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Digital innovation and environmental communication at Prince Sattam bin Abdulaziz University: Stakeholder engagement, platform affordances, and institutional trust

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ABSTRACT

This article analyzes Prince Sattam bin Abdulaziz University's environmental sustainability communication through the lens of digital innovation and stakeholder engagement. While environmental communication is often evaluated by the presence of green claims, university credibility increasingly depends on how digital platforms connect those claims to audiences, evidence, governance, and participation. Using a qualitative desk-based analysis of official PSAU digital materials, the article examines how the university's web ecosystem presents sustainability through Green University actions, Vision 2030 initiatives, digital transformation projects, IT governance, research and innovation, SDG/ESG coordination, digital learning indicators, and international impact ranking narratives. The article argues that PSAU's messaging is best understood as a platformed sustainability discourse: a communication system in which websites, portals, mobile apps, learning technologies, data-management structures, and news formats mediate the relationship between environmental responsibility and institutional trust. The analysis identifies five stakeholder functions: informing, legitimating, educating, mobilizing, and evidencing. It also identifies gaps, including the need for more interactive feedback loops, clearer audience segmentation, and direct links between digital transformation indicators and environmental outcomes. The article proposes an engagement model based on listening, evidence, translation, participation, reporting, and renewal.

KEYWORDS: stakeholder engagement, digital innovation, sustainability communication, higher education, platform affordances, institutional trust, Saudi universities, PSAU

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1. Introduction

Environmental sustainability communication in universities has moved from the printed report to the digital platform. Students learn about sustainability through course pages, announcements, dashboards, mobile applications, student-affairs campaigns, research news, ranking stories, and social media. Faculty and researchers encounter sustainability through funding calls, innovation centers, data platforms, and partnership announcements. Community partners meet the university through public-service pages and news items. International audiences judge institutional commitment through English-language webpages and ranking profiles. This means that sustainability communication is no longer a single message; it is a networked experience. Prince Sattam bin Abdulaziz University offers a productive case for such analysis because its public digital materials do not present sustainability only as environmental action. They connect it to digital transformation, IT governance, research and development, emerging technologies, student learning, social responsibility, and global SDG recognition. The university's Vision 2030 Initiatives page lists projects such as enterprise architecture, data management, a digital transformation strategic plan, and a Green Technology Initiative. Its Green University page foregrounds planting, green-space expansion, and quality-of-life benefits. Its SDG and ESG Strategy and Implementation Unit page presents a governance structure for coordinating and reporting sustainability-related initiatives. These elements form an ecosystem of messages.

The article asks: how do PSAU's digital platforms mediate environmental sustainability communication for stakeholders? The answer requires attention to platform affordances. An affordance is a possibility for action created by a technology or interface. A share button affords circulation. A chatbot affords service-oriented interaction. Bilingual navigation affords access by multiple language communities. Mobile apps afford continuity between campus and personal devices. Open educational resources afford scalable learning. A reporting platform affords monitoring. These affordances shape what stakeholders can do with sustainability information.

The article's premise is that environmental credibility in higher education depends increasingly on engagement architecture. An institution may publish accurate information, but if it is difficult to find, poorly connected, written for no clear audience, or detached from opportunities for participation, its communicative value is limited. Conversely, a university can build trust when it offers clear pathways from awareness to learning, from learning to participation, from participation to evidence, and from evidence to improvement. Digital innovation is therefore not simply a topic within sustainability communication; it is part of the infrastructure through which sustainability becomes public.

This analysis adopts a critical but constructive stance. It recognizes PSAU's visible achievements in green campus development, digital transformation, research activity, SDG/ESG governance, and impact ranking performance, while also asking how digital communication could become more participatory and evidence-rich. The goal is to move beyond promotional description toward a stakeholder-centered model that can strengthen institutional trust.

2. Digital Sustainability Communication in Higher Education

Higher education institutions occupy a distinctive position in sustainability communication. They are not only organizations with environmental footprints; they are also knowledge producers, educators, public-service actors, employers, land managers, and civic partners. Their sustainability messages must therefore speak to multiple expectations. Students may want to know how sustainability affects learning and campus life. Faculty may want to know how it shapes research funding and curriculum. Facilities staff may focus on operations. Local communities may care about public benefit. Government agencies may look for alignment with national goals. Ranking bodies may look for evidence. A single webpage cannot satisfy all of these needs unless it is embedded in a broader digital communication system.

Digital communication can help universities manage this complexity. Websites provide official statements and archives. News portals narrate events and achievements. Learning-management systems embed sustainability into courses. Mobile apps can deliver service reminders and campaign notifications. Open data portals can make performance indicators available. Social media can mobilize participation and share visual evidence. Dashboards can show progress over time. Yet digital tools can also create fragmentation. If sustainability information is scattered across subdomains, stakeholders may see disconnected announcements instead of a

coherent institutional strategy.

Stakeholder engagement requires more than communication reach. It requires role clarity. A student should understand whether they are being asked to learn, volunteer, conserve resources, innovate, evaluate, or share. A researcher should know how sustainability priorities connect to grants, laboratories, patents, or community projects. A community partner should see opportunities for collaboration. A ranking evaluator should find evidence quickly. An IT professional should know how digital systems support environmental goals. In this sense, the effectiveness of sustainability messaging depends on how well the platform translates institutional strategy into stakeholder action.

The literature on greenwashing also matters for universities. Stakeholders are increasingly skeptical of broad environmental claims that lack evidence. University sustainability communication can lose credibility when it relies on generic adjectives, beautiful images, ranking claims without context, or isolated event stories. Digital platforms can reduce this risk by providing direct links to data, methods, responsible units, annual updates, and opportunities for feedback. The platform can become a trust-building device if it makes claims traceable.

3. PSAU as a Platformed Sustainability Communicator

PSAU's official digital environment presents sustainability through several linked identities. The first is the green campus identity, visible in the Green University initiative. The second is the innovation identity, visible in research and development, emerging technologies, technology transfer, and SDG research funding. The third is the digital university identity, visible in enterprise architecture, data management, digital transformation, e-learning, open educational resources, and IT governance. The fourth is the globally benchmarked institution, visible in Impact Rankings and SDG-related achievements. Together these identities create a platformed sustainability communicator: a university whose environmental message is distributed across digital systems.

The university's mission provides a broad foundation by connecting excellent education, innovative research, partnerships, social responsibility, technological resources, and supportive administration. This mission language allows sustainability to be presented as cross-cutting. It is not confined to an environmental office or a public event. It can appear in curricula, research priorities, campus greening, digital learning, governance, and community service. The challenge is to make these appearances legible as parts of one strategy.

The Green University initiative gives the platform a concrete environmental anchor. Tree planting and green spaces are visually and experientially meaningful. They are easy for students and visitors to notice and easy for communicators to photograph. PSAU's page uses figures related to seedlings, trees, green-space area, carbon dioxide absorption, oxygen production, humidity, dust reduction, and temperature reduction. Such data can convert a campus-beautification story into an environmental-infrastructure story. For stakeholders, the campus becomes proof that sustainability is material, not only rhetorical.

The digital transformation material gives the environmental story a systems anchor. Enterprise architecture, data management, digital services, e-learning, open educational resources, and IT governance are not green by default, but they can enable environmental performance. They can reduce administrative paper use, make services more efficient, support remote access, increase transparency, and organize data for reporting. PSAU's challenge is to communicate these indirect environmental links clearly so stakeholders understand why digital transformation matters for sustainability rather than only for convenience.

4. Methodology

This article uses qualitative discourse and stakeholder analysis. The corpus comprises official public PSAU digital materials related to sustainability, digital transformation, research and innovation, IT governance, SDG/ESG strategy, and ranking news. The analysis focuses on how these materials construct stakeholder roles and what platform affordances they provide. It treats textual content, numerical evidence, page structure, institutional labels, share functions, bilingual navigation, official-domain cues, and references to platforms as communicative resources.

The coding process used three questions. First, what sustainability claim is made? This question identifies whether the claim concerns green space, education, research, technology, governance, ranking performance, community engagement, or national alignment. Second, who is addressed or implied? This question identifies

whether the message speaks to students, faculty, administrators, policymakers, local communities, external partners, or ranking bodies. Third, what action is afforded? This question asks whether the platform invites reading, sharing, applying, participating, verifying, contacting, learning, or comparing.

A limitation should be stated clearly. The analysis relies on official public sources and does not include interviews, analytics data, social-media metrics, or direct user testing. It therefore cannot determine how stakeholders actually receive the messages. It can identify the communicative design that stakeholders encounter and the opportunities for stronger engagement. A fuller study could compare Arabic and English pages, conduct usability testing, survey students, and analyze social-media circulation.

Table 1. Stakeholder needs and digital communication opportunities

Stakeholder group	Likely information need	Digital communication opportunity
Students	Practical ways to learn, volunteer, conserve, innovate, and see campus impact	Mobile app alerts, student project galleries, sustainability challenges, course links
Faculty and researchers	Funding, research priorities, methods, data, and partnership pathways	SDG research hub, grant calls, datasets, lab stories, technology-transfer links
Administrators and facilities teams	Operational indicators, responsibilities, monitoring, and improvement cycles	Dashboards, internal reporting systems, annual indicator reviews
Community partners	Local benefits, collaboration opportunities, and public accountability	Community pages, partner maps, event archives, feedback forms
Ranking and external audiences	Evidence, governance, SDG alignment, and comparability	Central evidence repository, downloadable reports, methodology notes

5. Findings: Stakeholder Functions of PSAU Sustainability Messaging

5.1 Informing: making sustainability visible

The most basic function of PSAU's digital sustainability messaging is informing. The Green University page informs audiences that the university has an afforestation initiative, states its goals, and reports achievements. The Vision 2030 Initiatives page informs users that sustainability has been integrated into educational activities, curricula, workshops, applied projects, and research initiatives. The SDG research funding page informs faculty that the university supports SDG-related research and technology applications. These messages create awareness and establish sustainability as a visible institutional priority.

Informing is not trivial. In a large university, many sustainability actions may occur without being visible to students or external audiences. Digital pages transform internal activity into public knowledge. They also create an archive. A tree-planting campaign or workshop that is documented online can be found later by students, researchers, partners, and ranking evaluators. The archive function is a major affordance of university websites. It gives sustainability activity memory and continuity.

However, informing becomes stronger when information is organized by audience and theme. A student may not know whether to look under Green University, Student Affairs, Vision 2030, Research Programs, or SDG/ESG pages. A centralized sustainability hub could improve the informing function by organizing content around questions such as: What is PSAU doing? How can I participate? What data are available? What courses or projects exist? What progress has been made? Who is responsible?

5.2 Legitimating: aligning with recognized frameworks

The second stakeholder function is legitimating. PSAU's sustainability messages repeatedly align with Saudi Vision 2030, the Saudi Green Initiative, the Quality of Life Program, and the SDGs. This alignment gives stakeholders a recognizable frame for interpretation. It tells students and staff that campus actions support national goals. It tells external partners that the university understands strategic priorities. It tells ranking audiences that institutional activity is mapped to global development frameworks. Legitimating discourse is especially important for public universities because their responsibilities are connected to national development.

Legitimation is also produced by institutional governance. The SDG and ESG Strategy and Implementation Unit is described as responsible for coordinating, governing, implementing, monitoring, and reporting sustainability initiatives across the university. The IT Governance and Compliance Unit describes technology-risk management, compliance, service reliability, and digital sustainability objectives. These units give the discourse organizational anchors. Stakeholders can trust sustainability communication more when it is associated with named structures rather than anonymous enthusiasm.

External recognition adds another layer of legitimation. PSAU's announcement of advancement in THE Impact Rankings and THE's own profile of the university provide evidence that the institution is visible in global benchmarking systems. For international audiences, rankings can be a shorthand for institutional seriousness. Yet rankings should be communicated as one evidence source among many. A stakeholder-centered platform should explain what rankings measure, which SDGs are strongest, and what environmental indicators are addressed through other forms of reporting.

5.3 Educating: turning messages into learning resources

The third function is educating. A university sustainability message should teach audiences how environmental responsibility works. PSAU's Vision 2030 Initiatives page describes the integration of sustainability concepts into activities, curricula, applied projects, practical training, and workshops on recycling, energy conservation, and sustainable technologies. This is significant because it shifts communication from reputation to pedagogy. The university is not only telling audiences that sustainability matters; it is representing sustainability as something students can study and practice.

Digital learning indicators deepen this educational function. The report on digital performance mentions thousands of e-courses, flexible learning paths, and open educational resources. These resources can make sustainability education scalable if sustainability topics are embedded in them. For example, open modules on campus energy, water conservation, green building materials, recycling systems, environmental data literacy, and SDG project design could serve students across colleges. The digital platform would then become a sustainability classroom beyond the physical classroom.

Research and innovation pages also educate by showing what counts as knowledge contribution. When the university links research programs to sustainability, energy, industry, future economies, and emerging technologies, it teaches stakeholders that environmental sustainability is not only behavioral but scientific and technical. Students can see sustainability as an innovation field; faculty can see it as a research priority; partners can see it as a collaboration area. This educational function is central to a university's environmental role.

5.4 Mobilizing: inviting participation and action

The fourth function is mobilizing. Sustainability communication should not stop at awareness. It should invite stakeholders to act. PSAU's pages and news items point to student programs, workshops, community initiatives, research funding, and partnerships. These elements imply participation, but the pathway from message to action could be made more explicit. A stakeholder visiting a Green University page should be able to find current volunteer opportunities, tree-care campaigns, recycling locations, sustainability clubs, project competitions, or feedback channels.

Digital affordances can make mobilization easier. A mobile app can send reminders about campaigns or energy-saving challenges. A portal can allow students to register for sustainability events. A dashboard can show which colleges are participating. Social sharing tools can circulate volunteer opportunities. A chatbot can answer questions about recycling, public transport, green spaces, or sustainability courses. PSAU's existing digital ecosystem suggests capacity for such engagement; the opportunity is to connect the ecosystem more directly to environmental action.

Mobilization also requires recognition. Students and staff are more likely to participate when their contributions are visible. Digital badges, certificates, leaderboards, project galleries, and annual sustainability awards can convert participation into institutional memory. These tools should be used carefully to avoid superficial gamification. Their purpose should be to recognize meaningful contribution and encourage sustained environmental habits, not merely to produce publicity.

5.5 Evidencing: making claims traceable

The fifth function is evidencing. PSAU's communication includes several evidence types: tree counts, green-space areas, digital transformation rates, e-course numbers, open educational resource counts, energy savings, social responsibility programs, volunteer hours, rankings, and governance structures. These evidence types serve different purposes. Some show environmental infrastructure. Some show digital capacity. Some show education and community engagement. Some show external recognition. A high-trust platform should identify these categories clearly so stakeholders can understand what each number proves.

Traceability is the key to evidencing. A number becomes more credible when users can see its source, date, method, responsible unit, and update cycle. For example, a claim about carbon dioxide absorption should link to a calculation note. A claim about energy savings should specify the baseline and period. A claim about digital transformation should explain the index. A claim about ranking performance should link to methodology. This does not require excessive technical detail on every page; it can be handled through expandable notes and downloadable reports.

The SDG and ESG Strategy and Implementation Unit can play a central role in evidencing. Because the unit is described as responsible for sustainability governance, reporting, benchmarking, and evidence generation, it can coordinate a single repository of indicators. Such a repository would benefit ranking submissions, public accountability, internal management, and student learning. It would also reduce the risk of selective disclosure by presenting progress and challenges together.

6. Platform Affordances and Institutional Trust

Platform affordances shape institutional trust in subtle ways. An official web domain affords authority. HTTPS and government-verification cues afford security. Bilingual navigation affords inclusion. Share icons afford circulation. Mobile app links afford service continuity. Chatbot imagery affords responsiveness. News archives afford memory. Data-management structures afford reporting capacity. These features do not automatically produce trust, but they create the conditions under which trust can be built.

In PSAU's case, these affordances support a public image of a modern university. The platform communicates that the institution is digitally organized, connected to government standards, and capable of serving multiple audiences. This is important for sustainability because environmental responsibility is increasingly associated with institutional maturity. A university that cannot organize data, update pages, respond to users, or connect claims across systems may struggle to be trusted on complex environmental issues.

Trust also depends on coherence. When sustainability material appears across many pages, the platform should guide users through the relationships among them. The Green University initiative should connect to SDG indicators. SDG governance should connect to research funding. Research projects should connect to student learning. Digital transformation should connect to resource efficiency. Ranking announcements should connect to evidence repositories. Without such links, stakeholders may see activity but not system.

Digital innovation can therefore be understood as a communicative responsibility. It is not enough for IT systems to exist internally. They should help stakeholders understand, participate in, and evaluate sustainability. The phrase 'green technology' should be made concrete through examples: smart irrigation, energy monitoring, paperless workflows, virtual labs, remote access, data dashboards, building-management systems, and open educational resources. When platform affordances become evidence affordances, institutional trust grows.

7. Proposed Engagement Model

This article proposes a six-part engagement model for PSAU and comparable universities: listen, evidence, translate, participate, report, and renew. Listening means using surveys, feedback forms, chatbot queries, student councils, faculty committees, and community consultations to understand what stakeholders need from sustainability communication. Evidence means collecting and publishing indicators with dates, baselines, methods, and responsible units. Translation means turning technical data into accessible explanations, visuals, stories, and learning materials. Participation means giving stakeholders practical pathways into campaigns, research, volunteering, innovation challenges, and curriculum projects. Reporting means publishing regular updates, including achievements and difficulties. Renewal means revising strategies based on feedback and evidence.

The model is designed to avoid two weaknesses in sustainability communication. The first is one-way publicity, where institutions announce achievements but do not invite dialogue. The second is technical opacity, where data exist but are difficult for non-specialists to understand. A university must do both: provide credible evidence and translate that evidence into meaningful stakeholder experiences. PSAU's digital ecosystem is well placed for this model because it already includes official websites, news pages, IT governance, digital learning, research structures, and SDG/ESG coordination.

The model also recognizes that stakeholders differ. Students may prefer short videos, app notifications, maps, and participation links. Faculty may need data, funding calls, and interdisciplinary networks. Administrators may need dashboards and performance indicators. Community partners may need clear contact points and impact stories. Ranking audiences may need structured evidence. International partners may need English-language summaries and comparable frameworks. A mature platform should not force all audiences into the same communication format.

Renewal is especially important. Sustainability challenges evolve, and so do stakeholder expectations. A static page can quickly become outdated. A communication system should have an annual cycle: gather data, publish indicators, update stories, invite feedback, revise targets, and archive previous years. This cycle would convert sustainability communication from a set of announcements into a learning system. It would also align with the logic of continuous improvement in quality assurance and digital governance.

8. Practical Recommendations

First, PSAU could build a centralized digital sustainability hub with audience pathways. The homepage might ask users to choose among student, researcher, staff, community partner, media, and ranking-audience pathways. Each pathway would present relevant actions and evidence. This would reduce the burden on users who currently need to infer where sustainability information is located. It would also allow the university to communicate the same strategy in different registers.

Second, the university could create an interactive campus sustainability map. The map could show green spaces, tree-planting zones, recycling points, energy projects, water-saving systems, sustainable buildings, research facilities, and student project sites. Each point could include photographs, dates, responsible units, SDG links, and maintenance notes. Such a map would make sustainability visible in space and would transform the campus into a digital learning environment.

Third, PSAU could publish short indicator cards. Each card would focus on one claim: green-space area, tree count, energy savings, digital courses, OER resources, sustainability workshops, SDG research projects, community beneficiaries, or ranking performance. The front of the card would present a simple message; the back or linked page would explain methods and sources. This format would suit social media while preserving traceability.

Fourth, student participation should be integrated into digital communication. Students could submit sustainability project summaries, photographs, data visualizations, short videos, and reflections through a moderated portal. Selected projects could be linked to courses and SDGs. This would show that sustainability is not only a top-down institutional claim but a lived educational practice. It would also generate peer-to-peer communication, which often has strong persuasive power.

Fifth, PSAU could connect digital transformation more explicitly to environmental outcomes. For example, e-services can be linked to reduced paper use, virtual labs to resource sharing, data management to sustainability reporting, and digital learning to access and reduced travel. The university should avoid assuming that audiences will infer these connections. Clear explanations would strengthen the environmental meaning of IT and innovation initiatives.

9. Conclusion

PSAU's digital environmental communication demonstrates that sustainability in contemporary higher education is platformed. It is communicated through green campus pages, strategic initiatives, digital transformation narratives, IT governance, research and innovation structures, SDG/ESG coordination, learning technologies, and ranking news. These materials inform, legitimate, educate, mobilize, and evidence institutional sustainability. Their effectiveness depends on how well the platform connects claims to stakeholders and stakeholders to action.

The article has argued that PSAU's strongest opportunity lies in transforming existing digital capacity into a participatory sustainability communication system. The university already has credible ingredients: green-campus evidence, national alignment, research priorities, digital transformation indicators, governance units, and external recognition. A stakeholder-centered platform could connect these ingredients through audience pathways, methodological notes, interactive maps, indicator cards, participation tools, and annual reporting. Such a system would strengthen institutional trust by making sustainability visible, actionable, and accountable.

10. Extended Stakeholder Notes

One underused stakeholder group in many university sustainability platforms is the facilities and operations staff. These employees often hold practical knowledge about energy use, irrigation, waste, maintenance, purchasing, and building performance. PSAU's digital communication could make their expertise more visible through short interviews, maintenance explainers, and annual operational notes. This would humanize sustainability and demonstrate that green transformation depends on everyday professional work as well as strategic leadership and student enthusiasm.

Another stakeholder group is prospective students. For them, sustainability communication can influence university choice and identity formation. A prospective student does not only ask whether the university teaches sustainability; they may ask whether campus life supports healthy, responsible, future-oriented habits. Digital pages can answer this through maps of green spaces, examples of sustainability-related courses, student clubs, volunteer opportunities, and research projects. Such communication would position PSAU as a place where students can participate in national transformation rather than merely observe it.

Alumni also matter. Graduates can carry sustainability values into workplaces and communities, and they can become partners in green innovation. PSAU's platform could invite alumni to share environmental projects, mentor students, support community initiatives, or collaborate with research teams. This would extend sustainability communication beyond the campus and show long-term social impact. Alumni stories would also strengthen employability narratives by linking sustainability skills with labor-market relevance.

Finally, stakeholder engagement should include critical feedback. Universities sometimes prefer positive stories, but trust grows when stakeholders can raise concerns about water use, waste, accessibility, or data clarity. A moderated feedback mechanism would allow PSAU to collect suggestions and publish responses. This would demonstrate that sustainability is not only a message sent by the institution but a shared responsibility negotiated with its community.

11. Additional Analysis: Designing the Stakeholder Journey

A stakeholder-centered sustainability platform should be designed as a journey rather than a library. A student journey may begin with curiosity, move to understanding, then participation, then recognition, and finally leadership. PSAU's current digital materials provide several parts of this journey, but they could be linked more explicitly. A student who reads about the Green University initiative should be able to find courses, clubs, volunteering, research assistants, project competitions, and reporting data without leaving the sustainability environment.

A faculty journey is different. Faculty members need to know how sustainability priorities connect to funded research, interdisciplinary collaboration, curriculum development, publication support, community projects, and technology transfer. PSAU's SDG research funding, research and innovation pages, and SDG/ESG governance material can serve this audience if they are connected through a research pathway. The pathway could include active calls, previous projects, datasets, partner needs, student involvement, and impact communication templates.

An administrative journey focuses on implementation. Deans, department chairs, and unit managers need clear indicators, reporting calendars, and examples of how to integrate sustainability into operations. Digital communication can provide templates for event sustainability, paperless workflows, procurement choices, energy-saving practices, and student engagement. This would translate sustainability from a central strategy into distributed routines across colleges and departments.

A community-partner journey should begin with relevance. Local partners may not care about internal university structures, but they may care about public lectures, school programs, greening campaigns, innovation services, environmental health, or youth participation. PSAU's platform could offer a community

page that explains collaboration opportunities in plain language and presents contact points. This would make sustainability communication outward-facing rather than only institution-facing.

A ranking-audience journey requires fast access to evidence. Ranking bodies and external reviewers often need documents, indicators, governance explanations, and proof of activities. PSAU's SDG/ESG unit can create a structured evidence repository that maps materials to SDGs, dates, responsible units, and evidence types. Such a repository would reduce the labor of annual submissions and improve consistency. It would also support transparency for ordinary users.

The design principle across these journeys is progressive disclosure. Users should first see a clear summary, then have the option to open more detail. A student may need a simple explanation of how to volunteer; a researcher may need methodological data; a ranking evaluator may need documentation. The platform should not force all users into the deepest level of detail, but it should make detail available. This is how digital communication can be both accessible and credible.

Accessibility is a major part of stakeholder engagement. Sustainability pages should use clear language, readable layouts, alt text for images, captions for videos, keyboard-accessible forms, and consistent Arabic-English content. Accessibility is not separate from sustainability; it is part of social sustainability and educational equity. PSAU's bilingual web environment already points toward inclusive communication. A sustainability hub could strengthen this by ensuring that environmental data and participation opportunities are usable by all beneficiaries.

Social media should also be integrated with the official evidence system. Posts are useful for visibility, but they can become ephemeral. Each campaign post should link back to an official page where the claim is archived, contextualized, and documented. This protects credibility because audiences can move from a short message to a fuller source. It also protects institutional memory because events do not disappear into a timeline. The chatbot or digital assistant can play a practical role. Rather than only answering administrative questions, it could route sustainability queries: Where can I recycle? How do I join a campaign? What is the Green University initiative? Where is the sustainability report? Which courses include SDG topics? Who coordinates SDG research? A well-designed response system would turn sustainability from a static webpage into a service experience.

Digital badges and certificates can support participation when tied to meaningful criteria. PSAU could recognize students who complete sustainability modules, volunteer hours, research projects, or innovation challenges. These badges could appear in student portfolios and support employability. The key is to ensure that badges represent real learning or contribution. Otherwise, they risk becoming symbolic. A credible platform should publish badge requirements and verification procedures.

Evaluation should be built into the communication strategy. PSAU could track page visits, downloads, event registrations, feedback submissions, student participation, dashboard use, and learning-module completion. These analytics should be interpreted ethically and used to improve communication. If students rarely open method notes, summaries may need redesign. If community partners cannot find contact points, navigation should change. Engagement data can turn communication into continuous improvement.

Risk communication is another stakeholder need. Environmental initiatives can face challenges such as tree survival, water constraints, heat stress, funding limits, maintenance demands, or changing technology. A credible university platform should be prepared to communicate such issues honestly. This does not weaken the message. It shows that sustainability is managed in the real world, where complex systems require adaptation. Stakeholders often trust institutions more when they acknowledge constraints.

Partnership communication should be specific. PSAU's sustainability discourse references partnerships and community engagement, but a stakeholder platform could show partner categories, active projects, expected outcomes, and opportunities to collaborate. Industry partners may be interested in green technologies. Schools may be interested in environmental education. Municipal partners may be interested in afforestation and urban quality of life. Each partnership type needs its own pathway.

The platform should also support storytelling without abandoning evidence. Stories help stakeholders care; data help them trust. A student story about a recycling project is stronger when paired with measured waste reduction. A faculty story about sustainable materials is stronger when linked to publications or prototypes. A facilities story about energy management is stronger when paired with baseline data. The best sustainability communication combines narrative warmth with evidentiary discipline.

Implementation can be phased. PSAU does not need to build a perfect system immediately. Phase one could centralize links and define evidence categories. Phase two could add indicator cards and methodological notes. Phase three could create interactive maps and stakeholder portals. Phase four could publish annual sustainability dashboards and integrated reports. A phased plan would make digital sustainability communication manageable and would allow users to see progress over time.

12. Detailed Communication Pathways

A student pathway could begin with orientation. New students could receive a digital sustainability guide that introduces the Green University initiative, campus green spaces, recycling practices, energy-saving expectations, volunteer programs, and sustainability-related courses. The guide could be embedded in the student portal and mobile app. This would make environmental responsibility part of university belonging from the first semester rather than an optional extracurricular topic.

A course pathway could connect instructors with ready-to-use local case material. Faculty teaching communication, engineering, environmental science, business, education, or computer science could use PSAU's sustainability data as teaching examples. The platform could provide datasets, case briefs, discussion questions, and project templates. This would make the university's own digital messaging a source for critical learning and problem-based education.

A research pathway could highlight interdisciplinary teams. Sustainability problems rarely fit one department. Energy, water, digital systems, health, behavior, policy, and education intersect. PSAU's platform could list researchers by SDG theme, provide collaboration forms, and showcase completed projects. This would help faculty find partners and would help students see how sustainability research crosses disciplinary boundaries.

A facilities pathway could explain operational changes in everyday language. Users often see construction, landscaping, maintenance, or service changes but do not know their environmental purpose. Short updates from facilities teams could explain why a green space is being expanded, how irrigation is managed, what energy-saving project is underway, or how waste collection is changing. This would reduce uncertainty and build appreciation for operational work.

A leadership pathway could communicate strategic commitments and progress. Senior leadership messages can be useful when they are linked to evidence and next steps. A president's or rector's sustainability message could introduce annual targets, acknowledge challenges, and invite participation. Leadership voice should not replace data; it should frame data as part of a shared institutional responsibility.

A community pathway could include schools, municipalities, NGOs, families, and local businesses. PSAU can present sustainability outreach in Al-Kharj as a partnership opportunity. The platform could include a calendar of public events, a form for collaboration requests, and stories showing how student and faculty work benefits local communities. This would align environmental communication with social responsibility.

A media pathway could improve public reporting. Journalists and communicators need concise, accurate material. PSAU could provide media kits with verified statistics, photographs, captions, methodology notes, and contact information. This would reduce the risk of misquotation and ensure that external coverage carries accurate evidence. It would also make the university's sustainability message easier to circulate beyond its own channels.

A policy pathway could connect university actions to Vision 2030, the Saudi Green Initiative, the Quality of Life Program, and SDG targets. Policymakers and public agencies often need evidence of alignment and contribution. A structured page mapping PSAU initiatives to national objectives would make the university's role easier to evaluate. Such mapping should include evidence, not only labels.

A digital services pathway could show how paperless processes, e-learning, open educational resources, virtual labs, and reporting platforms support sustainability. The university should be careful not to claim automatic environmental benefit, but it can explain plausible links and measure them where possible. For example, service digitization can be connected to reduced printing if actual paper-use indicators are tracked.

A data literacy pathway could teach stakeholders how to read sustainability indicators. Short explainers can define baseline, target, percentage change, carbon equivalent, energy intensity, water efficiency, waste diversion, and SDG mapping. This would empower students and staff to interpret claims critically. A university platform should not only provide data but also build the capacity to understand data.

A feedback pathway is essential for trust. Users should be able to suggest improvements, report problems, ask for clarification, or propose projects. Feedback should not disappear into an unknown inbox. The platform could publish themes from feedback and responses from responsible units. This would show that stakeholder engagement produces institutional learning.

Together, these pathways convert sustainability communication from a set of pages into a service ecosystem. Each pathway addresses a different stakeholder need while remaining connected to a common evidence base. This is the central promise of digital innovation for environmental communication: not more messages, but better relationships among messages, evidence, and action.

13. Monitoring and Evaluation of Engagement

Monitoring engagement should begin with simple indicators: visits to sustainability pages, downloads of reports, registrations for events, completion of sustainability modules, number of student submissions, number of feedback items, and response time to stakeholder questions. These indicators would not prove environmental impact, but they would show whether digital communication is reaching and activating audiences. PSAU could review them each semester and adjust content accordingly.

The next level is outcome evaluation. If a campaign encourages recycling, the platform should connect participation metrics to waste indicators. If a digital service is described as paperless, the university should track paper consumption before and after adoption. If students complete an energy-conservation module, surveys or behavioral indicators could examine whether habits change. Engagement becomes credible when communication is linked to observable outcomes.

Evaluation should also include qualitative feedback. Numbers may show that a page is visited, but interviews or open comments can explain whether users understood it. Students might report that sustainability pages are informative but hard to navigate. Faculty might ask for more data. Community partners might want clearer contact points. Such feedback can guide redesign more effectively than analytics alone.

A yearly engagement review could be published as part of a sustainability report. It would summarize what stakeholders read, asked, joined, downloaded, suggested, and changed. This would demonstrate that PSAU treats communication as part of sustainability governance. It would also help the university learn which digital affordances are most useful and which require improvement.

Ultimately, digital innovation matters because it can close the distance between institutional ambition and stakeholder practice. A platform that informs without mobilizing remains incomplete. A platform that mobilizes without evidence risks superficiality. A platform that provides evidence without translation risks technical isolation. PSAU's strongest path is to combine all three: clear information, meaningful participation, and trustworthy evidence.

This evaluation culture should be visible to stakeholders. A short public statement explaining how PSAU reviews its digital sustainability communication would signal seriousness. It could describe who reviews content, how data are checked, how feedback is handled, and when updates occur. Such process transparency is not glamorous, but it is one of the strongest foundations of institutional trust.

The same principle applies to innovation claims. When PSAU describes emerging technologies or green technology, stakeholders benefit from examples, prototypes, responsible teams, and environmental relevance. Innovation should be communicated as a pathway from problem to experiment to evidence to implementation. This pathway would make digital innovation more than a sign of modernity; it would make it a practical tool for sustainability.

A final benefit of stakeholder-centered communication is resilience. When sustainability messages are connected to evidence, participation, and feedback, they can survive changes in leadership, platforms, or ranking criteria. The knowledge remains archived, the data remain comparable, and stakeholders continue to know how to engage. This resilience is crucial for sustainability because environmental progress depends on long time horizons rather than short campaigns.

For this reason, PSAU's platform should be treated as part of its sustainability infrastructure. Just as trees, buildings, laboratories, and classrooms require maintenance, digital evidence systems require maintenance. Pages must be updated, links checked, data verified, and feedback answered. Sustainable communication is itself an operational practice.

This final point reinforces the central argument: digital sustainability communication succeeds when

stakeholders can move from awareness to evidence, from evidence to participation, and from participation to measurable institutional learning.

14. Future Research Directions

Future research could test the stakeholder model empirically by surveying PSAU students and employees. Respondents could be asked whether they know about the Green University initiative, where they learned about it, which digital channels they use, and what kinds of evidence they trust. The results would help determine whether official sustainability messaging reaches its intended audiences or remains concentrated among users who already follow university news.

Another study could map the user's actual navigation path. Researchers could ask participants to find information about sustainability volunteering, SDG research funding, green-space data, or digital transformation. Time on task, errors, and user comments would reveal whether the platform structure supports or hinders engagement. This would provide practical evidence for redesigning sustainability pages around stakeholder needs.

A third direction is social media analysis. Official webpages provide authority and archives, while social platforms provide speed, emotion, and peer circulation. Comparing the language, images, and engagement patterns of PSAU sustainability content across websites and social media would show how institutional messages change as they move across platforms. It would also reveal whether stakeholders respond more to data, stories, images, or participation opportunities.

Finally, researchers could examine the environmental effects of digital transformation itself. Claims about paperless services, virtual access, e-learning, and open resources should be connected to measurable resource changes where possible. This would make the relationship between digital innovation and environmental sustainability more precise. Such research would benefit PSAU's communication and contribute to wider debates on green digital universities.

15. Policy and Management Implications

For university management, the stakeholder model implies that sustainability communication should have an owner and a network. The owner may be a sustainability or SDG/ESG unit, but the network must include IT, student affairs, facilities, research administration, colleges, public relations, and quality assurance. Each unit produces different evidence and speaks to different audiences. Digital innovation can connect these units if roles, workflows, and publication standards are agreed in advance.

For IT management, the implication is that technical systems should be designed with sustainability reporting in mind. Data fields, dashboards, content management systems, and service portals can be configured to capture evidence that later supports public communication. This turns IT from a back-office provider into a strategic partner in sustainability governance. PSAU's existing emphasis on enterprise architecture and data management provides a natural foundation for this role.

For student affairs, digital sustainability messaging should support participation, not just awareness. Campaign pages should include registration links, calendars, task descriptions, learning outcomes, recognition criteria, and follow-up results. When students can see the results of their participation, they are more likely to understand sustainability as a shared practice. This also helps the university document student engagement for educational and SDG reporting.

For research administration, stakeholder communication should translate research into accessible forms. Funded SDG projects can be summarized in short public briefs that explain the problem, method, findings, and social or environmental relevance. These briefs would serve external partners, students, and ranking audiences. They would also help faculty demonstrate impact beyond publication counts. Research communication is a major bridge between innovation and public trust.

For public relations and corporate identity teams, the implication is that attractive design must be paired with evidence discipline. Visual materials, slogans, and campaign names should be reviewed alongside data sources and methods. This does not reduce creativity. It gives creativity a stronger foundation. A beautiful sustainability message is more persuasive when stakeholders can click through to the evidence behind it.

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