Refined definitions of LACM capabilities.
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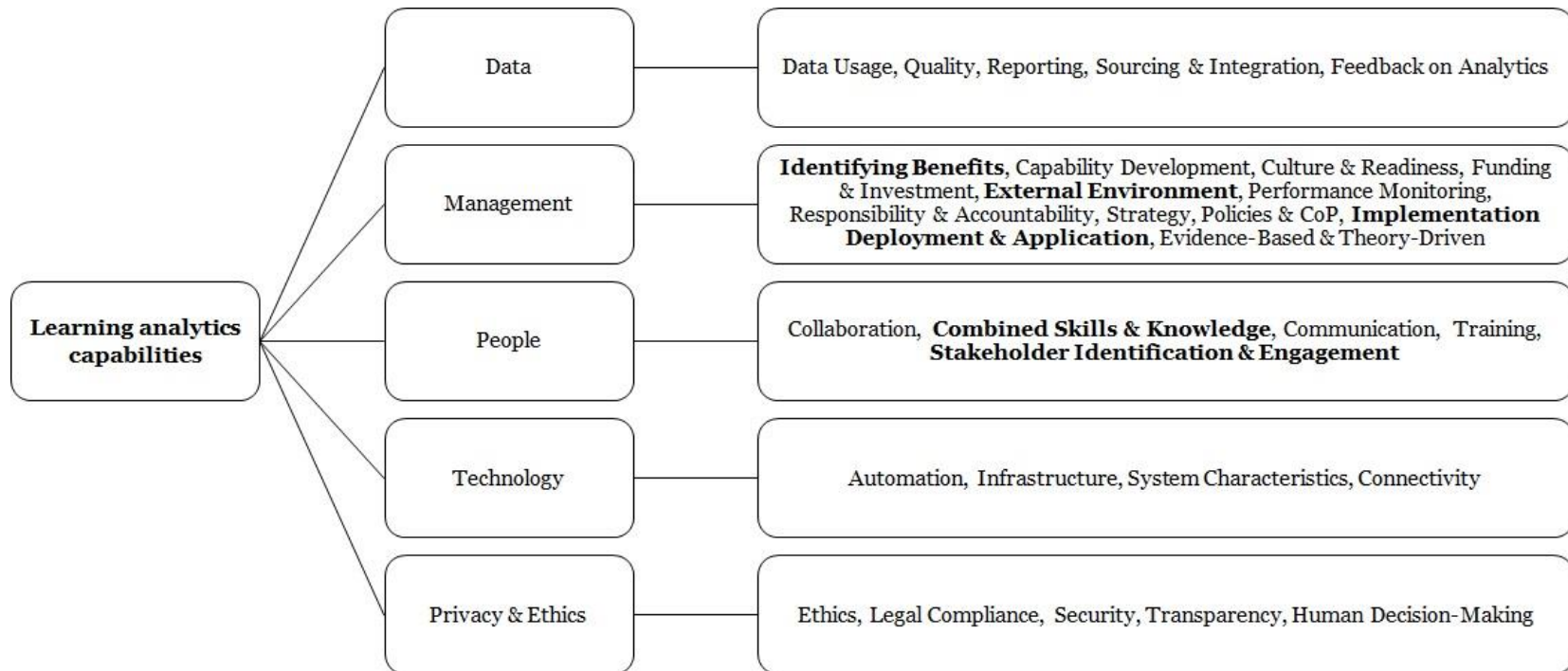## 22-4-2020 CC BY SA NC

Changes made to the definitions of capabilities of the Learning Analytics Capability Model. Definitions are refined based on data from the case study. Figures of both the new and the old model can be found on pages 4 and 5, respectively.

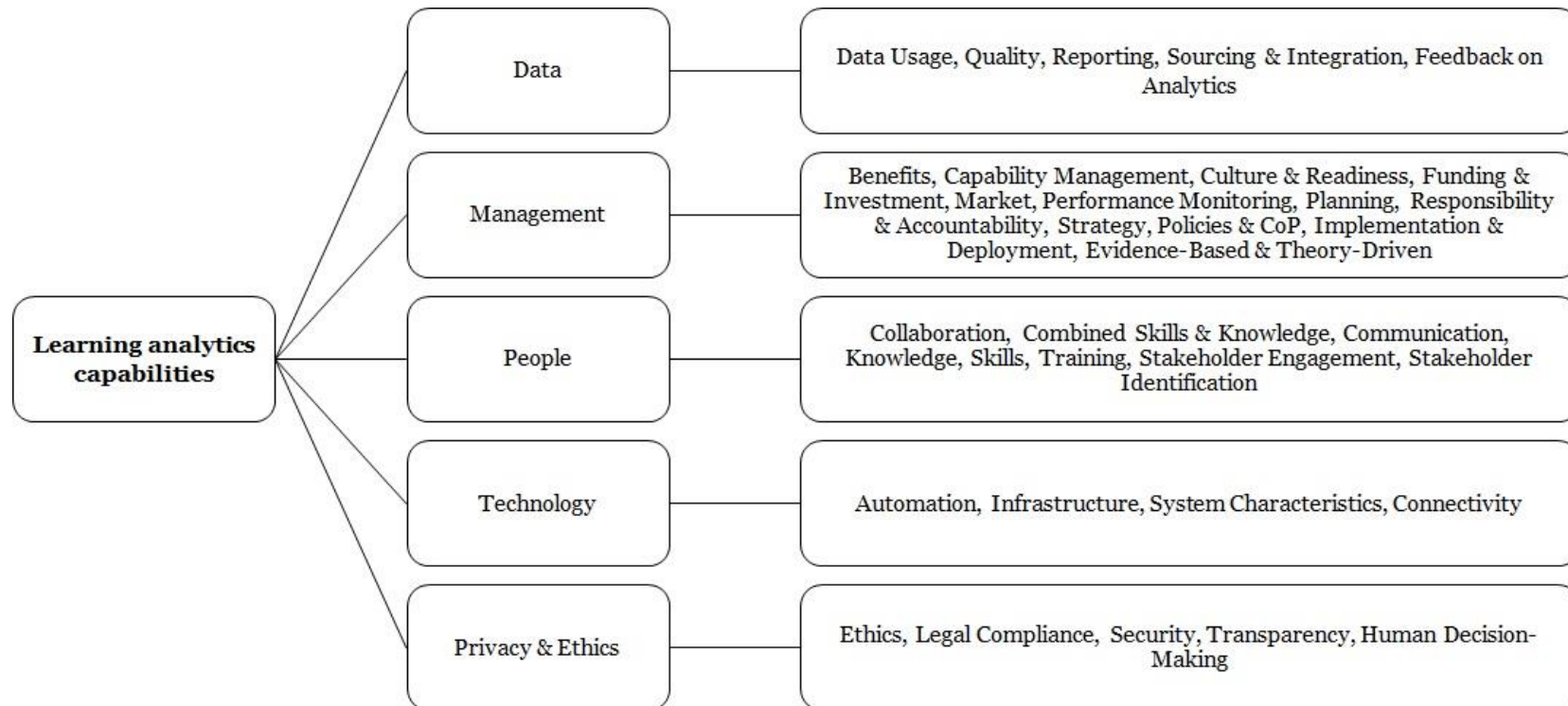| Category	Capability	Old definition	New definition
Data	Data usage	For what goals are analytics used	This capability describes in what way data analysis is used to improve education. It contains data aggregation, different kinds of analysis, the goals of the analysis, and the interventions performed based on the outcomes of the analysis.
	Quality	What are the characteristics of data quality	This capability describes what the characteristics of 'high-quality data' are and in what way the quality of data is secured.
	Reporting	How are analytical results presented	This capability describes in what way the outcomes of data analysis are presented to the various stakeholders and what the requirements of the presentation are. Reporting comprises all one-way flows of learning analytics outcomes.
	Sourcing & integration	What data sources are integrated and how	This capability describes what data sources are used to get the data and in what way different sources are integrated.
	Feedback on analytics	Allows users to provide feedback on the analytics	This capability describes the need of feedback from users and the way this feedback is given.
Management	Identifying Benefits (Previously *Benefits*)	What are the benefits analytics	This capability describes in what way learning (process, environment, or student performance) is improved, i.e., with what goal is an intervention performed?
	Capability management	How are organizational capabilities managed	This capability describes in what way existing organizational capabilities are managed, reconfigured and developed. This includes the growth of existing resources and capabilities into new ones.
	Culture & readiness	What are cultural aspects and readiness factors for the adoption of analytics	This capability describes characteristics of a data-driven culture and the readiness factors necessary for the adoption of learning analytics.
	Funding & investment	What kind of funding and investment is necessary and how is it secured	This capability describes what kind of funding and investment is necessary (time, people, money) and the role of executives to secure the proper funding and investment.
	External environment (Previously *Market*)	How to align with the external environment	This capability describes all influences from outside the organization. This includes the use of material and tools from external parties, the hiring of external personnel, requests and demands from external (governmental) bodies, and sharing materials, knowledge and experiences with other (higher) educational institutions.
	Performance monitoring	How are the performance of analytical processes and outcomes measured	This capability describes in what way the performance of analytical processes and applications are measured.
	Planning	How to plan the use of analytics in organizational processes	Merged with *Implementation Deployment & Application*

	Responsibility & accountability	How are responsibility and accountability managed	This capability describes how the responsibility and accountability regarding learning analytics is managed. That is, decide on who is responsible and accountable for what task and the leadership structure should be. This capability can relate to the responsibility and accountability for activities and tasks at either stakeholder group level (e.g., the learning analytics team) or individual level (e.g., the data scientist from the learning analytics team).
	Strategy	How to align analytics with organizational strategy	This capability describes how to align learning analytics with the (long-term) organizational vision, strategy, and policy.
	Policies & CoP	How to (re)-formulate policies	This capability describes in what way to design and maintain learning analytics policies and codes-of-practice.
	Implementation Deployment & Application (Previously *Implementation & Deployment*)	What factors to consider when implementing and deploying analytics	This capability describes in what way to plan the use of learning analytics, i.e., what activities to deploy before the implementation of learning analytics (systems), and what factors to consider when implementing, deploying and applying analytics.
	Evidence-based & theory-driven	Include evidence and theory in the design of analytics	This capability describes how to include evidence and theory in the design of learning analytics and the performance measurement of learning analytics interventions.
People	Collaboration	How is collaboration achieved	This capability describes the active cooperation between parties - either within a group of stakeholders or between different groups of stakeholders, and either internal or external. This capability also includes the mechanisms via which collaboration is achieved.
	Combined skills and knowledge	What combined skills and knowledge do people need to have to perform analytics and act on it accordingly	This capability describes the skills and knowledge stakeholders need to have in order to perform learning analytics activities and act on it accordingly.
	Communication	How will information about analytics will be communicated	This capability describes the flow of information between stakeholders (groups). This includes communication between users and the party delivering the learning analytics about the needs and possibilities ('demand and supply'), the communication mechanisms and the types of information that are shared between different stakeholders (groups).
	Knowledge	What knowledge do people need to have to perform analytics and act on it accordingly	Merged with *Combined Skills and Knowledge*
	Skills	What skills do people need to have to perform analytics and act on it accordingly	Merged with *Combined Skills and Knowledge*
	Stakeholder Identification & Engagement (Previously	Who to involve in analytics	This capability describes the identification of different (types of) stakeholders who should be involved, and for what purposes stakeholders should be involved in the design, implementation, and use of learning analytics.

	Stakeholder engagement)		
	Stakeholder identification	Who to identify	Merged with *Stakeholder Identification & Engagement*
	Training	What training do people need to receive	This capability describes what training stakeholders should get in order to perform learning analytics activities and act on the outcomes.
Technology	Automation	What is the role of automation in big data analytics and business analytics	This capability describes the role and mechanisms of automation to perform learning analytics activities.
	Connectivity	In what way can data sources be connected	This capability describes in what way systems can be connected
	Infrastructure	What infrastructure is necessary for analytics	This capability describes the required IT infrastructure for learning analytics
	System characteristics	What are characteristic of (technical) analytical systems	This capability describes both the quantitative and qualitative requirements for the systems used to perform learning analytics activities
Privacy & Ethics	Ethics	How to perform analytics in an ethical way	This capability describes in what way ethical issues should be considered
	Human decision-making	What is the role of humans in analytical decision-making	This capability describes the role of humans in decision-making based on data.
	Security	How to secure data and information	This capability describes how to secure data and information
	Transparency	In what way to create transparency about analytics	This capability describes to be transparent about the used definitions, decisions made during the process and context in which learning analytics was used.
	Legal compliance	How to comply with the law	This capability describes how to comply with the law

New, refined Learning Analytics Capability Model

	Data	Data Usage, Quality, Reporting, Sourcing & Integration, Feedback on Analytics
Learning analytics capabilities	**Management**	**Identifying Benefits**, Capability Development, Culture & Readiness, Funding & Investment, **External Environment**, Performance Monitoring, Responsibility & Accountability, Strategy, Policies & CoP, **Implementation Deployment & Application**, Evidence-Based & Theory-Driven
	People	Collaboration, **Combined Skills & Knowledge**, Communication, Training, **Stakeholder Identification & Engagement**
	Technology	Automation, Infrastructure, System Characteristics, Connectivity
	Privacy & Ethics	Ethics, Legal Compliance, Security, Transparency, Human Decision-Making

Old, theoretical Learning Analytics Capability Model[1]

Learning analytics capabilities		
	Data	Data Usage, Quality, Reporting, Sourcing & Integration, Feedback on Analytics
	Management	Benefits, Capability Management, Culture & Readiness, Funding & Investment, Market, Performance Monitoring, Planning, Responsibility & Accountability, Strategy, Policies & CoP, Implementation & Deployment, Evidence-Based & Theory-Driven
	People	Collaboration, Combined Skills & Knowledge, Communication, Knowledge, Skills, Training, Stakeholder Engagement, Stakeholder Identification
	Technology	Automation, Infrastructure, System Characteristics, Connectivity
	Privacy & Ethics	Ethics, Legal Compliance, Security, Transparency, Human Decision-Making

[1] See https://www.online-journals.org/index.php/i-jai/article/view/12793