Inkwell Functional Requirements for Student Devices Version 1.0

These functional requirements draw from commercially available 'off the shelf' technologies as much as possible while creating a set of 'ideal' requirements (e.g. version 2.0) that represent attributes unique to the needs of the elementary and secondary learner and their institution.

The Inkwell Functional Requirements describe a set of characteristics and functions for a computing device, or series of devices designed for the K12 elementary and secondary learner. It is the goal of our Inkwell initiative that via alignment of a collaborative industry consortia, informed by requirements identified and communicated by the education stakeholder community, that a unique set of intended uses, functions, and technical specifications can be developed leading to the manufacture and introduction of a new class of platforms for K12 learning. The Inkwell Requirements are unique in that they inform the development of a computing platform principal use of which is to support instruction and achievement for K12 elementary and secondary learners.

Priority Rank Scale

1. Essential Basic Requirement of all Devices (an Inkwell device cannot operate unless it meets this Requirement).

2. Important, but not essential requirement (the device can operate but this requirement is not necessary to the task of supporting teaching and learning).

3. Nice to Have, but would like to see in Release 2.0 of Inkwell Spec (e.g, perhaps not technically feasible, or commercially feasible at this time).

4. Point of Manufacturer Differentiation (e.g, manufacturer chooses at their option to meet this requirement).

5. Non-essential Requirement (meeting this requirement does not add/subtract from the Primary Purpose of the Inkwell device).

Primary Purpose (4 items)

Req. #	Title	Description	1	2	3	4	5
1	Primary Purpose	Inkwell device(s) are to be designed for the specific purpose of supporting and enhancing instruction and learning for students enrolled in elementary and secondary school settings --grade levels 4 and above.	27		1		
2	Primary Purpose	Inkwell device(s) faciliate, invigorate, and enable learning accommodating the unique needs of students anywhere and anytime they engage in learning activities (home, community, and at school).	26	2			
3	Intended Use	Inkwell device(s) should reflect the occupational and cognitive development levels of K12 students. Optimally, devices should be targeted to the unique need of students levels K-2, 3-5, 6-8, and 9-12 maintaining a consistent transition of user experience from one device to the next.	14	11	3		
4	Age of Learner	For this document the targeted learner is a level 4 or 5 (or above) student, minimum 8 years of age.	10	9	1		

General/Physical Characteristics (15 items)

Req. #	Title	Description	1	2	3	4	5

#	Name	Description					
5	Weight	Inkwell device(s) are lightweight (less than three pounds). This is a combined weight of the device, carrying case, spare battery (if required), mouse and keyboard.	25	9	2	1	
6	Size	Inkwell device(s) should fit into a student backpack and standard half-height student locker for safe storage. Maximum size approximately 9 x 6 x 1 (Z Height of 1").	25	5	3	5	
7	Carrying Case	A carrying case for Inkwell device(s) should provide increased protection for the device. The device(s) can be integrated with the carrying case including peripheral components (e.g, keyboard, mouse, spare battery).	14	6	2	13	1
8	Noise	Inkwell device(s) must make a minimum amount of audible noise (< 45dB when measured 1 meter away from the device) when in operation - the less, the better.	17	16	1	2	
9	Docking Station	Optional - a manufacturer option	3	1	3	25	5
10	Rugged General	Inkwell device(s) should withstand 'rough' usage from students, the wear and tear inflicted by students on the device(s). Ruggedness can be achieved at the component and materials level --such as the use of durable materials, and/or shock absorbers. Ruggedness can also be achieved through the use of 3rd party 'rubber' sleeves that protect the device(s), a carrying case, or other means as defined by the manufacturer. Note: school personnel comment that the largest incident of failure of a student device results from dropped laptops, shattered screens, and, hinges that attach a screen to the laptop.	26	6		4	
11	Rugged Drop Test	It is desirable that Inkwell device(s) withstand drops to a concrete, linoleum-covered floor (at least 10 times per school year from a height of 29") and still return to a fully operational mode. Note: for guidance consult 'Drop Test' in accordance with MIL-STD-810F, Method 516.5, Procedure IV (Transit Drop Test). [Courtesy Mil-Spec]	28	5	3	1	
12	Rugged Compression	It is desirable that Inkwell device(s) withstand compression from sitting or standing by students on the devices (avg 75 lbs) where a point of pressure is defined as the edge and/or middle of the device.	16	11	5	3	1
13	Rugged - Liquid Spills	It is desirable that Inkwell device(s) withstand liquid spills (e.g., a Spill Test onto the device chassis using a 60cc syringe filled with 2% Milk or Coke™). If a keyboard is integrated with the device, then the spill test is onto the keyboard. If the keyboard is external to the device (e.g, attaches via RF, USB or the like) then onto the chassis of the device).	24	6	4	3	
14	Duty Cycle	Inkwell device(s) should withstand regular student daily use in which the device is cycled (turned on/off) 2000 times per year over a 3 year period. Hinges on devices, if used, must withstand 20K cycles per year, over a 3 year period. USB ports, CF Card slots, CD-ROM trays, battery locks/snaps, and on/off switches will be used more frequently than the typical 'adult commercial user'.	35	1			
15	Ruggedness - Display	At manufacturer option Inkwell device(s) should incorporate the use of puncture-resistant displays.	17	4	2	10	3
16	Network Access	Students need mobile, broadband (minimum 11mbps) access to network resources (e.g., at school, in the community and at home) --broadband access is an essential component of student services in the K12 enterprise. Manufacturers are encouraged to design flexibility into student devices to accommodate current, and possible future, access technologies (e.g., WiFi, WiMAX, 3G, 10/100MB Ethernet, etc.).	33			3	1
17	Reliability	Inkwell device(s) are an essential tool for teaching and learning for students in primary and secondary school settings. Inkwell device(s) must be reliable and long lasting, and not prone to failure. Inkwell devices(s) should have not greater than a 3% MTBF rate per academic year (> 3200 hours operational time). Guidance: spare device(s) at each school are recommended to replace failed systems. Replacement for 'defective' or 'damaged' devices should occur within 1 hour of the reported incident.	22	8	1	2	1

			1	2	3	4	5
18	Modular Component Use	Inkwell device(s) should accommodate hardware components that can be added and removed (or replaced) as needed for quick break fix (e.g., Keyboard, Mouse, Battery). Guidance: the choice between component replacement or the 'whole device' is at the option of the customer and a trade-off between buyer preference for 'highly servicable' devices, and devices that are 'replaced' or recycled.	19	7	2	8	
19	Pricing	Guidance: An objective for Inkwell device pricing is to provide as low an overall TCO of the Inkwell device to ensure rapid market uptake of 1:1 access/computing. This TCO figure will be a function of the utility of the device over time, the applications accessed by or resident on the device, support and maintenancne options, and the procurement business model.	14	8	3	5	

Screen/Display (13 items)

Req #	Title	Description	1	2	3	4	5
20	Display Screen	Inkwell device(s) should incorporate a color display with resolution of minimum 800 x 480 -- or equivalent. Guidance: a greater resolution is desirable and should have ability for hardware or software scaling to 800x600 and 1024x768.	22	7	2	5	
21	Display Screen	The screen size should be a minimum 7" diagonal or larger.	16	13	2	6	
22	Display Screen	Touch screen compatible and capable of supporting use of a stylus (to enter 'ink' for example) and to drive menu options, applications and potential on-screen keyboard.	22	8	6	4	
23	Display Screen	Desired capability is the ability to flip the display to support landscape and portrait orientation.	5	8	7	12	4
24	Rugged Impact Resistance	The display should be impact resistant and there should be a means to 'shield' the screen from damage when the device is not in use (e.g., a carrying case).	13	7	6	10	
25	Rugged Dampeners	At manufacturer option, to prevent costly damage to the display, internal dampeners can be used to prevent damage by absorbing shock and sudden impact	10	8	4	14	
26	Rugged Overlay Panel	At manufacturer option, display may be protected by an overlay panel sealed around the edges to provide extra protection against moisture and dust.	4	9	5	18	
27	Rugged Membrane	At manufacturer option, the display can be sealed with a membrane to protect against potential damage from dirt and dust. [Mil-Spec]	4	10	3	19	
28	Rugged Pinch Test	The display should also be able to survive a pinch test (e.g., pressure on a small part of the screen exerted by a textbook, pen, pencil, or other device typically found in a student backpack) -- no spec here yet although we should suggest some type of psi standard for the pressure exerted on the screen before it fails.	13	9	7	7	
29	External Monitor Support	It is desirable that Inkwell devices should support an external display/monitor (connected via a built-in 15-pin monitor port for example) which offers greater resolution than the display integrated with the Inkwell device.	10	10	5	10	1
30	Display Legibility of Text	Inkwell device(s) displays should accommodate being able to read text and view graphic objects/animations in high ambient lighting conditions --ideally, both indoors and outdoor, sun-lit environments.	22	11		3	
31	VGA card and Video Memory	Inkwell device(s) must be capable of full-screen standard definition video playback with no loss of framerate. Minimum 64 MB display memory (Unified Memory Architecture acceptable) whether integrated with the CPU or if a video card is used (e.g, non-integrated GPU). Guidance: the objective is to allow learners to run full-screen decompressed video streams (e.g., for Professional Development, Distance Learning, or robust Animations, and 3D functionality for 3D visualizations & simulations).	24	6	2	1	1

Data Input (12 items)

Req. #	Title	Description	1	2	3	4	5
32	Keyboard-General	External or Integrated - standard QWERTY via USB or Bluetooth. On-screen keyboard also an option. Integrated thumb stick or touch pad type mouse also an option [refer also to item 36].	29	6	1	1	1
33	Keyboard-On Screen	On-screen handwriting recognition is desirable for younger learners who are still acquiring basic composition and handwriting skills. For older students handwriting recognition of both 'words' and numerical figures (e.g., algebraic and mathematical symbols) also desirable.	6	17	12	2	1
34	Keyboard-Multilingual	Inkwell device(s) should offer Multilingual keyboards as an option. [courtesy NYC BOE]	6	13	8	9	1
35	Keyboard-Ergonomic	As an option a detachable keyboard allows the learner to place the display at a height proportional to the height of the learner thus avoiding any 'hunching' and possible deleterious impact to proper posture.	5	11	7	11	4
36	Keyboard-Spill Resistance	Inkwell device(s) should feature spill-resistant keyboards and touchpads for protection against potential damage from the spills and splashes that are common to mobile computing environments (and classrooms). [Source: Mil-Spec] - see also item 13 for further clarification.	17	11	4	6	
37	Keyboard-Rugged	At manufacturer option, the keyboard can be sealed with a membrane to protect against potential damage from dirt and dust. [Mil-Spec]	5	8	6	19	
38	Stylus	A stylus is an option for interaction with the device when the keyboard is not required or available.	18	11	3	3	2
39	Stylus	The stylus should be inexpensive and can be integrated with the device(s) and/or carrying case.	16	6	3	10	3
40	Mouse	Integrated track-ball, touch pad, thumb stick, or external via USB or Bluetooth.	23	5	4	5	
41	Mouse	An external mouse should be small, capable of being easily stowed in the device carrying case, and use as few moving parts as possible. Mice balls are not acceptable.	9	11	6	11	1
42	Speech to Text	As an option, Inkwell device(s) should support voice actuation of commands and possible speech to text capability -- possible key requirement for children who are learning disabled, sight impaired, or other.	3	9	14	11	1

Power Management (9 items)

Req. #	Title	Description	1	2	3	4	5
43	Battery Life	Inkwell device battery must operate 4 hours continuous 'On' time, 6 hours with stand-by, or 'sleep mode' enabled, and capable of 300 full discharges and refreshes per academic year. 4 & 6 hour requirement is stated as after 1 full year of use. A battery for Inkwell devices should also not chip or break when dropped - [see drop test requirement item # 11]. Guidance: "On" is defined as 4 hours using traditional applications such as a browser, word processor, productivity tool, or text-based collaboration suite (email, instant message) that read from disk, or 3 hours engaged in wireless streaming video or other graphics intensive activities.	35	3	1		
44	Battery-Interchangeable	It is desirable that batteries should be interchangeable across multiple Inkwell Certified manufacturers.	11	11	6	8	2

			1	2	3	4	5
45	Battery-Recharging Cradles	It is desirable that battery recharging cradles should be interchangeable between battery manufacturers.	9	8	3	9	4
46	Battery-Disposal Returns	<u>Guidance:</u> Inkwell device manufacturers should establish a policy for the safe disposal, return, recycle of batteries. Discussion: for Districts and States that have a large inventory of devices, how will they dispose of the worn out batteries?	10	10	4	12	2
47	Power Supply	It is desirable that power supplies for Inkwell devices are standardized and interchangeable between multiple manufacturers. Cords for Power Supplies should also be of a standard length.	14	11	1	9	3

<u>Operating System, CPU, Boot Time, Memory, and File Interoperability (22 items)</u>

Req. #	Title	Description	1	2	3	4	5
48	Operating System-General	Inkwell device(s) must incorporate a reliable and stable Operating System which facilitates graceful failure of applications (e.g., failure of a browser doesn't cause the word processor to similarly fail) and a minimum uptime of greater than 99.5%.	33		2	1	
49	Operating System-Compatibility	Inkwell device(s) should have the ability to run either Windows Vista, Windows XP, CE, Windows Tablet OS, Mac OS, Mac OS X, and/or Linux software.	19	3	1	9	4
50	Operating System-Updates	Inkwell device(s) OS facilitates automatic updates from vendor websites, remote management by IT personnel, and capabilities to enable shut down of non-essential applications/features.	20	6	3	6	1
51	Operating System-'Locking'	Should accommodate administrator ability to 'lock down' applications (e.g., Chat tools) to ensure student engagement in classroom activities.	27	8		1	
52	CPU	No specification although the Inkwell device(s) should utilize low power consumption CPUs and be optimized for wireless usage and long battery life.	21	8	1	5	1
53	Boot Time	Target of 10 seconds from cold start, 2 seconds from sleep, suspend, or standby mode. <u>Discussion:</u> Session changes in school settings require that the device have as short a response time as possible to render an application from start up (e.g., powered down mode) and also be able to shut down with the same amount of time. We should strive for instant on, instant off so that teachers can manage the process of having students engage, and then appropriately disengage the use of the devices to support classroom instruction although this capability is likely achievable, given current technology, in a version 1.5 or 2.0 spec. Session changes, particularly in middle and secondary settings don't allow much time for a long boot up procedure.	20	7	2	4	2
54	Chipset	Reliable, fast, low power, low voltage chipset preferred optimized for long battery life.	12	5	2	14	1
55	EMS Memory	As much as possible, minimum 512MB DDR2 with expansion option.	19	3	3	8	1
56	Stereo Sound & Microphone	Integrated high quality stereo sound with integrated 3.5mm for earphone/microphone. Integrated microphone (or external at manufacturer option).	21	6	4	3	1

#	Item	Description					
57	Local Storage (previously hard disk size)	Minimum 20GB (rotational or flash-based or combination at option of manufacturer). Discussion: Local Storage should be available to students with the assumption that the students will store current assignments, multimedia files and ebooks which are periodically backed up to a network storage environment. Guidance: Local 'student files' must be automatically backed up to school, district, or region provided SANs to ensure reliable backup of student information in the event of device, and/or local storage failure.	20	5	2	7	
58	Local Storage-Rugged	At manufacturer option Inkwell device local storage should insure data is not lost through shock or vibration both when the device is 'powered off' and in sleep or standby mode. [see items 10 - 15 for a discussion of 'rugged' requirements]	19	4	1	10	
59	Thin Client Local Storage	In a Thin Client implementation Inkwell device(s) should have sufficient capability to cache applications (and data generated by these applications) so that student work is not lost as a result of intermittent network activity/connections. Guidance: applications used by students should be mobile optimized.	18	8	2	3	
60	Student Files Backup	Inkwell device(s) do not need to be able to maintain student files onboard permanently. Student files saved in stand alone mode should be stored temporarily onboard (eg., via local storage such as Flash, SD, Hard Disk, USB Storage Key) and automatically moved to server storage when the Inkwell device is next connected to the network.	12	15	3	2	1
61	Portable CD-ROM (CD/RW), SD/Flash Storage	The system should be able to support various student data storage options for data archival and/or authentication purposes (e.g, SD card with unique student session attributes and identification information, CD or DVD storage, USB Storage Key, etc). A CD-ROM, CD-RW, CD-RW/DVD-RW combo drive should be available as a manufacturer option, or, at manufacturer option, integrated into the Inkwell device(s).	20	9	3	3	
62	Wireless Network	Integrated IEEE 802.11b/802.11g, 11Mbps (802.11b), 54Mbps (802.11.g), 802.11n (for increased security), upgradeable to WiMAX (802.16d,e) (fixed and/or mobile) when commercially available. Guidance: Students are mobile learners. It is essential that the student have reliable access to network resources at school, at home, in the community, to ensure uninterrupted progress and collaboration with peers, educators, and the broader community of support for the learner. Guidance: Networking Inkwell device(s) should be simple and automated, and support privacy and security of student data. This should support the ability for classroom networks to be recognized by the Inkwell device when the student enters, automatically configured for local printer support, classroom displays, and accept the authority of the teacher's computer to manage the device(s) on the network. The goal is to have everything net enabled, everything can be connected to/communicate with the net via IP [courtesy NYC BOE]	29	4		1	1
63	Wired Network	10/100/1000 Integrated Ethernet at option of manufacturer	23	3	1	8	
64	External Ports	Min 2 full size USB 2.0 although greater number are desired. Guidance: An option is to increase the number of USB ports and remove legacy products such as COM ports, parallel ports, analog modem, etc,	19	8	1	6	