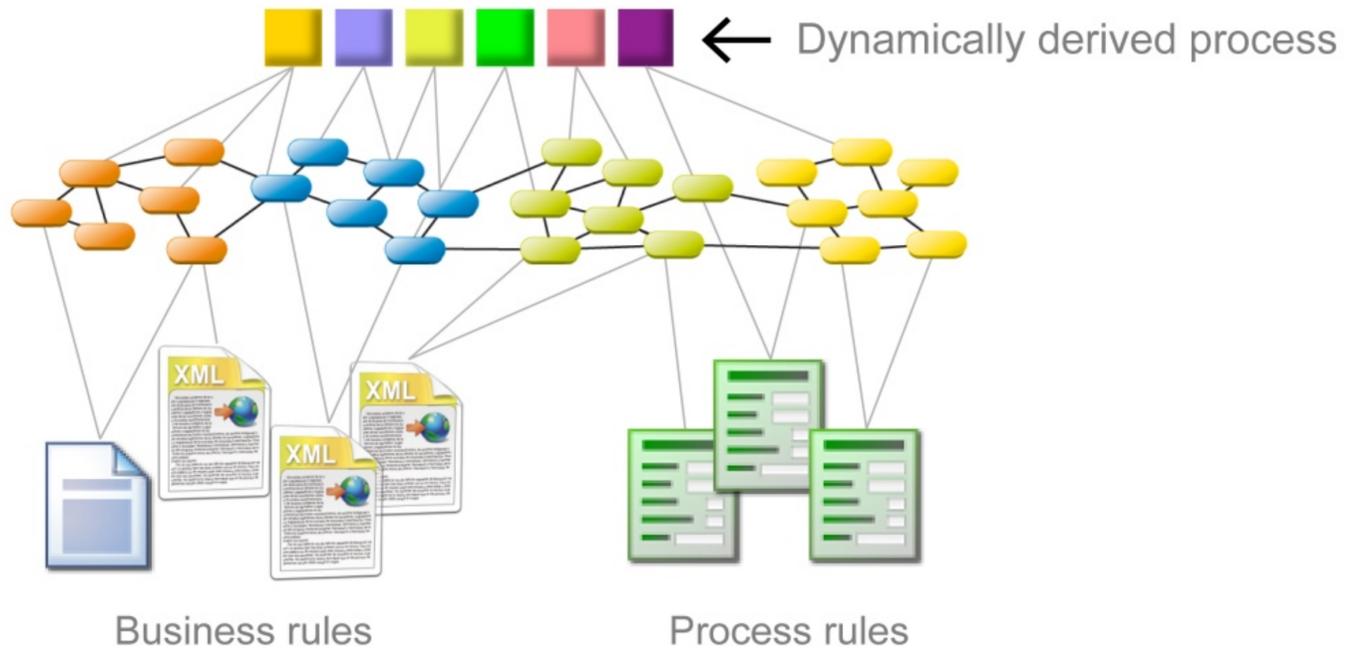
Generic activities

Case at hand



Knowledge model

Laws
Regulations
Policies





Goal-oriented

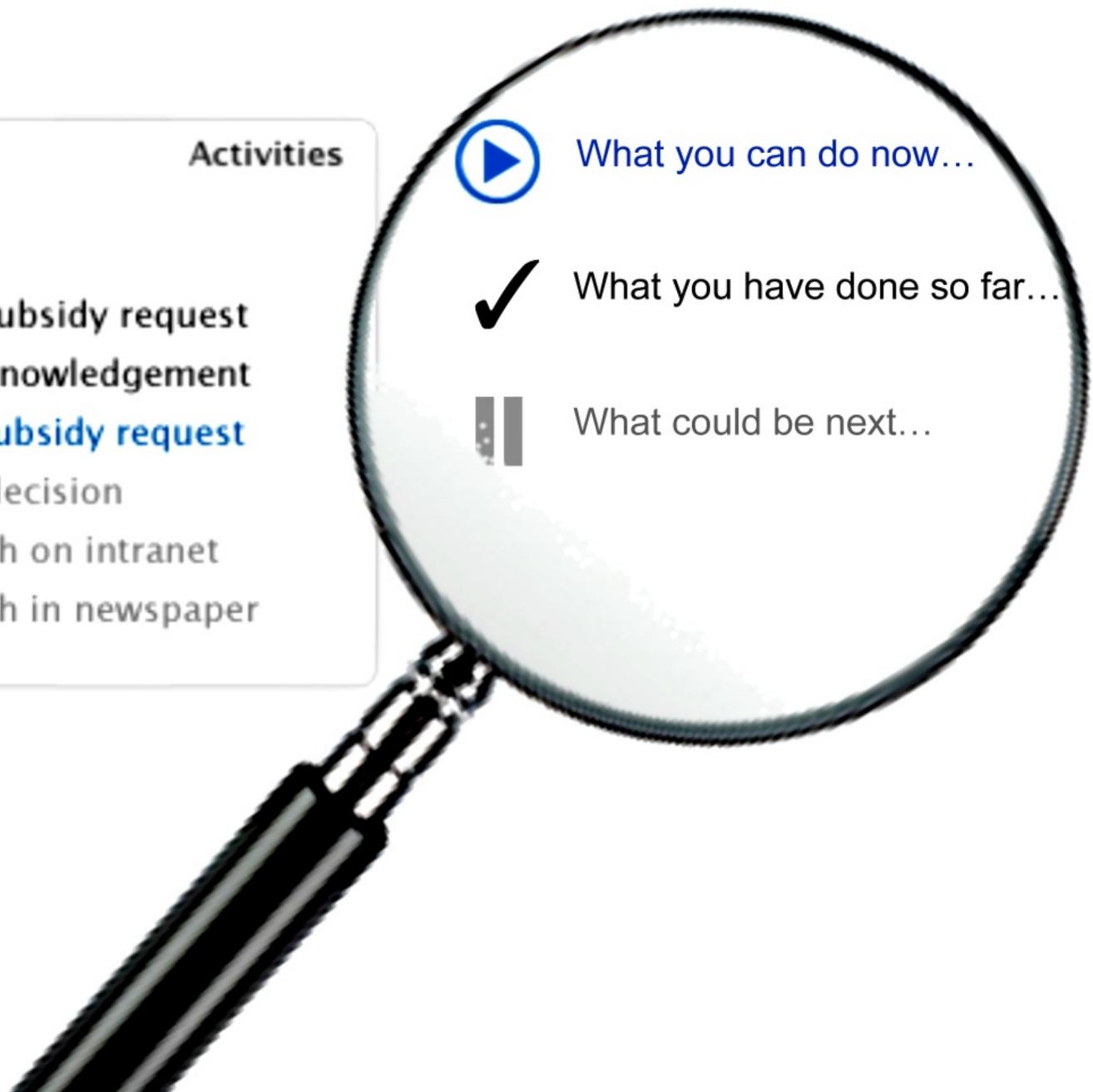
It's all about the *outcome* at the end of the process



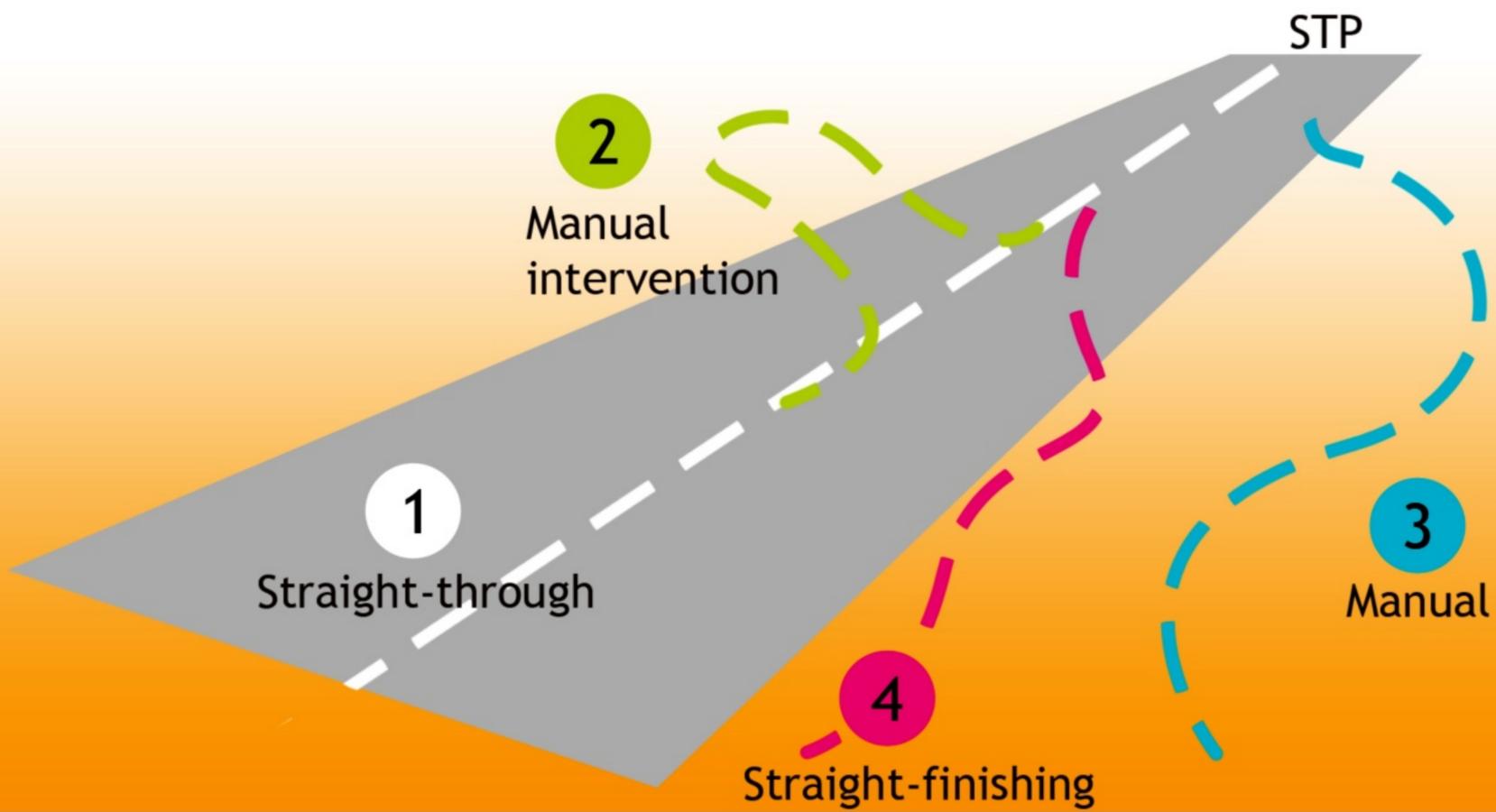
Event-driven - Dynamic Activity Plan

Activities

- ▶ **Grant**
 - ✓ Submit subsidy request
 - ✓ Send acknowledgement
 - ▶ **Assess subsidy request**
 - II Publish decision
 - II Publish on intranet
 - II Publish in newspaper



No difference between straight-through and manual processing - using the same components





**Consumer, Citizen,
Business**

- Shifting requirements
- Driving the process
- Minimal burden



**Administrative
Professional**

- Each case is different
- Interpretation of ambiguous information
- Making operational decisions

Collaborative



Conflicting stakeholder requirements



**Manager,
Strategist**

Operational excellence



Positioning
Be Informed



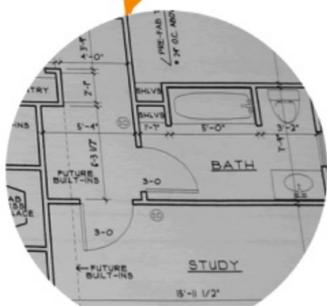
be informed

Concept Computing
Platform

Be Structured
Development Environment



discover



define



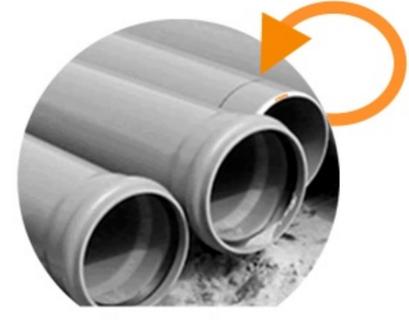
design



deliver
core
application



detail



develop

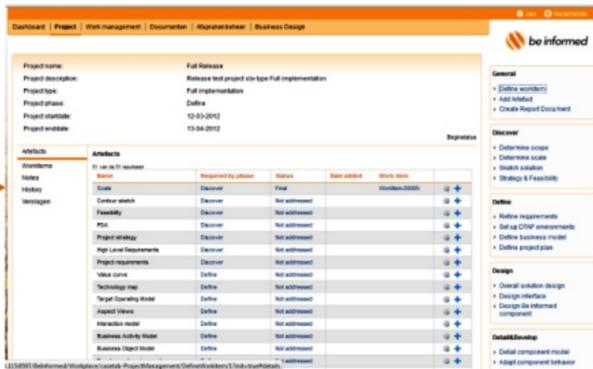


Insight



How to ...

Workplace

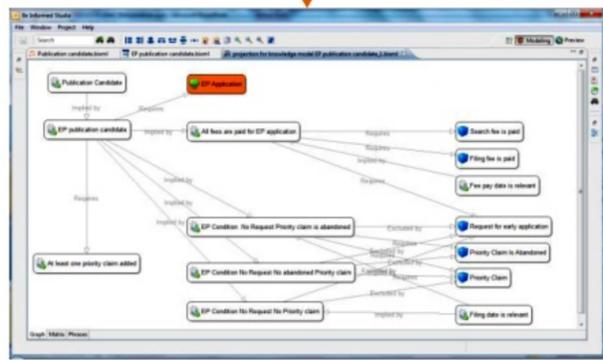


Workitems

Change requests

Project

Studio



Reports



Models

Models



 Integrated platform for **business driven** development

Case Examples



Market
Market Position
Offerings

- Public Sector: market leader
- Track record in: tax, social security, immigration, legal aid, criminal justice, health and welfare, intellectual property, environmental protection and planning
- one-stop-government, advice, execution and enforcement, policy making



SEMANTIS

GOVERNMENT SERVICE MEETS SOFTWARE

For generations of technology innovation cycles the focus has been on incremental technology improvements. Even in the last two years consumerisation and cloud computing have realigned the points of origin and access to services but one thing has not changed. Until now.

The arrival of semantic models and model driven applications has created a new era in the production and re use of service components for numerous government and public service applications.

A pioneer in these technologies, Be Informed is able to present the 'Public Service Platform' and 'Semantis' as a completely new way of building solutions for Smart government and Smart City Services.

Customer interaction

Primary process

Policy management

Compliance and risk

- Each customer is unique and treated accordingly
- Self service and straight through where possible
- Collaboration and tailor made arrangements when needed
- Requests are processed in a dialogue with the customer.



“Each customer is unique”



New to Holland:
One integrated tailor-made advice to people coming to the Netherlands from 14 agencies.



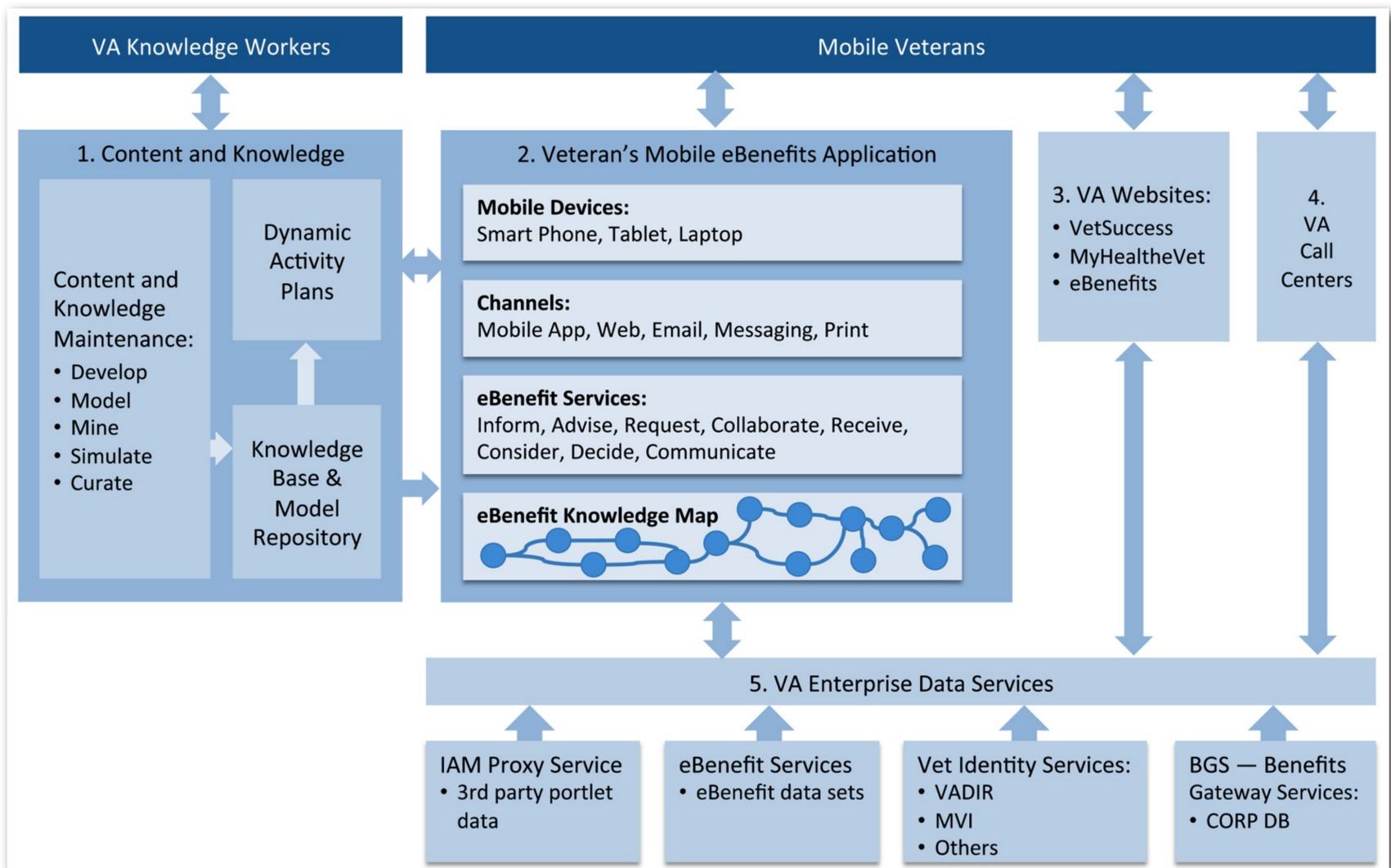
Regelhulp:
Nationwide service to assist people in finding and applying for all the social and health related care, support and benefits required.



Omgevingsloket online:
One customer centric portal to support citizens and businesses in quickly getting all required permissions for their projects.



Veterans Mobile Multi-eBenefits



Customer interaction

Primary process

Policy management

Compliance and risk

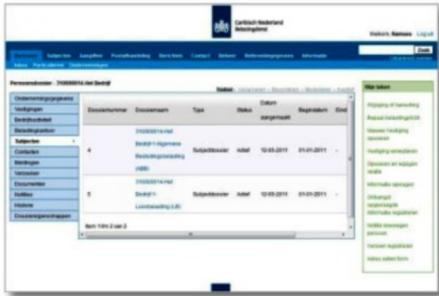
- Mass customization, every transaction is different.
- Combining straight through and manual processing
- Non-linear transactions
- Integrated customer view required
- Complex business policies, and domain knowledge.



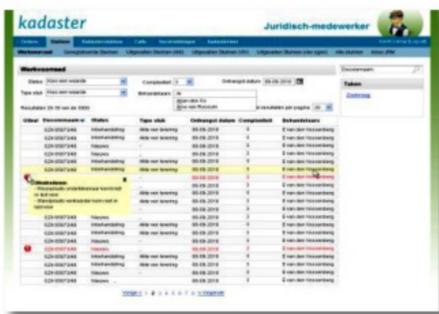
Be Informed: “Complexity needs to go somewhere”



Central Administration Office:
New multi-benefit platform for health and welfare related benefits and contributions. 99.2% straight through processing over an integrated supply chain.



Tax Office:
One platform for all taxes with an integrated customer view over all tax regulations facilitates transition to generic back office / employees.



Land Registry:
New platform for processing all legal deeds in one generic end-to-end process. Expected operational cost reduction of > 50% and TCO reduction > 70%.



Customer interaction

Primary process

Policy management

Compliance and risk

- Frequent external changes in require policy changes
- Non-trivial impact of regulatory requirements
- Difficult to predict the effects of policy changes
- Short time to market for new products and services
- Continuous improvement



Be Informed: “The business rules”



APG / ABN AMRO:

Largest pension administrator in the world uses Be Informed to quickly onboard new customers with unique pension products and services.



Immigration service (IND):

IND is faced with 50 major legislative changes a year. With Be Informed they have reduced time-to-change from 9 months to 2 days.



Social Security Dutch Caribbean:

Delivering a multi-benefit solution for the Dutch Caribbean in 4 weeks. Growing live, while the government was making up the new legislation.



Customer interaction

Primary process

Policy management

Compliance and risk

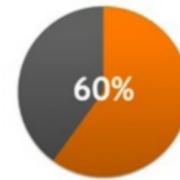
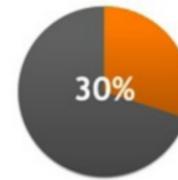
- Define requirements and controls only once
- Transform paper procedures, manuals and spreadsheets in integrated executable models
- Integrate compliance and risk management in primary processes
- Embedded audit trail



Big Impact

- **Solve complexity:**
 - handle tens of thousands of rules, ranging from national to international legislation, and many bi-lateral treaties.
 - treat every customer as an individual.
 - one application covers 1,600 permit types.
- **Fast time to market:**
 - a complete Tax Service in 6 months.
 - a multi-benefits solution in 9 months.
 - licensing and enforcement application in 3.5 months.
- **High productivity development:**
 - Reduce time to implement regulatory changes (from 9 months to 2 days).
 - < 2 hours / function point (full cycle).
 - traditional approach would have cost at least 20 times more (Tax Service).
- **Low Total Cost of Ownership:**
 - up to 70% TCO reduction in permitting.
- **Operational cost reduction:**
 - 30% reduction in administrative burden for police officers.
 - reduce over 90% of all manual labor at a pension fund administrator.
 - 99.2% of all cases handled straight through in government administration.
- **Compliant and correct:**
 - Transparent: “We now know we always apply the correct set of rules.”
 - We now know who decided what, based upon which facts and applying which rules.

2-10X



be informed

CONCLUSION

ACTIVITY-CONTEXT COMPUTING IS COMING!

- IT'S TIME FOR A BETTER LEXICON: SOMETHING WE CAN ALL UNDERSTAND, LIKE "**CONCEPT COMPUTING**"

CONCEPT COMPUTING IS A PARADIGM SHIFT.

- ARCHITECTURE WHERE EVERY ASPECT OF THE SOLUTION IS SEMANTIC AND MODEL-DRIVEN
- DEVELOPMENT METHODOLOGY EVERY STAGE OF THE SOLUTION LIFECYCLE IS SEMANTIC AND MODEL-DRIVEN

CONCEPT COMPUTING IS ALREADY ENTERING THE MAINSTREAM

- THE RACE IS ON TO TRANSFORM CONSUMER AND ENTERPRISE MARKETS

CLICK!

WITH ONE PRESS OF
A BUTTON, I CAN
SIMULTANEOUSLY
UNTANGLE STRING
THEORY, FORECAST
NEXT WEEK'S
WEATHER, AND DO
MY TAXES!

